



REPUBLIC OF KENYA

LEARNING GUIDE

FOR

ICT LEVEL 4



First published 2018

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FOREWORD

The provision of quality education and training is fundamental to the Government's overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya's development blue print and sustainable development goals. This triggered the formulation of the Policy Framework on "Reforming Education and Training in Kenya" (Sessional Paper No. 1 of 2019). A key provision of this policy is the radical change in the design, development and delivery of Technical and Vocational Education and Training (TVET) which is the key to unlocking the country's potential for industrialization. This policy requires that training in TVET be Competency Based, learning guide development be industry led, certification be based on demonstration of competence and that mode of delivery allows for multiple entry and exit in TVET programs.

The State Department for Vocational and Technical Training (VTT) has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET) to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labor force. The Technical and Vocational Education and Training Act No. 29 of 2013 and the Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya, emphasizes the need to reform learning guide development, assessment and certification to respond to the unique needs of the industry.

This learning guide has been developed to support the implementation of CBET curriculum in ICT Technician Level 4 and is intended to guide the trainee through the learning process. It is my conviction that this learning guide will play a critical role towards supporting the development of competent human resource for ICT sector's growth and sustainable development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING
MINISTRY OF EDUCATION**

PREFACE

Kenya Vision 2030 is anticipated to transform the country into a newly industrializing, "middle-income country providing a high-quality life to all its citizens by the year 2030". The Sustainable Development Goals (SDGs) number four that focuses on inclusive and equitable quality education and promotion of lifelong learning for all, further affirm that education and training is an important driver to economic

development for any country. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy.

TVET CDACC has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET) to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force. The Technical and Vocational Education and Training Act No. 29 of 2013 and the Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya, emphasizes the need to reform learning guide development, assessment and certification to respond to the unique needs of the industry.

To effectively implement CBET curriculum in ICT Technician Level 4 this learning guide has been designed and organized with clear interactive learning activities for each learning outcome of every unit of learning. The guide further provides information sheet, self-assessment items, tools, equipment, supplies, and materials necessary for the particular learning outcome. This is aimed at imparting the relevant knowledge, requisite skills and the right attitude for work.

I am grateful to the trainers involved in the development of this learning guide.

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CHAIRMAN, TVET CDACC**

ACKNOWLEDGEMENT

This learning guide has been designed and developed to support the implementation of Competency Based Education and Training (CBET) curricula in Kenya. The learning guide is intended to support learning by providing practical and theoretical learning activities, simplified content and self-assessment items to guide the trainee in the learning process.

I recognize with appreciation the critical role of trainers in developing this learning guide and ensuring its alignment with National Occupational Standards (OS) and CBET curriculum. I am convinced that this learning guide will support trainees' acquisition of knowledge, skills and right attitude needed for work in the ICT sector.

Dr. LAWRENCE GUANTAI M'ITONGA, PhD
COUNCIL SECRETARY/CEO

ABBREVIATIONS AND ACRONYMS

ANSI	: American National Standards Institute
API	: Application Programming Interface
BASIC	: Beginner's All-purpose Symbolic Instruction Code
BC	: Basic Competency
CDACC	: Curriculum Development, Assessment and Certification Council
COBOL	: Common Business-Oriented Language
CPU	: Central processing unit
CR	: Core Competency
FTP	: File Transfer Protocol
GNU GPL	: GNU General Public License
HTML	: Hypertext Mark-up Language
HTTPS	: Hypertext Transfer Protocol Secure
IBM	: International Business Machines Corporation
ICANN	: Internet Corporation for Assigned Names and Numbers
ICT	: Information Communication Technology
IDE	: Integrated Development Environment
IEEE	: Institute of Electrical and Electronic Engineers
IM	: Instant Messaging
IP	: Internet Protocol
ISP	: Internet Service Provider
JEE	: Java Enterprise Edition
KNQA	: Kenya National Qualifications Authority
LAN	: Local Area Network
MMS	: Multimedia Message Service
OOP	: Object-Oriented Programming

OS	: Occupational Standards
OSHA	: Occupation Safety and Health Act
OSHS	: Occupation Safety and Health Standards
PPE	: Personal Protective Equipment
RAM	: Random-access memory
SDK	: Software Development Kit
SMS	: Short Message Services
SMTP	: Simple Mail Transfer Protocol
SSAC	: Sector Skills Advisory Committee
SSH	: Secure Shell
TCP	: Transmission Control Protocol
TLD	: Top Level Domain
TVET	: Technical and Vocational Education and Training
UI	: User Interface and UX: User eXperience
URL	: Universal Resource Locators
USB	: Universal serial bus
W3C	: World Wide Web Consortium
WWW	: World Wide Web

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Background Information

This learning guide will enable the trainee to acquire competencies to undertake in various activities in ICT. It provides theoretical and practical learning activities, simplified content, illustrations and self-assessment items to guide the learner in learning process it also provides link and references for further reading.

Layout of the Trainee Guide

Performance standards: These are obtained from the performance criteria statements in the related unit of competency of the Occupational Standards (OS)

Information Sheet: This section covers information relating to the specific learning outcome. This information should include but not limited to meaning of terms, methods, processes/ procedures/ guidelines, Illustrations (photographs, pictures, videos, charts, plans, digital content links, simulations links) and case studies. This section also provides additional information sources relevant to the learning outcome e.g. books, web links

Learning activities: This section covers practical activities related to the Performance Criteria statements, Knowledge in relation to Performance Criteria as given under content in the curriculum Special instructions related to learning activities

Self-Assessment: This section must be related to the Performance Criteria, Required Knowledge and Skills in the Occupational Standards. This section requires the trainee to evaluate their acquisition of skills, knowledge and attitude in relation to the learning outcome. A variety of assessment items such as written and practical tests which emphasizes on the application of knowledge, skills and attitude is recommended

The self-assessment items should be valid, relevant and comprehensive to the level of qualification in the learning outcome

Tools, equipment, materials and supplies: This section should provide for the requirements of the learning outcome in terms of tools, equipment, supplies and materials. The section should be adequate, relevant and comprehensive for the learning outcome.

References: Information sources should be quoted and presented as required in the APA format
The units of learning covered in this learning guide are as presented in the table below:

Core Units of Learning

Unit Code	Unit Title
IT/CU/ICTA/CR/01/4/A	Usage of ICT devices
IT/CU/ICTA/CR/02/4/A	Software Installation
IT/CU/ICTA/CR/03/4/A	Repair and Maintenance
IT/CU/ICTA/CR/04/4/A	Application of Microsoft Office tools

IT/CU/ICTA/CR/05/4/A	Usage of the Internet

CHAPTER ONE: USAGE OF ICT DEVICES

UNIT CODE: ICT/CU/ICTA/CC/01/4/A

Related unit of competency to Occupational Standards

This unit addresses the unit of competency: **Use of ICT Devices**

1.1 Introduction to the unit of learning

This unit describes the competencies required in Understanding Basic use of ICT devices. It involves identification of computer components, operating a computer, identifying ICT applications, identifying healthy, safety and environmental issues in ICT and identifying ICT security issues.

1.2 Summary of Learning Outcomes:

1. Identification of Computer components
2. Operating a computer
3. Understanding Computer Networks
4. Identification of Applications of ICT
5. Identification of health, safety and environmental issues in ICT
6. Identification of ICT security issues

4.2.1 1.2.1 Learning Outcome 1: Identification of Computer components

1.2.1.1 Introduction to the learning outcome

The learning outcome will equip the trainee with knowledge, skills and competencies required in identifying computer hardware devices and software; the trainee will be able to identify and acquire knowledge on different types of hardware components of a computer, their functions and how they are used together with different application programs to achieve the desired goal. In addition, they will acquire competencies on assembling and connecting other external devices like printers and speakers with computer, and software installation.

1.2.1.2 Performance Standard

- 1.2.1.2.1 Various *hardware devices* are identified. according to the manufacturer's specifications
- 1.2.1.2.2 Functions of the hardware devices are described
- 1.2.1.2.3 Documentation of the hardware devices is done as per the manufacturer's specification.
- 1.2.1.2.4 Definition of application and operating system software terminologies is done
- 1.2.1.2.5 Types of application software are identified
- 1.2.1.2.6 Functions of the application and operating system software are outlined

1.2.1.3 Information Sheet

Definitions of terms,

- **UPS** - During power surges and failures, Uninterruptible Power Supply (**UPS**) devices keep **computer** systems and ICT equipment safe and operational. An Uninterruptible Power Supply (**UPS**) provides battery backup power when the flow of electricity drops to an inadequate voltage, or if it stops.
- **Server** - a **server** is a piece of computer hardware or software that provides functionality for other programs or devices, called "**clients**".
- **Computer technician** - is an individual who identifies, troubleshoots and resolves computer problems. Computer technicians possess skills, knowledge, hands-on experience and different tools to repair and maintain computer hardware, software and network/Internet issues.

Introduction to identification of computer hardware and software

Identification of computer hardware and software will take place in computer lab where the trainer will guide the trainee on identifying different computer components and demonstrate how they are used to carry out different functions.

Theoretical and practical lessons will be undertaken by the trainer to enable the trainee familiarize with lab hardware and software by use of explanations and demonstrations. By the end of the lesson individual and group assignments will be given to for more practice. Below are areas the trainer will cover

Introduction to computer application

Computer: A computer is an electronic device which works under the control of stored programs which automatically enable it to accept, store, process, and produce information to be used by the management for decision making.

Terminologies used in ICT

- *Data:* - these are basic raw facts or figures.
- *Information:* - refers to results of data processing
- *Processing:* - the act of collecting raw data from a source document, feeding the data into a computer via a keyboard, converting the data into an understandable language of computer to be manipulate to produce a reliable data (information)
- *Program:* - these are step by step set of instructions which enables computer system to perform some specific functions

- *GIGO*: - is a term used in computers and stands for *garbage in garbage out*. It is used to mean that computer will always conform to the instructions given to it by the user. Hence the term garbage in garbage out.

Computer hardware devices



Figure 1: Hardware devices

Hardware

Definition: computer hardware are physical or tangible components of a computer system, they include input, output, CPU back-up and bus system.

Input devices

1. Pointing devices

- Mouse** is an input device which has two buttons (primary and secondary) used for clicking on items or icons on computer screen. Some of the functions of a mouse include:
 - Clicking – means pressing and releasing the left mouse button once
 - Double clicking – pressing the left button twice in quick succession
 - Right clicking – pressing the right hand side mouse button once
 - *Drag and drop* – the user drags an item from one location to another
 I.e. *Drag* – press and hold down left button and then move the mouse to the new location
Drop – release the button immediately after dragging the item to the new location.

Trackball uses a sphere located on top that is rotated by hand to control cursor movement.

- a. **Joystick** is a pointing device which looks like a car gear lever which can be moved sideways, upwards, downwards to no space control the position of cursor.
- b. **Light pen** is a hand held pen-like device that has a light sensitive point.

Keying devices

Keyboard is an example of an input device used to convert and key in data in form of machine code (understandable language of computer).

Types of keyboard

- *Cordless keyboard* – is a battery powered keyboard that buses Bluetooth technology instead of being physically connected to system unit.
- *Braille keyboard* – is designed for use by the blind. Has keys identified by raised dots.
- *Ergonomic keyboard* – is designed specifically to provide comfort and eliminate wrist pain to users.
- *Flexible keyboard* – is a portable keyboard that can be folded and packed in a bag.
- *Traditional keyboard* – is a full sized rigid keyboard.

Scanning devices

They are devices that capture data into the computer directly. They include: Optical Mark Recognition (OMR), Optical Bar Recognition (OBR), Optical Character Reader (OCR) and Magnetic – Ink character recognition (MICR)

Other digital devices include touch screen, touchpad, digital cameras, digitizer's smartboards etc.

Central Processing Unit (C.P.U)

It's the brain of a computer. It consists of *control unit, arithmetic and logic unit* and *main memory*. The main function of C.P.U is to process raw data to information.

Storage Devices



Figure 2: Storage Devices

These are storage devices that complement the primary memory. They are used to store information for longer periods. Some of the examples include: Magnetic disks, Magnetic tapes, Optical disks and Solid State Technology

Output Devices



Figure 3: Output Devices

Output devices are peripheral devices that a computer uses to give out information produced after processing.

There are two forms of output

Softcopy – refers to the intangible output mainly displayed on the screen or through devices like speakers.

Hard copy – refers to tangible output produced on papers e.g. by printers, plotters etc.

Examples of output devices include:

- Monitors, printers, speakers, graph plotters etc.

Computer Software

Software is a set of instructions that enables a computer system to operate.

Classification of software

Basically there are two main classifications i.e. system software and application software

System software

It enables the user to communicate with the computer and its various devices e.g. keyboard.

Examples include: operating system, firmware, utility software, network software etc.

Application software

Application software is designed to help the user accomplish specific tasks. They include: word-processor, database, desktop publishing AutoCAD etc.

Functions of operating system

a. Memory Management

Memory management refers to management of Primary Memory or Main Memory. E.g.

- Keeps tracks of primary memory, i.e., what part of it are in use by whom, what part are not in use.
- Allocates the memory when a process requests it to do so.
- De-allocates the memory when a process no longer needs it or has been terminated.

b. File Management

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directions.

An Operating System does the following activities for file management –

- Keeps track of information, location, uses, status etc. The collective facilities are often known as **file system**.
- Decides who gets the resources.
- Allocates the resources.
- De-allocates the resources.

c. Processor Management

In multiprogramming environment, the OS decides which process gets the processor when and for how much time. This function is called *process scheduling*

d. Device Management

An Operating System manages device communication via their respective drivers. It does the following activities for device management

- Keeps tracks of all devices. Program responsible for this task is known as the I/O controller.
- Decides which process gets the device when and for how much time.
- Allocates the device in the efficient way.
- De-allocates devices.

1.2.1.4 Learning activities

Practical Assessment

Assemble computer components

Tools and equipment's provided are

- Table
- First aid kits
- mats
- Motherboard. A motherboard is the first component you'll want to choose. ...
- Processor/Central Processing Unit (CPU) The CPU is the engine of your **computer** and sets the performance expectations for the entire build. ...
- Memory (RAM) ...
- Installing the memory. ...
- Installing the HDD or SSD.
- Cables
- Graphics and expansion cards
- Screw driver

Follow the following procedure

1. Set working area
2. Take Inventory
3. Make space and time
4. Remove side panels
5. Check clearance
6. Install motherboard
7. Power motherboard
8. Install optical drive (CD/DVD drive)
9. Install the hard drive (HDD)
10. Install the processor
11. Install the processor heat sink
12. Install the RAM
13. Install CD/DVD drive
14. Connect graphic and Expansion cards
15. Install SYS/Rear cooling fan
16. Bus cable connection
17. Power Cable connection
18. Front Panel connector connection

1.2.1.5 Self-Assessment

1. What is a computer? (2 marks)
2. Define the following terms in relation to computer (6 marks)
3. Name FOUR components that make up a computer. (4 marks)
4. Distinguish between special purpose and general purpose computer. (2 marks)
5. State the technology used in each of the following computer generations. (4marks)
6. Highlight FOUR characteristics of a computer. (4 marks)
7. List TWO advantages and TWO disadvantages of using computers. (4 marks)
8. State **THREE** characteristics of the following computer generations. (6 marks)
9. Differentiate between the following computer devices (6 marks)
10. Explain three application areas of computers (6 marks)

1.2.1.6 Tools, equipment supplies and materials

- Printers
- Software
- operating system
- office tools
- network management tools
- network components

1.2.1.7 References

Ahrens, J. H. and Kohrt, K. D. (1981) Computer methods for efficient sampling from largely arbitrary statistical distributions.

Computing 26, 19-31. Andrews, D. F. (1976) Contribution to the discussion of Atkinson and Pearce (1976). J. Roy. Statist. Soc. A 139, 452-453.

1.2.1.8 Self-Assessment Responses

1. What a computer? (2 marks)
A computer is an electronic device which works under the control of stored programs to accept, process, and store information to be used by management for decision making.
2. Define the following terms in relation to computer (6 marks)
 - i. Data – These are basic raw facts or figures
 - ii. Processing – act of collecting data, feeding via keyboard, converting into understandable language of computer and manipulating the raw data into information.

- iii. Information – These are results of data-processing
3. Name **FOUR** components that make up a computer. (4 marks)
- Input
 - Processor
 - Storage
 - Output
4. Distinguish between *special purpose* and *general purpose* computer. (2 marks)
- Special purpose computers are those computers that are designed to serve a specific purpose e.g. Robots, mobile phones used for communication only
5. State the technology used in each of the following computer generations. (4marks)
- First generation computers – *vacuum tubes*
 - Second generation computers – *transistors*
 - Third generation computers – *integrated circuits*
 - Fourth generation computers – *large scale integrated circuits and very large scale integrated circuits*
6. Highlight **FOUR** characteristics of a computer. (4 marks)
- *Speed* - A computer works with much higher **speed** and **accuracy** compared to humans while performing mathematical calculations. ...
 - *Accuracy* - Computers perform calculations with 100% **accuracy**. ...
 - *Diligence* - A computer can perform millions of tasks or calculations with the same consistency and
 - *Voluminous* – computer can store millions of data/ instructions because it is highly capacitated.
7. List **TWO** advantages and **TWO** disadvantages of using computers. (4 marks)

Advantages

- Computers can store large volumes of data
- Computers operate at a very high speed e.g. microseconds

Disadvantages

- Computers are costly
- Computers can be attacked by viruses leading to loss of data

8. State **THREE** characteristics of the following computer generations. (6 marks)
- i. *First generation computers*
- Their technology was based on vacuum tubes
 - Big physical circuitry
 - Limited internal memory of 2kb
- ii. *Third generation computers*
- Their technology was based on integrated circuits

- They were smaller in size
 - They were costly compared to first and second generation computers
9. Differentiate between the following computer devices (6 marks)
- i. Mouse and trackball
 - *Mouse* is used to enter data or instructions by controlling a pointer on the screen while...
 - *Trackball* uses a sphere located on top that is rotated by hand to control cursor movement
 - ii. Touchpad and touch screen
 - *Touchpad* is a surface that is sensitive to pressure and motion i.e. when you move four fingertips across the pad, the pointer on the screen moves in the same direction. While ...
 - *Touchscreen* – is a device that recognises the location of contact on the screen through a built-in grid of sensing lines and sensors.
 - iii. Digitizers and light pen
 - Digitizers* – has a graphic tablet on which the user writes on using a pen (stylus). The stylus moves on the tablet and the drawing is directly reflected on the screen. **While...**
 - Light pen* – is a handheld pen-like device that has a light sensitive point to select items on computer screen through sensing.
10. Naivas supermarket intends to buy an input put device they can use in the supermarket to scan barcodes on items. Which device would one advice the company to buy and why? (2 marks)
- Optical bar recognition* – because it is the only device specifically designed to scan and translate a barcode into machine understandable mode.
11. Explain three application areas of computers (6 marks)
- Airline reservation systems**
- Nowadays computers are being used for booking in flights where, after one books online a seat is reserved for them and in the system the same information is reflected
- Banking**
- Today, banking is almost totally dependent on computers.
- Banks provide the following facilities –

- Online accounting facility, which includes checking current balance, making deposits and overdrafts, checking interest charges, shares, and trustee records.
- ATM machines which are completely automated are making it even easier for customers to deal with banks.

Education

Computers have helped in providing a lot of facilities in the education system. This includes:

- Providing a tool in the education system known as CBE (Computer Based Education). Which involves control, delivery, and evaluation of learning.
- It is also used to prepare a database about performance of a student and analysis is carried out on this basis.

Marketing

- *Advertising* – With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.
- *Home Shopping* – Home shopping has been made possible through the use of computerized catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.

Healthcare

Computers have become an important part in hospitals, labs, and dispensaries. They are being used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, ultrasounds CT scans, and MRI etc. are also done by computerized machines.

Following are some major fields of health care in which computers are used.

- *Diagnostic System* – Computers are used to collect data and identify the cause of illness.
- *Lab-diagnostic System* – All tests can be done and the reports are prepared by computer.
- *Patient Monitoring System* – these are used to check the patient's signs for abnormality such as in Cardiac Arrest, ECG, etc.

- *Pharma Information System* – Computer is used to check drug labels, expiry dates, harmful side effects, etc.
- *Surgery* – Nowadays, computers are also used in performing surgery.

4.2.2 1.2.2. Learning Outcome 2: Operate a computer

1.2.2.1 Introduction to learning outcome

The learning outcome will equip the learner with knowledge, skills and competencies required on how to operate a computer. The trainee will acquire knowledge on starting computer i.e. switching on and off procedures. In addition, they will acquire competencies on use of different computer application programs. I.e. opening and closing/ exiting programs, creating and saving documents, formatting and editing text etc.

They should be able to perform basic file management operations like creating files and folders and use of different directories and drives to store data.

1.2.2.2 Performance Standard

1.2.2.2.1 switching on and off procedures is demonstrated.

1.2.2.2.2 Navigation and personalization of the windows operating system is done as per the operation manual

1.2.2.2.3 Basic file management operations are performed

1.2.2.3 Information sheet

Definition of terms

Cold boot – This refers to starting a computer

Warm boot – Refers to restarting a computer

Lab technician – Personnel who deals with repair and maintenance of computers. Also assists the lecture during the lesson in case a computer malfunctions

Ups – An interruptible power supply which acts as a power back up

Icons - An *icon* is a small graphical representation of a program, feature, or file. When you click or double-click an *icon*, the associated file or program opens or an action...

Starting computer

This is the process by which a computer loads system files into the memory and it is called boot process.

Types of booting

Cold booting – the process of switching on a computer that has been off completely by pressing the power button.

Warm booting - this happens when the computer originally on is forced to restart by pressing the restart button on the system unit.

Switching on and off

This entails pressing the power knob on system unit to enable start a computer (cold boot). The vice versa is switching off after the shutdown procedure.

Shutting down a computer

The following steps are followed when shutting down a computer system.

- Click start button
- Click the power icon
- Click shutdown option

Windows

It is an operating system which uses graphical user interface. It embraces use of mouse to click on icons. Compared to MS DOS (Microsoft Disk operating system) it more user friendly.

Windows came into market in different versions e.g. Windows 95, windows98, windows XP, windows Vista, windows 8 etc.

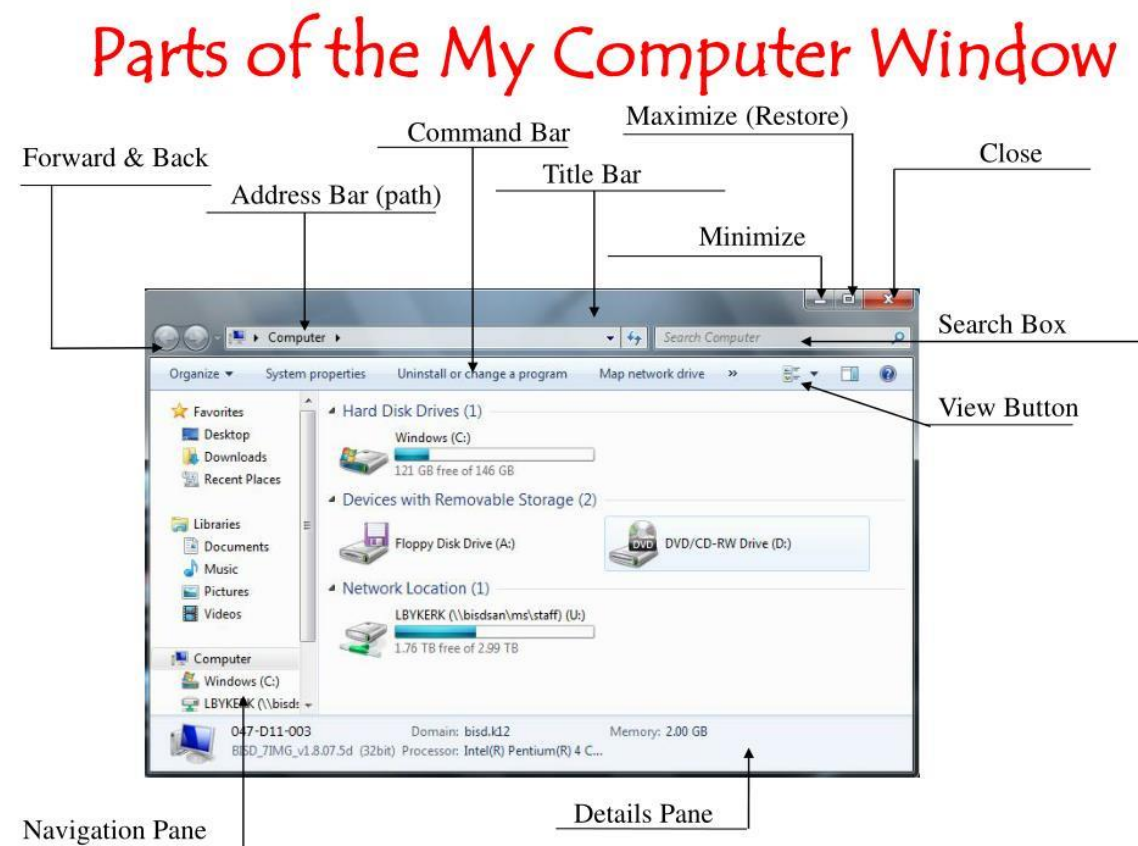


Figure 4: My computer window

Parts of a window

- Title bar
- Menu bar
- Tool bar
- Work Area
- Status bar
- Scroll bars
- Insertion pointer/ text cursor

Organisation of information using operating system

How windows organises information

The operating system organises information in terms of file, folders and drives

1. File

It's a collection of related data or information stored in one location.

Types of files

- *System files* - These files contain information that is critical for the operation of the computer
- *Application files* - These files hold programs or application files

Functions of files

Storage of data

- Organisation of information
- Folder/directory

2. Folder/directory

It's a named storage area where the user can store related files to enable easy access

3. Drives

The operating system recognise storage media or devices as *drives*. Drives are given labels as letters A – Z to identify them. E.g. hard disk if a computer has 3 hard drives, they will be assigned letters C, D, E.

Managing files/folders

The following activities are involved:

- *Renaming files/folders*- This refers to changing the name of files or folders from their original ones to some other new ones.
- *Sorting files and folders* - Refers to organising files and folders in a particular way.
- *Copying files and folders* - Enables the computer user to duplicate file and folders to another location.
- *Moving files and folders* - Refers to moving files and folders to another location

- *Deleting files and folders* - Refers to removing files and folders completely from the storage location.
- *Searching files and folders* - Refers to looking for a certain file or folder

Disk management using operating system

Formatting Disk – the process of preparing a new disk for use by creating sectors and tracks on the surface of disk

Disk defragmentation - Refers to arranging of scattered folders and files on storage media for easy access of files and folders

Disk Compression - This tool helps in consolidating files and folders in smaller storage areas hence creating more space on the storage device.

Disk Partitioning - The process of dividing physical disk into two or more partitions called logical drives

Backing up data - The tool enables user to create copies of areas to avoid loss of data and programs in case the storage device fails.

Scanning storage device - This tool helps the user to check up and repair minor storage problems e.g. lost storage or damaged surface

Scanning for virus - Refers to checking your system for virus and remove them e.g. using Norton antivirus, MacAfee software to scan.

1.2.2.4 Learning activity

Practical Assessment

- Follow the instructions below to perform practical
 - Create a word document with a title of your choice
 - Bold and underline the title, font size 14, and Tahoma
 - Save the document using the filename “new doc”
 - Save the document in desktop
 - Create a folder and rename it “main”
 - Transfer the file named “new doc” to the created folder “main”

1.2.2.5 Self-Assessment

1. What is booting
2. Write steps followed to shut down a computer
3. Name any FOUR parts of Ms-word application window
4. Distinguish between the following features of Ms-word
 - i. Save and save as
 - ii. Copy and move
5. State two ways you can use to highlight a word in Ms-word.
6. Distinguish between text editing and text deleting.
7. Highlight the steps taken to move one paragraph to another area in the same document.
8. The computer teacher in **MAJIVUNI HIGH SCHOOL** has put a rule that no diskette should be used in the computer lab
 - i. Which reason do you think made him put the rule?
 - ii. State other two ways he could have used to meet his objective

1.2.2.6 Tools, equipment supplies and materials

- Software
- operating system
- office tools
- network management tools
- network components

1.2.2.7 References

Bagga, R. K., Kenniston, K. and Mathur, R. R. (Eds.) (2005). The State, IT and Development. Sage Publications, New Delhi. 10.

Benigno, V. Et al (2007): Inclusive Education: Helping Teachers to Choose ICT Resources and Use Them Effectively – InstitutoTecnologie, Italy, eLearning Papers No. 6, November 2007.

1.2.2.8 Self-Assessment Responses

What is booting

It is the process by which a computer loads system files into the main memory.

Write steps followed to shut down a computer

- Click start button
- Click power
- click shutdown

Name any **FOUR** parts of Ms-word application window

Title bar

Menu bar

Status bar

Work area

Distinguish between the following features of Ms-word

Save and save as

Save this command saves the document without changing the file name or the location

Save as is a command that allows the user to save a document for the first time, change the file name or save on a different location.

i. Copy and move

- **Copying** means creating a duplicate copy of the text.
- **Moving** means removing the **text** from one place to another.

1. State two ways you can use to highlight a word in Ms-word.
 - Double clicking on the word
 - Dragging mouse pointer across the word
2. Distinguish between text editing and text deleting.
 - Editing refers to making necessary changes to an existing document
 - Deleting refers to erasing a text
3. Highlight the steps taken to move one paragraph to another area in the same document.
 - Select the paragraph
 - Press Ctrl + C for copy
 - Click the paragraph destination and Press Ctrl + V for paste
4. The computer teacher in **MAJIVUNI HIGH SCHOOL** has put a rule that no diskette should be used in the computer lab
 - i. Which reason do you think made him put the rule?

To prevent spread of viruses to the computers from infected floppy disks
 - ii. State other two ways he could have used to meet his objective
 - Disabling floppy disk drive
 - Encourage use of compact disks or flash memory.

4.2.3 1.2.3 Learning Outcome 3: Computer Network

1.2.3.1 Introduction

This unit specifies the competencies required to understand how computer network operates. It involves identification of network components, types of computer networks, and outlining computer network applications

1.2.3.2 Performance Standard

1.2.3.2.1 Definition of computer networks is done

1.2.3.2.2 Components of computer networks are identified according to organization structure.

1.2.3.2.3 Terminologies used in computer networks are explained.

1.2.3.2.4 Types of computer networks are identified.

1.2.3.2.5 Applications of computer networks are outlined

1.2.3.4 Information sheet

Definition of terms

Intranet - An **intranet** is a private network, operated by a large company or other organisation, which uses internet technologies, but is insulated from the global internet.

Extranet - An extranet is an intranet that is accessible to some people from outside the company, or possibly shared by more than one organisation. Extranet will allow public access of the network.

-W.W.W. - The **World Wide Web (WWW)**, commonly known as **the Web**, is an information system where documents and other web resources are identified by Uniform Resource Locators e.g. <https://arsenalfc.com/>, which may be interlinked by hyperlinks, and are accessible over the internet.

-Topologies – this refers to network design or arrangement of elements (links, nodes etc.) in a communication network.

-Servers - a server is a piece of computer hardware or software that provides functionality for other programs or devices, called "clients"

-Protocol - A **protocol** in networking is set of rules that determine how data is transmitted between different devices in the same network.

Types of Computer Networks

LAN (Local Area Network)

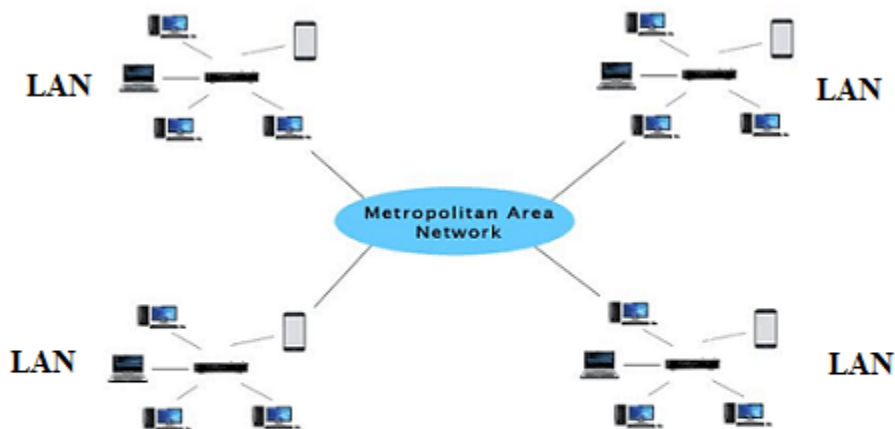


Figure 5: Local Area Network

Local Area Network is a group of computers connected to each other in a small area such as room, building, and office. The computers may be linked by use of twisted pair, coaxial cable, etc.

The speeds are as low as 10mbps.

MAN (Metropolitan Area Network)



Metropolitan Area Network (MAN)

Figure 6: Metropolitan Area Network

A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network. E.g. between cities

In most cases they belong to individual organizations

The speed are 100mbps

WAN (Wide Area Network)

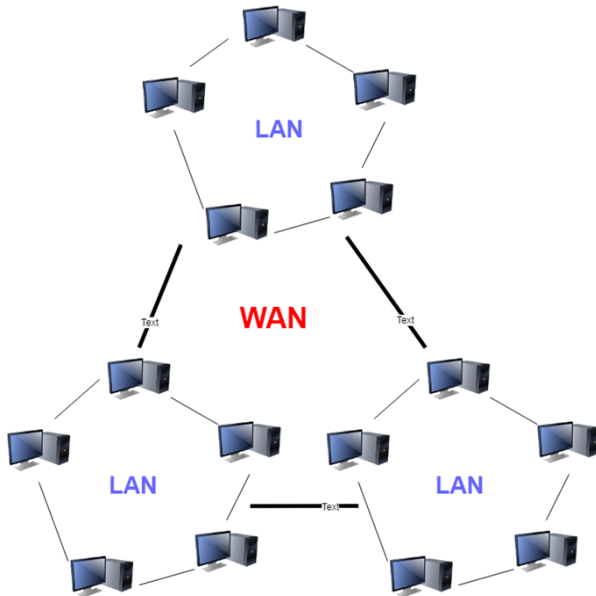


Figure 7: Wide Area Network

A Wide Area Network is a network that extends over a large geographical area such as states or countries.

A Wide Area Network is not limited to a single location, but it spans over a large geographical Area through a telephone line, fiber optic cable or satellite links.

The speeds are more than 1000mbps.

PAN (Private Area Network)



Figure 8: Private Area Network

Private area network is a network that moves with a person. **For example**, a mobile network moves
With a person.

Application Areas of computer networks

- Chatting: This is the real-time communication between two users via computer. Once a chat has been initiated, either user can enter text by typing on the keyboard and the entered text will appear on the other user's monitor. The two must be online for a chat to be initiated.
- Video Conferencing: This is the process of conducting a **conference** between two or more participants at different sites by using computer networks to transmit audio and video data.

Email Programs

These allow users to type messages at their local nodes and then send them to someone on the network. It is a fast and easy way of transferring mail from one computer to another

1.2.3.4 Learning activity

Practical Assessment

Perform Computer Networking

The following tools are provided to the trainee to enable them perform computer networking.

Tools Required

Cutters, Scissors, Pliers
Cable Tie Tools
Compression and Crimp Tools
Fibre Optic Tools
Insertion - Extraction Tools
Manual/Automatic Switch Boxes
Network Testers
Punch down Tools
Strippers
Tool Sets
Twisted pair cables
RJ 45
Computers (two or more)

1.2.3.5 Self-Assessment

1. Define the term network topology

2. State two advantages and two disadvantages of star topology
3. What is a VPN?
4. Explain the term firewalls
5. Explain **THREE** types of networks
6. Explain three types of topologies in computer networking

1.2.3.6 References

J. F. Kurose and W. R. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*.

L.L. Peterson and B. S. Davie, *Computer Networks: A System Approach*.

Self-assessment responses

1. Define the term network topology
It's a collection of computers linked together using transmission media for the purpose of communication and resource sharing

2. State two advantages and two disadvantages of star topology

Advantages

- Easy to configure
- Its easily expanded

Disadvantages

- If the central hub fails, the entire network goes down.
- Requires more cables to install hence more expensive

3. What is a VPN?

VPN means Virtual Private Network,

A technology that allows a secure tunnel to be created across a network such as the Internet. For example, VPNs allow you to establish a secure dial-up connection to a remote server.

4. **Explain the term firewalls**

Firewalls serve to protect an internal network from external attacks. These external threats can be hackers who want to steal data or computer viruses that can wipe out data

in an instant. It also prevents other users from external networks from gaining access to the private network.

5. Explain **THREE** types of networks

LAN (Local Area Network)

Local Area Network is a group of computers connected to each other in a small area such as room, building, and office. The computers may be linked by use of twisted pair, coaxial cable, etc.

The speeds are as low as 10mbps.

MAN (Metropolitan Area Network)

A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network. E.g. between cities

In most cases they belong to individual organizations

The speed are 100mbps

WAN (Wide Area Network)

A Wide Area Network is a network that extends over a large geographical area such as states or countries. The speeds are more than 1000mbps

6. Explain three types of **topologies** in computer networking

Star topology

In this topology, all devices are connected to a central hub. Workstations communicate across the network by passing data through the hub. When the hub receives data from a transmitting computer, it broadcasts the message to all other stations on the network.

Mesh topology

This protocol uses separate cables to connect each device to every other device on the network providing a straight communication path.

Bus topology

All devices are connected to a central cable called bus or backbone (main trunk).

Transmission and reception of a message is done by all the nodes. However, only one node can carry out a transmission at any time.

Practical assessment responses

Steps followed in performing computer networks

1. First, you will need to log on with administrator privileges in order to set up a network. This requirement prevents unauthorized users from changing network settings. There should be only one administrator account on the network, and its username and password should be closely guarded secrets.
2. You will need some hardware to physically connect the computers. E.g. Ethernet cabling
3. Each technology will have its own kind of *NIC (network interface card)*, a device that plugs into a computer and enables it to communicate with the network.

4. Software drivers provided with NICs configure the hardware you install for use with the network. This configuration is usually done automatically by Windows when it detects a newly installed device.
5. Connect a router – router will handle sharing an Internet connection. In the case of a wireless network, a device called an access point broadcasts radio signals to all of the NICs.
6. A software network operating system is also necessary to manage traffic on the network. This software is built into modern operating systems such as Windows and Linux. It allows you to set up user groups and resources that can be shared, such as files, folders and peripheral devices.
7. With the network hardware and software installed, it's time to organize your network resources. When you installed the operating system on each computer, you assigned a work group or domain name, such as "OFFICE," to each set of computers that share resources.
8. Set up resources on each computer that will be shared with others on the network. In Windows, you will need to enable file and printer sharing on each computer.
9. To share a device, such as a printer attached to the accounting computer, you have to enable sharing on the device and give the device a network name, for example, "printer." it will then show up as "printer on accounting" in the list of available printers.
10. Set up accounts
11. A **firewall** is an essential security precaution when connecting to the Internet. Windows comes with a built-in firewall, and routers also include firewall functions.

4.2.4 1.2.4 Learning Outcome 4: Identify applications of ICT

1.2.4.1 Introduction to the learning outcome

This unit specifies the competencies required to identify applications of ICT. It involves outlining the applications of ICT, identifying merits opportunities and challenges of ICT, and outlines the emerging trends in ICT too.

1.2.4.2 Performance standards

1.2.4.2.1 Applications of ICT in various sectors is outlined

1.2.4.2.2 Merits, opportunities and challenges of ICT application are identified.

1.2.4.2.3 Emerging trends in ICT outlined

1.2.4.3 Information sheet

Application area of ICT

Digital library

A full service digital library must accomplish all essential services of traditional libraries and also exploit the well-known advantage of digital storage, searching and communication. It provides access to part of or all its collection, such as plain texts, images, graphics, audio and video materials and other library items that have been electronically converted, via the internet and www.

Industries

The entry of ICT after the industrial revolution led to the development of the machines used and linking them to the web to send orders to them from different sectors.

ICT has increased the productivity of industries and reduced the time required to achieve the desired goal

Entertainment:

Information and communication technologies (ICT) have impacted entertainment and leisure activities in different ways in which you spend your time.

ICT offers a variety of entertainment and leisure activities and allows for quick access to movies or music that can be easily accessed and you can watch movies and listen to music directly from the Internet.

Medical Science:

Medical devices and modern equipment have evolved considerably favoring information and communications technology. Use of devices like CT scan, MRI which entirely depend on ICT has really improved service delivery in hospitals and medical field in general

Finance:

Information and communication technology is used daily by financial companies, to trade financial instruments, to report a business's earnings, and to keep records of personal budgets. ICT allows rapid calculation of financial data and provides financial services companies with

strategic and innovative benefits as well as electronic transfer of money, through the use of credit cards, or e-commerce, which includes the purchase and payment via the Internet and others...

Merits, Opportunities and Challenges in ICT

Merits of ICT

- Enhanced the modes of communication.
- Better teaching and learning methods.
- Enhanced data and information security.
- Minimize **cost** and save time.
- Easy student management.
- Automatic solutions to manual paper-based process and procedures.

Opportunities in ICT

- Computer Service Technician
- Cyber Security Specialist
- Data Analyst
- Data Centre Technician
- Data Scientist
- Database Administrator
- Database Analyst.

Challenges of ICT

- Lack of agility
- New security threats
- Multi-cloud security
- Skills gap
- Data protection
- Innovation and digital transformation
- Outsourcing risks

Emerging trends in ICT

Cloud Computing

One of the most talked about concept in information technology is the cloud computing. Clouding computing is defined as utilization of computing services, i.e. software as well as hardware as a service over a network. Typically, this network is the internet.

Mobile Application

Another emerging trend within information technology is mobile applications (software application on Smart phone, tablet, etc.)

User Interfaces

User interface has undergone a revolution since introduction of touch screen. The touch screen capability has revolutionized way end users interact with application. Touch screen enables the user to directly interact with what is displayed and also removes any intermediate hand-held device like the mouse.

Analytics

The field of analytics has grown many folds in recent years. Analytics is a process which helps in discovering the informational patterns with data. The field of analytics is a combination of statistics, computer programming and operations research.

1.2.4.4 Self-assessment questions

1. State emerging trends in ICT
2. Outline merits of ICT
3. Explain application areas of ICT
4. Explain challenges of ICT

1.2.4.5 References

J. F. Kurose and W. R. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*.

L.L. Peterson and B. S. Davie, *Computer Networks: A System Approach*.

Self-assessment responses

1. State emerging trends in ICT
 - Cloud computing
 - Mobile application
 - User interface
 - Analytics
2. Outline merits of ICT
 - Better teaching and learning methods.
 - Enhanced data and information security.
 - Minimize **cost** and save time.
 - Easy student management.

- Automatic solutions to manual paper-based process and procedures.
3. Explain application areas of ICT
- **Medical Science** - Medical devices and modern equipment have evolved considerably favoring information and communications technology. use of devices like CT scan, MRI which entirely depend on ICT has really improved service delivery in hospitals and medical field in general
 - **Entertainment** - Information and communication technologies (ICT) have impacted entertainment and leisure activities in different ways in which you spend your time.
ICT offers a variety of entertainment and leisure activities and allows for quick access to movies or music that can be easily accessed and you can watch movies and listen to music directly from the Internet.
4. Explain challenges of ICT
- **Issues of Equity:** Introducing ICTs raises equity issues for the developing countries which don't have access to modern technologies and also for the marginalized linguistic, cultural or ethnic groups, and low income communities, already excluded from existing educational practices and environments.
Gap in the Speed of Technological and Institutional Innovation: Changes and innovations in technology come much faster than changes in the education system. A lack of congruence between the timelines for roll out of educational reform efforts and the roll out of supporting ICT tools (hardware, software, and training) is a potential area of great challenge, as reform may be dependent on technologies that are no longer available and/or supported.

4.2.5 1.2.5 Learning Outcome 5: Identify healthy, safety and environmental issues in ICT

1.2.5.1 Introduction to the learning outcome

The learning outcome will equip trainees with knowledge, skill and competencies required to identify *healthy, safety and environmental issues* in ICT.

1.2.5.2 Performance standards

1.2.5.2.1 ICT risk elements are identified

1.2.5.2.2 Standards and guidelines for health, safety and environment are outlined

1.2.5.2.3 Opportunities of green ICT are identified.

1.2.5.3 Information sheet

Healthy issues

- Repetitive Strain Injury (RSI)
- Back and Neck Strain.
- Eye Strain and Headaches.
- Creates joint pain.

Safety issues

Safety issues in ICT include:

Trailing Cables - Cables are laid on the floor, can cause people to **trip** over them

Spilt Drinks or Food - If any liquids are spilt on electrical equipment, such as a computer, it can result in damage to the equipment, or an electric shock to the user.

Environmental issues

This leads to **pollution** of soil, water and air in the present as well as for the future. During the use phase of ICT hardware, energy consumption impacts the environment. At the end of life of ICT hardware, recycling, disposing as e-waste in landfills or disassembling are additional impacts that affect the environment.

Risk elements in ICT

These are risks associated with ICT. If your business uses information technology (IT), it's important to understand the key steps that you can take to minimise IT risk. Risks associated with information Communication technology include:

- hardware and software failure
- human error
- spam
- viruses and malicious attacks,

- natural disasters

Opportunities of green ICT

Also known as **Green computing** is the environmentally responsible and eco-friendly use of computers and their resources. In broader terms, it is also defined as the study of designing, engineering, manufacturing, using and disposing of computing devices in a way that reduces their environmental impact. Some of the opportunities of green computing include:

Deployment optimization

- Power management
- Material reusing
- Tele commuting

1.2.5.4 Learning activities

The trainee will be required to identify healthy, safety and environmental issues in ICT
He will demonstrate competencies in identifying healthy, safety and environmental issues in ICT.

1.2.5.5 Self-assessment

1. What is sustainable IT?
2. What is sustainable IT manufacturing?
3. Mention types of cybercrime
4. What is the goal of sustainable IT?
5. Explain the term cybercrime

1.2.5.6 References

Maras, Marie-Helen. (2016). Cyber criminology. Oxford University Press. • Maras, Marie-Helen. Cyberlaw and Cyberliberties. Oxford University Press, forthcoming, 2020.

Self-assessment responses

1. What is sustainable IT?
Sustainable, or 'green', IT is used to describe the manufacture, management, use and disposal of information technology in a way that minimizes damage to the environment.
2. What is sustainable IT manufacturing?
Sustainable IT manufacturing refers to methods of producing products in a way that does not harm the environment. It encompasses everything from reducing the amount of harmful chemicals used in products (such as lead and mercury) to making them more energy efficient and packaging them with recycled materials.
3. Mention FOUR types of cybercrime

- Email and internet fraud.
 - Identity fraud (where personal information is stolen and used).
 - Theft of financial or card payment data.
 - Theft and sale of corporate data.
4. What is the goal of sustainable IT?
- The goal behind most green initiatives, including green IT, is to promote environmental sustainability.
5. Explain the term cybercrime
- Cybercrime*, also called *computer crime*, the use of a computer as an instrument to further illegal ends, such as committing fraud, trafficking in child pornography and intellectual property, stealing identities, or violating privacy.

4.2.6 1.2.6 Learning Outcome 6: Identify ICT Security Issues

1.2.6.1 Introduction to the learning outcome

The learning outcome will equip trainees with knowledge, skill and competencies required to identify ICT security issues. The trainer will help the trainee identify, and outline security issues and the control measures against threats by way of explanation and by the end of the lesson, the trainee will acquire knowledge in existing enormous security threats to information and ICT assets and how to overcome them.

1.2.6.2 Performance standards

- 1.2.6.2.1 ICT assets to be secured are identified
- 1.2.6.2.2 Goals of ICT security are outlined
- 1.2.6.2.3 Types of security threats are identified
- 1.2.6.2.4 Controls to security threats are outlined

1.2.6.3 Information sheet

Security issues

One of the main problems with ICT is security for a long time now, has been vigorous developments of electronic attacks, malware, vulnerabilities and countless of information and communication technologies in the field of intrusion witnessed.

ICT assets to be secured include

Computers

Printers

Servers

Switches

Goals of ICT security

All information security measures try to address at least one of the goals listed below. The primary goals of information security are:

Protect the confidentiality of data

Preserve the integrity of data

Promote the availability of data for authorized use

Privacy

Authenticity and trustworthiness

Non-repudiation

Accountability

Auditability

Types of security threats

- *Viruses* – an illicit program entered into a computer with aim of destroying or altering data and spreading the distraction to other computers.
- *Eaves dropping* – refers to tapping into communication channels to get information
- *Industrial espionage* – use of computer to steal designs, marketing plans or other secrets from one company and sell them to another company.
- *Piracy*- making unauthorised copies of copyrighted computer software
- *Fraud* – use of computers to cheat other people with the intention of gaining, money or information.
- *Theft* – physical theft of computer hardware and software

Control measures to security threats

Firewall: a device or software used to filter the data and information exchanged between different networks by enforcing the host networks access control policy. It monitors and controls access to or from protected networks hence preventing hackers.

Data encryption – data on transit over networks may be tapped, listened to or copied to authorised destinations. Such can be protected by scrambling (mixing) it up in a form that only the sender and receiver is able to understand. Security monitors – programs that monitor and keep a log file or record of computer systems and protect them from unauthorized access.

- *Biometric security* – a form of unauthorized control measure that takes the user's attributes such as voice, fingerprints and facial recognition.

Other control measures include:

- Assigning users log on accounts
- Use of smart cards and personal identification number (PIN)

1.2.6.4 Learning activities

The trainee will be required to identify ICT security issues, assets to be secured, outline goals of ICT, and control measures to security threats too.

The trainee will demonstrate competencies in identifying healthy, safety and environmental issues in ICT.

1.2.6.5 Self-assessment

1. Define the following terms as used in cyber security
2. List some of the common cyber-attack.
3. Explain social engineering and its attacks.
4. Explain phishing.
5. What is Data Encryption? Why it is important in network security?

1.2.6.6 References

Wall, David S. (2007). *Cybercrime: The Transformation of Crime in the Information Age*. Polity Press (2nd edition, forthcoming 2020)

Self-assessment responses

1. Define the following terms as used in cyber security

Cryptography - It is a technique used to protect information from third parties called adversaries. Cryptography allows the sender and recipient of a message to read its details.

Firewall - It is a security system designed for the network. A firewall is set on the boundaries of any system or network which monitors and controls network traffic. Firewalls are mostly used to protect the system or network from malware, worms, and viruses. Firewalls can also prevent content filtering and remote access.

Hacking - Hacking is a process of finding weakness in computer or private networks to exploit its weaknesses and gain access.

For example, using password cracking technique to gain access to a system.

2. **List some of the common cyber-attack.**

- Malware
- Phishing
- Password attacks
- Man in the middle
- Drive-by downloads
- Rogue software

3. **Explain social engineering and its attacks.**

Social engineering is the term used to convince people to reveal confidential information.

There are mainly three types of social engineering attacks:

- *Human-based attack*: They may pretend like a genuine user who requests higher authority to reveal private and confidential information of the organization.
- *Computer-based attack*: In this attack, attackers send fake emails to harm the computer. They ask people to forward such email.
- *Mobile-based attack*: Attacker may send SMS to others and collect important information. If any user downloads a malicious app, then it can be misused to access authentication information.

4. **Explain phishing.**

It is a technique used to obtain a username, password, and credit card details from other users.

5. **What is Data Encryption? Why it is important in network security?** Data encryption is a technique in which the sender converts the message into a code. It allows only authorized user to gain access.

CHAPTER 2: COMPUTER SOFTWARE INSTALLATION

Unit of learning code: IT/CU/ICTA/CR/02/4/A

Related Unit of Competency in Occupational Standard: Install Computer Software

2.1 Introduction to the unit of learning

This unit addresses the unit of competency: Installation of Computer Software

2.2 Summary of Learning Outcomes

1. Identification of software to be installed
2. Install the Software
3. Software Change management
4. Conduct user training

4.2.7 2.2.1 Learning Outcome: 1. Identification of Software to be installed

2.2.1.1. Introduction to the learning outcome

This learning outcome specifies the content of competencies required to identify the Software to be installed. It includes Definitions of Software, Classification of Software Functionality, and Software Acquisition methods.

2.2.1.2. *Performance Standard*

2.2.1.2.1 Classification of Software according to the functionality, resource requirement and use.

2.2.1.2.2 Identification and Selection of Software based on usage and system requirements.

2.2.1.2.3 Establishment of Acquisition methods of Selected Software.

2.2.1.2.4 Installation of Software type according to procedures and licensing types.

2.2.1.3. Information Sheet.

Definitions of terms

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem. There are two types of software: System Software and Application Software.

System Software: The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users. Examples of System Software include: Microsoft windows and Linux.

Application Software: Application software products are designed to satisfy a particular need of a particular environment. Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package. Examples of Application Software include; Microsoft Office Suite Software, Inventory Management Software, Payroll Software and Railways Reservation Software.

1. Classification of Software

According to Functionality

System Software

System software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself.

System software serves as the interface between the hardware and the end users.

Some examples of system software are:

(A). Operating System

It's a set of programs that control and supervise the hardware resources of a computer during processing. Examples of operating system include; Windows 95/98/2000/7/Vista/8/10, Ms Dos.

(b). Firmware

It's a combination of both hardware and software, it is in the form of a chip which may be used to store programs.

(c). Network Software

It is used to establish communication between two or more computers by linking them using a communication channel e.g. cables to create a network e.g. Novel-Netware.

(d). Utility Software

They are programs that perform commonly used services that make certain aspects of computing to go on more smoothly, Examples include; Application utility, program translator, text editor, sort editor.

(ii). Application Software

Application software is designed to help user accomplish specific tasks. Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are the following –

- i. Word processor-For typing documents e.g. Ms-word.
- ii. Database-For keeping records and files e.g. Ms-access.
- iii. Spreadsheet-For calculations e.g. Ms-excel.
- iv. Computer Aided Design-For technical drawing e.g. AutoCAD.

2. Software Acquisition Methods

(A). Vendor off the Shelf

These programs are developed by software engineers, packaged and made available for purchase through a vendor or directly from the developer e.g. Microsoft office.

(b). In-house development

These programs are designed to serve a particular purpose for specific groups or people e.g.in banks for managing their operations, Airlines for booking etc.

Advantages of vendor off the shelf over in house software

- i. They can be easily installed.
- ii. Thoroughly tested hence few errors.
- iii. Readily available.
- iv. Easily Modified to meet specific user needs.
- v. Less expensive.

Disadvantages of vendor off the shelf over in house software

- i. May not meet special needs.
- ii. They are not as efficient as user made programs.
- iii. When changes occur, extra costs are usually needed from user.
- iv. Not all packages are compatible with a computer systems.

2.2.1.4. Learning Activities

PRACTICAL TASK

DHL have recently started a new branch in Kericho. They plan to automate their systems by install new software in their systems as an expert in this field they have approached to assist them identify the kind of software they will install that will meet their needs.

A case study

Carefully read the case study presented in this excerpt and answer questions that follow

Jumia an online company needs to expand its business to other countries like Rwanda but they are faced with the challenge of their current software since it can't support more customers. As an ICT expert, brief do the following:

- a. Classify the software that will meet the user needs of jumia.
- b. Classify the software acquisition method that you will advise the jumia company to use in acquiring the software that will solve their challenges.
- c. Identify system requirements and usage that you will advise jumia to consider when selecting a software.
- d. When installing software, procedures and licensing types are considered advice jumia why it's necessary.

2.2.1.5. Self-Assessment

1. During classification of software, why is functionality, resource requirement and use considered?
2. When selecting and identifying a software, why is usage and system requirements critical?
3. What acquisition methods are considered when selecting software and why?
4. When installing software, why are procedures and licensing types considered?

2.2.1.6. Tools, Equipment, Supplies and Materials

The following resources are provided

- Software
- Hardware
- UPS
- Digital instructional material including DVDs and CDs;
- Stationery
- Manufacturers manuals
- Classroom and classroom resources

2.2.1.7. References

1. Tutorials point (2020) Computer-Software.
2. Sharpened Production (2021) System Requirements.
3. High flyer series (2021) Computer studies.
5. EDUCBA (2020) what is Application Software and its Types.
6. Greeks for Geeks (2020) Differences between System Software and Application Software.

Responses to self-assessment

1. During classification of software, functionality, resource requirement and use are considered why.

Functionality

Software is the programs that are needed to accomplish the input, processing, output, storage, and control activities of information systems. Computer software is typically classified into two major types of programs: system software and application software.

Resource requirement

Typical system requirements for a software program include:

1. Operating system
2. Minimum CPU or processor speed
3. Minimum GPU or video memory
4. Minimum system memory (RAM)
5. Minimum free storage space
6. Audio hardware (sound card, speakers, etc.)

Use of software

Software is a set of instructions, data or program used to operate computers and execute specific task. The purpose of the software is critical during the selection of the software.

2. When selecting and identifying a software, usage and system requirements are critical why.

When identifying software and selecting software it's critical to first know the purpose, the use of the software these will come as a result of the user needs.

Before installing the software on the computer. There are system requirements that the computer need to have for the software to function well some of the system requirements include; the version of operating system like windows 10, the minimum free storage space i.e. the available space for the software installation, the processor speed; if the processor speed is low the software might not function well

3. What acquisition methods are considered when selecting software?

In-house developed Software

These programs are designed to serve a particular purpose for specific purpose for specific groups or people e.g.in banks for managing their operations, Airlines for booking.

Standard Software (Vendor off the shelf)

These programs are developed by software engineers, packaged and made available for purchase through a vendor or directly from developer e.g. Microsoft.

4. When installing software, procedures and licensing types are considered why.

Software Installation Procedures

- They assist in guiding one in installation of the software since the guide one step by step in installing the software.
- They assist in locating the installation file within the CD-ROM that has the software.
- They assist in locating the folder with serial key that will be used in the installation of the software.

Licensing types

Different types of software licenses require you to meet certain obligations if you want to reuse the code. Here are five types of software licenses.

Public domain. This is the most permissive type of software license. When software is in the public domain, anyone can modify and use the software without any restrictions. But you should always make sure it's secure before adding it to your own codebase.

Permissive. Permissive licenses are also known as "Apache style" or "BSD style." They contain minimal requirements about how the software can be modified or redistributed. This type of software license is perhaps the most popular license used with free and open source software.

LGPL. The GNU Lesser General Public License allows you to link to open source libraries in your software. If you simply compile or link an LGPL-licensed library with your own code, you can release your application under any license you want, even a proprietary license. But if you modify the library or copy parts of it into your code, you'll have to release your application under similar terms as the LGPL.

Copy left. Copy left licenses are also known as reciprocal licenses or restrictive licenses. The most well-known example of a copy left or reciprocal license is the GPL. These licenses allow you to modify the licensed code and distribute new works based on it, *as long as* you distribute any new works or adaptations under the same software license.

Proprietary. Of all types of software licenses, this is the most restrictive. The idea behind it is that all rights are reserved. It's generally used for proprietary software where the work may not be modified or redistributed

4.2.8 2.2.2 Learning Outcome: 2. Install the software

2.2.2.1. Introduction to the learning outcome

This learning outcome specifies the content of competencies required to install the Software. It includes Definitions of Software, Installation Sources, End user license agreement, Software options, Existing data backup and protection and Software documentation.

2.2.2.2. Performance Standard

2.2.2.2.1 Identification of Software Specifications and Computer resource requirements.

2.2.2.2.2 Determination of source of software installation files.

2.2.2.2.3 Identification of user Vendor agreements.

2.2.2.2.4 Selection of Appropriate installation options.

2.2.2.2.5 Installation of Software as per Installation manual guide.

2.2.2.2.6 Testing of Software Functionality.

2.2.2.3. Information Sheet.

Definitions of terms

Software Installation

Installation (or setup) of a computer program (including device drivers and plugins), is the act of making the program ready for execution. **Installation** refers to the particular configuration of a **software** with a view to making it usable with the computer.

The installation of a software will depend on the user requirements and the system requirements. **System requirements** are the required specifications a device must have in order to use certain hardware or software. For example, a computer may require a specific I/O port to work with a peripheral device. A smartphone may need a specific operating system to run a particular application

1. Installation Sources

(A). External Hard drive

How to Install Software using an External Hard Drive?

Step 1

Connect the external hard drive to the PC via USB connection. Turn the external hard drive on.

Step 2

Begin the installation process for the software and follow the installation prompts.

Step 3

Choose a destination drive to install the program onto when prompted. Select the drive that corresponds to the external hard drive.

Step 4

Continue the installation process, and the software should install on the external hard drive without problems.

Step 5

Never attempt to disconnect the external hard drive from the PC while programs are running that are installed on the external hard drive. This will result in numerous errors.

(b).CD and DVD

How to Install Software using a CD and DVD.

1. Insert the program disc into your computer's disc drive or tray, label side up (or, if your computer has a vertical disc slot instead, insert the disc with the label side facing left).

The AutoPlay dialog box appears.



Figure 1: AutoPlay dialog box

2. Click the option to run Install or Setup.

User Account Control may ask if you really want to run this program. (Windows 7 tries to keep you from installing software unintentionally by asking for confirmation.)

If nothing happens when you insert the disc, choose Start the Computer to open the Computer window; double-click the icon for your DVD or CD drive; and then double-click a program named Setup or Install.

3. If the installer offers a language selection, choose yours; likewise, agree to the end-user license agreement, if requested. Many installers require you to accept an end-user license agreement (EULA). You can read the EULA or not, but you can't install without agreeing to its terms.

4. If the installer offers Express or Custom installation options, choose the Express option to let the installer set up the program without further input from you.

The Custom option or Advanced Settings allows you to specify where to install the program and, perhaps, which parts of the program to install. Some installers provide other options to install documentation and other programs or to register the program.



Figure 2: Cyber-shot Application Software.

5. As the installer program continues to run and display dialog boxes, click the Next or Continue button. You proceed to the next dialog box each time you click.

6. Click the Finish or Close button in the last step of the installer program to complete the process. In a few cases, the setup program may ask you to restart Windows 7. In this case, you don't have to restart immediately, but you won't be able to use the new program until you do restart.

(c). Flash Disk

How to Install Software using Flash Disk.

1. Open Windows Explorer or My Computer and find the USB drive that is often the last drive letter.
2. Once the drive is opened, find the setup or executable file, and double-click the file icon to start the setup process.

(d). Certified Online Sites

How to Install Software using certified Online Sites.

1. Using your browser open the certified online site using their web address.
2. While on the web page of the certified online site search for the software you want to install.
3. Before downloading most of certified online sites will ask for payment of the software that you want to download Proceed and pay the amount required using your credit card. Don't worry about your transaction details being hacked online as most of the certified online sites are secured.
4. After downloading the software, the software will be stored in the download folder.
5. Double click on the download folder to open and proceed to where the software is located Click the option to run Install or Setup.
6. If the installer offers a language selection, choose yours; likewise, agree to the end-user license agreement, if requested.
7. If the installer offers Express or Custom installation options, choose the Express option to let the installer set up the program without further input from you.
8. As the installer program continues to run and display dialog boxes, click the Next or Continue button.
9. Click the Finish or Close button in the last step of the installer program to complete the process.
10. You will be required to restart your computer in order for the computer to accept changes done i.e. the installation of the software.

(e). Server Based installation

The Server Core installation option is a Windows installation option available for Windows servers. This installation option debuted in Windows Server 2008 and is available for all recent Windows Server versions. A Server Core installation provides a minimal environment for running specific server roles, which reduces the maintenance and management requirements and the attack surface for those server roles. A server running a Server Core installation supports the following server roles:

- Active Directory Domain Services (AD DS)
- Active Directory Lightweight Directory Services (AD LDS)
- DHCP Server
- DNS Server
- File Services
- Print Services
- Streaming Media Services
- Web Server (IIS)

Benefits of a Server Core installation

The Server Core installation option provides the following benefits:

- **Reduced maintenance:** Because the Server Core installation option installs only what is required to have a manageable server for the AD DS, AD LDS, DHCP Server, DNS Server, File Services, Print Services, and Streaming Media Services roles, less maintenance is required than a full Windows Server installation with a graphical interface.
- **Reduced attack surface:** Because Server Core installations are minimal, there are fewer applications running on the server, which decreases the attack surface.
- **Reduced management:** Because fewer applications and services are installed on a server running the Server Core installation, there is less to manage.
- **Less disk space required:** A Server Core installation requires only about 1 GB of disk space to install and approximately 2 GB for operations after the installation.

2. End user license agreement

An **End-User License Agreement (EULA)** is an agreement put in place between someone who purchases, installs, or downloads software, and the licensor or provider of that software. This kind of legal agreement can go by different names: **EULA**.

Reasons why end user license agreement is important

1. The EULA licenses your app to the user but doesn't sell the app to the user.
2. A EULA restricts certain abusive uses of your app.
3. A EULA allows you to limit your liability.
4. A EULA allows you to disclaim warranties.
5. A EULA can protect your right to terminate licenses or stop operating without repercussion.

3. Software Options

This will aid the user in the installation of software to avoid situations of wrong installation of the software because it will lead to the software not working

4. Existing data backup and protection

Data backup and recovery is the process of backing up your data in the event of a loss and setting up secure systems that allow you to recover your data as a result. Data backup requires the copying and archiving of computer data to make it accessible in case of data corruption or deletion.

Backing up data cannot always restore all of your system's data and settings. For instance, computer clusters, database servers, or active directory servers may need additional types of disaster recovery since a backup and recovery may not entirely reconstitute them fully.

Data protection is the process of safeguarding important information from corruption, compromise or loss.

The importance of data protection increases as the amount of data created and stored continues to grow at unprecedented rates. There is also little tolerance for downtime that can make it impossible to access important information.

Consequently, a large part of a data protection strategy is ensuring that data can be restored quickly after any corruption or loss. Protecting data from compromise and ensuring data privacy are other key components of data protection.

5. Software Documentation

User documentation covers manuals that are mainly prepared for end-users of the product and system administrators. ... The common examples of process documentation are project plans, test schedules, reports, standards, meeting notes, or even business correspondence.

There may be different types of software documentation, depending on the audience it is created for. Here are some examples of the software documentation types:

- Requirements documentation. Typically created in the beginning of a software development project. Has the goal to clearly and precisely specify the expectations in regards to the software being created. May include functional requirements, limitations, hardware or software requirements, compatibility requirements, and so on.
- Architecture documentation. Defines the high-level architecture of the software system being created. May describe the main components of the system, their roles and functions, as well as the data and control flow among those components.

- Technical documentation - Documentation of the software code, algorithms, APIs. Written for the technical audience like software developers.
- End user documentation

2.2.2.4. Learning Activities

PRACTICAL TASK

An orphanage in Nakuru wishes to have a new software that will aid them in accounting the amount of money they receive from well-wishers and how its spent as an expert in this area they have approached you to install the software.

A case study

Carefully read the case study presented in this excerpt and answer questions that follow
Bata Company needs to start an online business to expand their business. As an ICT expert, brief do the following:

- Identify the software specifications and computer resource requirements that they have to consider and advise them accordingly.
- During the Installation process advise them how they will determine the source of software installation files.
- Identify user vendor agreements that they will have to consider before installing the software.
- During the installation of software advise them on the appropriate installation options.
- Advise them on the importance of installation manual guide during software installation.
- Software functionality testing is considered when installing a software advise them its importance.

2.2.2.5. Self-Assessment

- While identifying the software, specifications and computer resource requirements are considered. Explain why.
- When installing software, determination of source of software installation files is important. Explain why.
- Before installing a software, Identification of user vendor agreements is a priority. Explain why.
- When installing a software, Selection of Appropriate installation options. Explain why.
- When installing software, Installation manual guide is a priority. Explain why.
- During installation you are supposed to carry out testing of software functionality. Explain why

2.2.2.6. Tools, Equipment, Supplies and Materials

The following resources are provided

- Software
- Hardware
- UPS
- Digital instructional material including DVDs and CDs;
- Stationery
- Manufacturers manuals
- Classroom and classroom resources.

2.2.2.7. References

Synopsys (2021) 5 types of software licenses you need to understand.

University Information Technology Services (2021). About Server core Installations.

Computer Boards (1999) Software Installation Manual.

Anthony James (2018) How to Write a software Installation guide with simple guidelines.

EDUCBA (2020) what is Application Software and its Types.

High flyer series (2021) Computer studies.

2.2.2.8. Responses

1. While installing a software, identification of the software specifications and computer resource requirements are considered why.

Installation sources are CD/DVD, USB drive, network share and Windows Deployment Services (WDS). When installing from CD/DVD, we have to ensure the proper boot order to boot from the CD/DVD drive.

2. When installing a software, determination of source of software installation files is important why.

Yes, it is necessary to consider the software acquisition method because it helps to identify which method is best in acquiring a given software and also it will help the company to decide which method will be best in acquiring the software in terms of cost to the company.

.

3. Before installing a software, Identification of user vendor agreement is considered why.

User Vendor agreement is important since it acts as insurance to guide the user against any possible damages that can result from the software installation

4. During installation selection of appropriate installation options is considered why?

Proper Installation options will help to Poor installation not only can affect thermal performance, but also safe, smooth operation of moving parts. Indeed, aside from seal failures, over 80% of service problems result from poor installation practices.

5. When installing a software, you are supposed to follow the installation manual guide why
An Installation Guide is a type of technical document that describes the steps required to install software. This guide will aide in the installation of the software.
6. After installing a software, you are supposed to carry out testing on the software functionality why

Functional testing is a type of software testing that validates the software system against the functional requirements/specifications. The purpose of Functional tests is to test each function of the software application, by providing appropriate input, verifying the output against the Functional requirements.

4.2.9 2.2.3 Learning Outcome: 3. Software Change Management

2.2.3.1. Introduction to the learning outcome

This learning outcome specifies the content of competencies required to identify the Software Change Management. It includes Definitions of Software Change Management, Types of user needs requirements, Software Upgrading needs, Software Functionality, Software documentation

2.2.3.2. Performance Standard

2.2.3.2.1 Identification of new user requirements.

2.2.3.2.2 Identification of software changes as per need.

2.2.3.2.3 Software Functionality testing is done according to expected output.

2.2.3.2.4 Software change documentation is done.

2.2.3.3. Information Sheet.

Definitions of terms

Software Change management

Change management is a systematic approach towards dealing with a change. When changing software, it has to be done accordingly otherwise a lot of essential resources might be lost or the organization that required the new software might lose data in the process of changing the required software if it is not managed well. Questions like what if the new software crashes what will happen with the functional running of the organization? Do we have a provision of alternative?

1. Types of user needs requirements

User requirements, often referred to as user needs, describe what the user does with the system, such as what activities that users must be able to perform.

Stability

Some users will strongly prefer stable user interface that isn't too dynamic or shifting.

Learnability

An intuitive and predictable user interface. It is common for modern users to expect to be able to use complex software and tools without training.

Visual Appeal

Users strongly prefer products, services and environments that are aesthetically pleasing.

Readability

Users strongly prefer information and visual data that is easy to understand

Accessibility

User needs should be collected from users with diverse characteristics and abilities. For example, a user who is sight impaired may need audio cues to navigate a visual user interface that uses small icons.

Productivity

The ability to complete work quickly. For example, a graphics designer who wants a scripting tool built into photo editing software so that they can automate repetitive tasks.

Context

A need to understand context. For example, a user who wants to know how many steps there are in a purchasing process and when they will see their discount applied to the purchase amount.

Integration

The need for things to be connected. For example, a user who needs their photos on their mobile devices to be automatically available on their television.

Functions

Things that a user needs to accomplish. For example, a user of luggage who needs to pack and unpack and unpack a suit without wrinkling it.

2. Software Upgrade Needs

A **software upgrade** is often better than its previous version. It'll have more features, incorporate new technology and advancements, and run smoother and faster. They can come with improved ease of use, or even incorporate a way to save energy and improve power consumption.

Functionality

This includes functional, non-functional and technical testing, quality assurance, data integrity, security, performance, and theme/design testing including browser, and device testing. Vital to the testing process is a shared mechanism for capturing and tracking issues. Issues should be described in detail, have a unique identifier for tracking purposes, have a current status, and be allocated to someone until fully resolved. It is also important to allow time for, and manage expectations around, user acceptance testing. While an upgraded system might be functional, it might not fulfil all of the business requirements it was implemented to address.

3. Software Functionality testing

Is performed to verify that a software application performs and functions correctly according to design specifications. During functionality testing we check the core application functions, text input, menu functions and installation and setup on localized machines.

Functional testing categories

Sanity Testing: Testing that is done to ensure that all the major and vital functionalities of the application/system are working correctly. This is generally done after a smoke test.

Smoke Testing: Testing that is done after each build is released to test to ensure build stability. It is also called as build verification testing.

Regression Tests: Testing performed to ensure that adding new code, enhancements, fixing of bugs is not breaking the existing functionality or causing any instability and still works according to the specifications. Regression tests need not be as extensive as the actual functional tests but should ensure just the amount of coverage to certify that the functionality is stable.

Integration Tests: When the system relies on multiple functional modules that might individually work perfectly, but have to work coherently when clubbed together to achieve an end to end scenario, validation of such scenarios is called Integration testing.

Beta/Usability Testing: Product is exposed to the actual customer in a production like an environment and they test the product. The user's comfort is derived from this and the feedback is taken. This is similar to that of User Acceptance testing.

4. Software documentation

Preparing help files or user manuals, as well as technical documentation detailing any custom developments or deployment requirements is vital to the success of your current upgrade as well as any future upgrades. Leverage any documentation provided by the software supplier or your technology vendor and highlight the differences between versions to emphasize important changes in the new release.

2.2.3.4. Learning Activities

PRACTICAL TASK

Brookside have introduced a new product in the market and as a result they have acquired anew software to cater for the new product they have introduced as an expert in this area they have hired you to carry out software change management.

A case study

Carefully read the case study presented in this excerpt and answer questions that follow

Kilimall an online company has installed a new software to cater for the high demand of customer with different needs. As an ICT expert, brief do the following:

- a. Aid the company in Identifying of new user requirements on their workers during the software change management.
- b. Under identification of software changes as per need advice the company accordingly.
- c. Software functionality testing is critical and should be carried out accordingly aid the company in carrying it out.
- d. Software change documentation is essential in software change management advice the company why it's important.

2.2.3.5. Self-Assessment

- While performing software change management it's important to consider new user requirements why is it important.
- During software change management software functionality testing is essential why.
- Software changes as per need is considered during the process of software change management why is it critical.
- Software Change documentation is done during software change management is it important.

2.2.3.6. Tools, Equipment, Supplies and Materials

- Software
- Hardware
- UPS
- Digital instructional material including DVDs and CDs;
- Stationery
- Manufacturer's manuals

2.2.3.7. References

John Spacey (2018) Examples of user needs.

Software Testing Help (2021) Complete Functional Testing guide with its types and examples.

Meredith Hension (2018) Essentials Steps in the Software Upgrade process.

Click Help (2021) Software Documentation glossary

Responses to self-assessment questions

1. While performing software change management it's important to consider new user requirements. Why is it important?

It is very important that the analyst work with the users to determine how the current system functions and what the users want from the new system. It is also important that future users are involved in the process early on so that their views of the system are taken into consideration.

1. During software change management software functionality testing is essential. Why?

Yes, it is necessary to consider the software acquisition method because it helps to identify which method is best in acquiring a given software and also it will help the company to decide which method will be best in acquiring the software in terms of cost to the company.

3. Software changes as per need is considered during the process of software change management why is it critical.

Software change management is a process of identifying changes that are to be done in the software. It facilitates and controls making changes to the software for the effective development of the project.

4. Software Change documentation is done during software change management, is it important.

Documentation will make information easily accessible, provide a limited number of user entry points, help new users learn quickly, simplify the product and help cut support costs.

4.2.10 2.2.4. Learning Outcome: 4. Perform User Training

2.2.4.1. Introduction to the learning outcome

This learning outcome specifies the content of competencies required to perform user training. It includes Definitions of Software Change Management, Types of user needs requirements, Software Upgrading needs, Software Functionality, Software documentation

2.2.4.2. Performance Standard

2.2.4.2.1 Determination of user skills set.

2.2.4.2.2 Preparation of Training materials according to organization ICT policy.

2.2.4.2.3 Conduction of user training according to skill gap.

2.2.4.2.4 Documentation of Training feedback.

2.2.4.3. Information Sheet.

A. Keys to Developing an End user training plan.

1. Determination of user skills set

- Determining what the workers enjoy doing during training i.e. active listening and problem solving skills.
- Consider the skills of the workers that have been complimented by the administration of the given company.
- Consider previous accomplishment that the workers have done.

2. Creating a training program

(I) Assess Training needs:

The first step in developing a training program is to identify and assess needs. Employee training needs may already be established in the organization's strategic, human resource or individual development plans.

(ii) Set Organizational Training Objectives:

Training needs assessments (organizational, task & individual) will identify any gaps in your current training initiatives and employee's skill sets. These gaps should be analysed, prioritized, and turned into the organization's training objectives. The ultimate goal is to bridge the gap between current and desired performance through the development of a training program.

(iii) Creating Training Action Plan:

The next step is to create a comprehensive action plan that includes learning theories, instructional design, content, materials and other training elements. Resources and training delivery methods should also be detailed. While developing the program, the level of training and participants' learning styles need to also be considered.

(iv)Implementation Training Initiatives:

The implementation phase is where the training program comes to life. Organizations need to decide whether training will be delivered in-house or externally coordinated. Program implementation should consider employee engagement and learning KPI goals, as well as thoroughly planning the scheduling of training activities and any related resources (facilities, equipment, create questionnaire process.).

(v)Evaluate & revise training:

As mentioned in the last segment, the training program should be continually monitored, in the end, the entire program should be evaluated to determine if it was successful and met training objectives. Feedback should be obtained from all stakeholders to determine program and instructor effectiveness plus knowledge or skill acquisition.

3. Setting training goals

To make sure training goals are clear and reachable, each one should be:

- Specific (simple, sensible, significant).
- **Measurable** (meaningful, motivating).
- **Achievable** (agreed, attainable).
- **Relevant** (reasonable, realistic and resourced, results-based).
- **Time bound** (time-based, time limited, time/cost limited, timely, time-sensitive).

(A). Specific

Your training goal should be clear and specific, otherwise you won't be able to focus your efforts or feel truly motivated to achieve it.

- **What** do I want to accomplish?
- **Why** is this goal important?
- **Who** is involved?
- **Where** is it located?
- **Which** resources or limits are involved?

(b). Measurable

It's important to have measurable goals, so that you can track your progress and stay motivated. A measurable training goal should address questions such as:

- How much?
- How many?
- How will I know when it is accomplished?

(c). Achievable

Your training goal also needs to be realistic and attainable to be successful. In other words, it should stretch your abilities but still remain possible. An achievable goal will usually answer questions such as:

- How can I accomplish this goal?
- How realistic is the goal, based on other constraints, such as financial factors?

(d). Relevant

This step is about ensuring that your goal matters to you, and that it also aligns with other relevant goals. We all need support and assistance in achieving our goals, but it's important to retain control over them. A relevant goal can answer "yes" to these questions:

- Does this seem worthwhile?
- Is this the right time?
- Does this match our other efforts/needs?
- Am I the right person to reach this goal?
- Is it applicable in the current socio-economic environment?

(e). Time-bound

Every goal needs a target date, so that you have a deadline to focus on and something to work toward. A time-bound goal will usually answer these questions:

- When?
- What can I do six months from now?
- What can I do six weeks from now?
- What can I do today?

4. Training delivery methods

(A). Instructor-led Training (ILT)

Instructor-led training, or classroom training, is the most traditional form of training, best leveraged for creating an overall understanding of the training topic. According to Training Industry, Inc. research, ILT is the training modality most preferred by learners, with 55% of learners reporting a preference for this method.

(b). Virtual Classrooms

Virtual classrooms enable organizations to deliver training in the form of text, video and documents in real time. They can deliver training from anywhere, and learners can attend the session from wherever they are located, saving organizations valuable time and money on logistics and venues.

(c). E-Learning

E-learning is a good option for organizations that want to offer flexible learning opportunities in a short time frame to a global audience by delivering interactive and engaging training programs in the form of games, videos, HTML, quizzes and other content.

(d). Mobile Learning

According to Towards Maturity, 64% of learners say that using a mobile device to access training content is “essential/very useful,” and 89% of smartphone users download apps for learning or productivity.

(e). Blended Learning

With blended learning, organizations can leverage a combination of approaches, ensuring that every learner retains information. A blended learning approach is perfect for organizations with diverse training requirements and complex learning objectives.

5. Assessing end user needs

Not all end users need the same training. Teams only need training on what they do, so make sure to group people together based on their needs and don't assume that everyone needs to know every aspect of a system.

6. Signing off

This involves ending the training after receiving the feedback from members how the training was conducted. Signing off will happen after receiving positive feedback about the training if there were negative feedback arrangements should be made to conduct the training again.

B. Training feedback elements

1. Time

Feedback should be immediate after training the workers within a given organization this will help individuals to improve on areas that the feedback was not good and also it will aid in increase in production to those areas where the feedback was good.

2. Accuracy

Accurate feedback should always be encouraged because it helps in assessing what the trainers were able to do and what they were not able to do. This will also help the organization to know what areas the trainers need more training and if there is need to organize for another training.

2.2.4.4. Learning Activities

PRACTICAL TASK

After successful installation of the sales software at naivas supermarket the executive manager has assigned you to train their staff on the new software, your will be provided the following resources to conduct the training.

A case study

Carefully read the case study presented in this excerpt and answer questions that follow KCB Bank which has opened a new branch in Mogotio and installed a new software that will cater for customer complains plans to carry out a training on their staff about the new software. As an ICT expert, brief do the following:

- a. Assist them in determining of user skills set.
- b. In preparing of the training materials according to organization ICT policy, what should they consider?
- c. Skill gap is important in the conduction of interview explain to them why.
- d. After training the feedback should be documented, is it necessary.

2.2.4.5. Self-Assessment

- User skill set is important when performing user training, why is it important.
- Before you perform user training its critical you prepare training materials according to organization ICT policy. Why?
- Skill gap is considered during user training. Why?
- Feedback should be documented after training. Why?

2.2.4.6. Tools, Equipment, Supplies and Materials

- Software
- Hardware
- UPS
- Digital instructional material including DVDs and CDs;

- Stationery
- Manufacturers manuals
- Classroom and classroom resources

2.2.4.7. References

Explorance (2021) 5 steps to create effective training programs.

Mind tools (2021) how to make your goals achievable.

Namtek (2018) The Importance of User Training during Software Implementation.

The Sun view Team (2013) 5 keys to Developing on End User Training plan.

The Sun view Team (2013) 5 keys to developing on end user training plan.

Responses to self-assessment

1. User skill set is important when performing user training, why is it important?

It will help you in knowing a particular range of individual's skills, experiences and abilities before performing the training.

2. Before you perform user training its critical you prepare training materials according to organization ICT policy. Why?

ICT policy will guide on the law, regulation, and procedure, administrative action when coming up with the training materials so that the law, regulation, procedure and administrative action within ICT sector are followed.

3. Skill gap is considered during user training. Why?

Skills gap refers to the difference between the skills required for a job and the skills employers actually possesses. It is important to note the difference in skills that the workers have within the given organization, this will help in training because not all workers will have same skills

4. Feedback should be documented after training. Why?

User training will allow businesses to see the advantages of a new system. Therefore, it is necessary to train users before the system officially is implemented this will give users a chance to acclimate to any new processes and work out any problems with the system before it is implemented.

CHAPTER 3: COMPUTER REPAIR AND MAINTENANCE

Unit of learning code: ICT/CU/IT/CR/3/5/A

Related Unit of Competency in Occupational Standard: **Perform Computer Repair and Maintenance**

3.1 Introduction to the unit of learning

This unit specifies competencies required to perform computer repair and Maintenance. It includes performing troubleshooting, disassembling faulty components, repair/replace and reassembling components, testing computer, component functionality and upgrading computer software/hardware.

3.2 Summary of Learning Outcomes

1. Assemble and Disassemble Computer Components
2. Troubleshoot Computer Components
3. Repair/replace and reassemble components
4. Test computer/component functionality
5. Upgrade computer hardware

3.2.1 Learning Outcome 1: Assemble and Disassemble Computer Components

3.2.1.1 Introduction to learning outcome

This unit covers competencies required to perform assembling and disassembling of computer components. It include tools for disassembling and assembling, Procedures and techniques for disassembling and dissembling, repair or replace and reassemble component

3.2.1.2 Performance standards

- 3.2.2.2.1 Tools for disassembling are acquired
- 3.2.2.2.2 Faulty components are disassembled from the computer according to the provided instruction manuals.
- 3.2.2.2.3 Documentation of faulty components is done

3.2.2.3 Information Sheet

A toolkit should contain all of the tools necessary to complete hardware repairs. As you gain experience, you will learn which tools to have available for different types of jobs.

Hardware tools are grouped into these four categories:

1. ESD Tools
2. Hand Tools
3. Cleaning Tools

4. Diagnostic Tools

ESD Tools

There are two ESD tools: The antistatic mat and the antistatic wrist wrap, both designed to protect the PC from ESD. The antistatic wrist wrap protects the PC when clipped onto the PC chassis. The antistatic wrist mat protects the computer equipment by preventing accumulation of static electricity on the computer and the technician.

Hand Tools

Most tools used in the computer assembly process are small hand tools. They are available individually or as part of a computer repair toolkit. Toolkits range widely in size, quality, and price. Common hand tools include the following:

- Flat-head screwdriver: Used to tighten or loosen slotted screws
- Phillips-head screwdriver: Used to tighten or loosen cross-headed screws
- Torx screwdriver: Used to tighten or loosen screws that have a star-like depression on the top, a feature that is mainly found on laptops
- Hex driver: Used to tighten or loosen nuts in the same way that a screwdriver tightens or loosens screws (sometimes called a nut driver)
- Needle-nose pliers: Used to hold small parts
- Wire cutters: Used to strip and cut wires
- Tweezers: Used to manipulate small parts
- Part retriever: Used to retrieve parts from locations that are too small for your hand to fit
- Flashlight: Used to light up areas that you cannot see well

Cleaning Tools

Having the appropriate cleaning tools is essential when maintaining or repairing computers.

Using these tools ensures that computer components are not damaged during cleaning.

Cleaning tools include the following:

- Soft cloth: Used to clean different computer components without scratching or leaving debris.
- Compressed air: used to blow away dust and debris from components without coming into contact with them.
- Cable ties: used to bundle cables neatly inside and outside of a computer.

- Parts organizer: used to hold screws, jumpers, fasteners and other small parts to prevent them from getting mixed together.

Diagnostic Tools

Diagnostic tools include:

- Digital Multimeter: used to test the integrity of circuits and the quality of electricity in computer components.
- Loopback adapter: used to test the basic functionality of computer ports.

PROCEDURES AND TECHNIQUES FOR DISASSEMBLING

STEP 1: PLAN AND ORGANIZE YOUR WORK

When you first begin to learn how to work inside a computer case, make it a point to practice good organization skills. If you keep your notes, tools, screws, and computer parts well organized, your work goes smoother and is more fun. Consider the following guidelines when planning and organizing your work:

- Make notes as you work so that you can backtrack later if necessary.
- Remove loose jewelry that might get caught in cables and components as you work.
- To stay organized and not lose small parts, keep screws and spacers orderly in a part retriever.
- Don't stack boards on top of each other: You could accidentally dislodge a chip this way.
- When handling motherboards, cards, or drives, don't touch the chips on the device. Hold expansion cards by the edges.
- To protect a microchip, don't touch it with a magnetized screwdriver.
- Never ever touch the inside of a computer that is turned on. The one exception to this rule is when you're using a Multimeter to measure voltage output.
- Never remove the cover or put your hands inside this equipment unless you know about the hazards of charged capacitors and have been trained to deal with them.
- As you work, remember to watch out for sharp edges on computer cases that can cut you.
- In a classroom environment, after you have reassembled everything, have your instructor check your work before you put the cover back on and power up.

STEP 2: OPEN THE COMPUTER CASE AND EXAMINE THE SYSTEM

Here are the steps to open a computer case:

1. Back up important data. If you are starting with a working computer, make sure important data is first backed up. Copy the data to an external storage device such as a flash drive or external hard drive. If something goes wrong while you're working inside the computer, at least your data will be safe.
2. Power down the system and unplug it. Unplug the power, monitor, mouse, and keyboard cables, and any other peripherals or cables attached and move them out of your way.
3. Press and hold down the power button for a moment. After you unplug the computer, press the power button for about three seconds to completely drain the power supply.



4. Have the parts retriever ready to hold important screws?
5. Open the case cover. If you need help figuring it out, check the user manual or web site of the case manufacturer. To remove the computer case cover, do the following:
 - a. Many newer cases require you to start by laying the case on its side and removing the faceplate on the front of the case first. Other cases require you to remove a side panel first, and really older cases require you to first remove the entire sides and top as a single unit. Study your case for the correct approach.
 - b. Most cases have panels on each side of the case that can be removed. It is usually necessary to only remove the one panel to expose the top of the motherboard.
 - c. To know which panel to remove, look at where the ports are on the rear of the case.

- d. Locate the screws that hold the side panel in place. Be careful not to unscrew any screws besides these. The other screws probably are holding the power supply, fan, and other components in place. Place the screws in the parts retriever.



6. After the screws are removed, slide the panel toward the rear, and then lift it off the case.



7. Clip your ground bracelet to the side of the computer case. To dissipate any charge between you and the computer, put on your ground bracelet if you have not already done so. Then clip the alligator clip on the ground bracelet to the side of the computer case.



8. After you open a computer case, the main components you see inside are the power supply, motherboard, and drives installed in drive bays. You also see a lot of cables and wires connecting various components. These cables are power cables from the power supply to various components, or cables carrying data and instructions between components. The best way to know the purpose of a cable is to follow the cable from its source to destination.

STEP 3: REMOVE EXPANSION CARDS

If you plan to remove several components, draw a diagram of all cable connections to the motherboard, expansion cards, and drives. You might need the cable connection diagram to help you reassemble. Note where each cable begins and ends, and pay particular attention to the small

wires and connectors that connect the lights, switches, and ports on the front of the case to the motherboard.

Computer systems vary in so many ways, it's impossible to list the exact order to disassemble one. Most likely, however, you need to remove the expansion cards first.

Do the following to remove the expansion cards:

1. Remove any wire or cable connected to the card.
2. Remove the screw holding the card to the case.



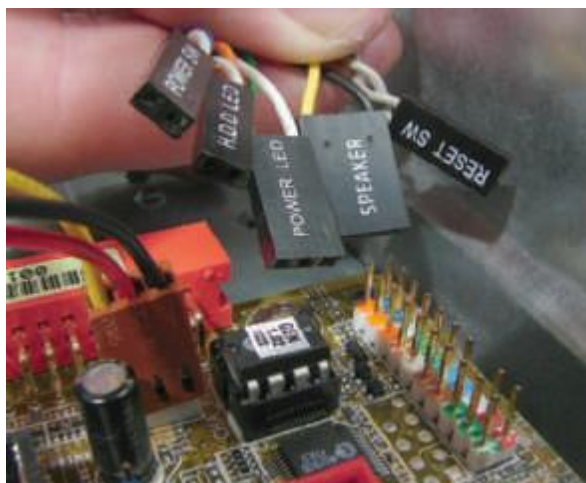
3. Grasp the card with both hands and remove it by lifting straight up.
4. As you remove the card, don't put your fingers on the edge connectors or touch a chip, and don't stack the cards on top of one another. Lay each card aside on a flat surface, preferably in an antistatic bag.



STEP 4: REMOVE THE MOTHERBOARD, POWER SUPPLY, AND DRIVES

Depending on the system, you might need to remove the motherboard next or remove the drives next. However, in some cases, you must remove the drives or the power supply before you can get to the motherboard. Study your situation and decide which to do first. To remove the motherboard, do the following:

1. Unplug the power supply lines to the motherboard. There might also be an audio wire from the optical drive to the motherboard. Disconnect it from the motherboard.
2. Unplug PATA, SATA, and floppy drive cables to the motherboard.
3. The next step is to disconnect wires leading from the front of the computer case to the motherboard, which are called the front panel connectors. draw a diagram of the motherboard and the disconnect the wires.



4. Disconnect any other cables or wires connected to the motherboard. A case fan might be getting power by a small wire connected to the motherboard. In addition, USB ports on the front of the computer case might be connected by a cable to the motherboard.
5. You're now ready to remove the screws that hold the motherboard to the case. A motherboard is installed so that the bottom of the board does not touch the case. If the fine traces or lines on the bottom of the board were to touch the case, a short would result when the system is running.
6. The motherboard should now be free and you can carefully remove it from the case.



7. To remove the power supply from the case, look for screws that attach the power supply to the computer case. Be careful not to remove any screws that hold the power supply housing together. Turn the case over and look on the bottom for these slots. If they are present, determine in which direction you need to slide the power supply to free it from the case.



8. Remove each drive next, handling the drives with care. Here are some tips: Some drives have one or two screws on each side of the drive attaching the drive to the drive bay. After you remove the screws, the drive slides to the front or to the rear and then out of the case.



Sometimes, there is a catch underneath the drive that you must lift up as you slide the drive forward.

Some drive bays have a clipping mechanism to hold the drive in the bay. First release the clip and then pull the drive forward and out of the bay.

Handle the drives with care. Some drives have an exposed circuit board on the bottom of the drive. Don't touch this board.



Some cases have a removable bay for small drives. These bays can hold narrow drives such as hard drives, floppy drives, and tape drives. The bay is removed first and then the drives are removed from the bay. To remove the bay, first remove the screws or release the clip holding the bay in place and then slide the bay out of the case. The drives are usually installed in the bay with two screws on each side of each drive. Remove the screws and then the drives.





Repair or replace and reassemble components

Reassemble the computer

To reassemble a computer, reverse the process of disassembling. Here is where your diagrams will be really useful and having the screws and cables organized will also help.

In the directions that follow, we're also considering the possibility that you are installing a replacement part as you reassemble the system. Do the following:

1. Install components in the case in this order:

power supply

drives

motherboard

cards

When installing drives, know that for some systems, it's easier to connect data cables to the drives and then slide the drives into the bay. If the drive is anchored to the bay with screws or latches, be careful to align the front of the drive flush with the front of the case before installing screws or pushing in the latches.

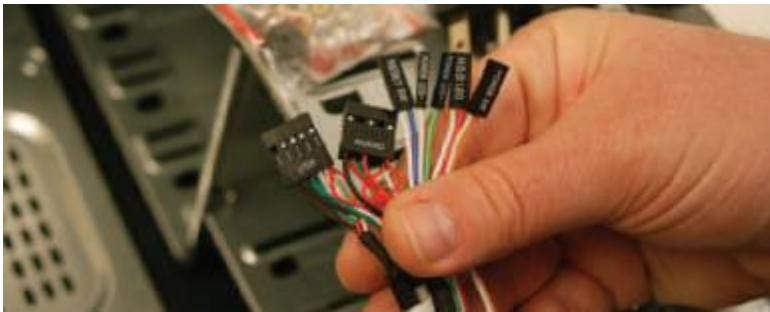


2. Place the motherboard inside the case. Make sure the ports stick out of the I/O shield at the rear of the case and the screw holes line up with screw holes on the bottom of the case. align the screw holes on the motherboard with those in the case. There should be at least six screw sets, and there might be as many as nine. Use as many screws as there are holes in the motherboard.



3. Connect the power cords from the power supply to the motherboard. A system will always need the main P1 power connector and most likely will need the 4-pin auxiliary connector for the processor. Other power connectors might be needed depending on the devices you later install in the system. Here are the details:
 - Connect the P1 power connector from the power supply to the motherboard.
 - Connect the 4-pin auxiliary power cord coming from the power supply to the motherboard. This cord supplies the supplemental power required for the processor.

- A board might have a 6-pin or 8-pin PCIe power connector.
 - If the board has either connector, connect the 6-pin or 8-pin cord from the power supply to the connector. If a power supply doesn't have this connector, you can use an adapter to convert two Molex connectors to a PCIe connector.
 - Some boards designed to support multiple PCIe video cards will have additional power connectors on the board to power these wattage-hungry cards.
 - To power the case fan, connect the power cord from the fan to pins on the motherboard labeled Fan Header. Alternately, some case fans use a 4-pin Molex connector that connects to a power cable coming directly from the power supply.
 - If a CPU and cooler are already installed on the motherboard, connect the power cord from the CPU fan to the pins on the motherboard labeled CPU Fan Header.
4. Connect the wire leads from the front panel of the case to the front panel header on the motherboard. These are the wires for the switches, lights, and ports on the front of the computer.



The five major connectors in a PC are as follows:

- a. Power SW. Controls power to the motherboard; must be connected for the PC to power up.
- b. HDD LED. Controls the drive activity light on the front panel that lights up when any SATA or IDE device is in use (HDD stands for hard disk drive; LED stands for light-emitting diode; and an LED is a light on the front panel.)

- c. Power LED+. Positive LED controls the power light and indicates that power is on.
 - d. Power LED. Negative LED controls the power light; the two positive and negative leads indicate that power is on.
 - e. Reset SW. Switch used to reboot the computer.
5. Connect wires to ports on the front panel of the case. Depending on your motherboard and case, there might be cables to connect audio ports or USB ports on the front of the case to headers on the motherboard. Look in the motherboard documentation for the location of these connectors.



6. Install the video card and any other expansion cards.
7. Take a few minutes to double-check each connection to make sure it is correct and snug. Verify all required power cords are connected correctly and the video card is seated solidly in its slot. Also verify that no wires or cables are obstructing fans. You can use cable ties to tie wires up and out of the way.
8. Plug in the keyboard, monitor, and mouse.
9. In a classroom environment, have the instructor check your work before you close the case and power up.
10. Turn on the power and check that the PC is working properly. If the PC does not work, most likely the problem is a loose connection. Just turn off the power and go back

and check each cable connection and each expansion card. You probably have not solidly seated a card in the slot. After you have double-checked, try again.

If the PC powers up, you have successfully completed the task.

Tools, Equipment, Supplies and Materials

- ground bracelet
- Phillips-head screwdriver
- Flathead screwdriver
- Paper and pen.
- Manufacturer Instruction Manuals
- Manufacturer website resources

Learning Activities

Learning Activity 1.1: Planning Your PC Repair Tool Kit

- Research on the web to find the following tools for sale: ground bracelet, antistatic gloves, set of flathead and Phillips-head screwdrivers, can of compressed air, monitor cleaning wipes, Multimeter, power supply tester, cable ties, flashlight, loopback plug to test an Ethernet port, POST diagnostic card, and toolbox.
- Print or save the web page showing each tool and its price.
- What is the total cost of this set of tools? If you were building your own PC repair tool kit, which tools would you purchase first if you could not afford the entire set of tools? Which tools not listed would you add to your toolbox?

Learning Activity 1.2: Open a Computer Case: Using a desktop or tower computer, identify all the ports on the front or rear of the case.

- Look at the rear of the case.
- On which side is the motherboard?
- Examine the case and determine how to open it. Shut down the system, and unplug the power cable.
- Disconnect all other cables.
- Press the power button on the front of the case to discharge residual power.
- Carefully open the case.

- Remember to not touch anything inside the case unless you are using a ground bracelet or antistatic gloves to protect components against ESD.
- Draw a diagram of the inside of the case and label all drives, the motherboard, the cooler, DIMM memory modules, the power supply, and any expansion cards installed.

Learning Activity 1.3: Identify Connectors Used on an Installed Motherboard

- If necessary, remove the case cover to your desktop computer.
- Next, remove the expansion cards from your system.
- With the expansion cards out of the way, you can more clearly see the power cables and other cables and cords connected to the motherboard.
- Diagrams and notes are extremely useful when disassembling and reassembling a system.
- To practice this skill, draw a large rectangle that represents the motherboard.
- On the rectangle, label every header or connector that is used on the board. Include on the label the type of cable that is used and where the other end of the cable connects.

Learning Activity 1.4: reassembling a Computer

A PC technician needs to be comfortable with taking apart a computer and putting it back together. In most situations, the essential tools you'll need for the job are a ground bracelet, a Phillips-head screwdriver, a flathead screwdriver, paper, and pen.

Working with a partner and using a lab computer designated to be disassembled, take a computer apart. It is not necessary to remove the processor or memory modules from the motherboard, but be very careful to properly support the motherboard and processor as you remove them from the case. Then reassemble the system. Don't replace the computer case panel until your instructor has inspected all cable connections. Then turn on the computer and verify all is working.

Tools, Equipment, Supplies and Materials

- user manual or manufacturer manual/ guide
- manufacturers website
- ground bracelet
- Phillips-head screwdriver
- Flathead screwdriver
- Paper and pen.

- Parts retriever

Self-Assessment

1. Which two tools can a PC support technician use when taking apart a computer to best protect computer components against ESD?
2. When working on a computer, which of the following best protects against ESD? Why?
 - a. Always touch the computer case before touching a circuit board inside the case.
 - b. Always wear a ground bracelet clipped to the side of the case.
 - c. Always sit a computer on an antistatic mat when working on it.
 - d. Always work on a computer in a room without carpet.
3. When troubleshooting a computer hardware problem, which tool might help with each of the following problems?
 - a. You suspect the network port on a computer is not functioning.
 - b. A hard drive is not working and you suspect the Molex power connector from the power supply might be the source of the problem.
4. When taking a computer apart, why is it important to not stack boards on top of each other?
5. Why is it important to remove loose jewelry before working inside a computer case?
6. When assembling a system, which do you install first, the drives or the motherboard?
7. What is the purpose of raised screw holes or standoffs installed between the motherboard and case?
8. When installing the front panel wires to the motherboard front panel header, how do you know which pins to use for each wire if the pins on the header are not labeled?

References

Andrews, J. (2013). A+ Guide to Managing & Maintaining Your PC. Cengage Learning.
Press, C. IT Essentials PC Hardware and Software Course Booklet, Version 4.1.

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3.2.2 Learning outcome 2: Troubleshoot Computer Components

3.2.2.1 Introduction to the Unit of Learning

This unit covers competencies required to perform troubleshooting. It includes identification of computer parts, hardware software, assembling of computer maintenance tools, theory of probable cause, assembling and disassembling process, test of theory of probable cause, problem identification and appropriate solutions

3.2.2.2 Performance standards

- 1.1 Identification of computer parts is done
- 1.1 Gathering of appropriate computer maintenance tools and maintenance techniques is done
- 1.2 Theory of probable cause is established
- 1.3 Testing of the theory to determine cause is done
- 1.4 Problem cause is established
- 1.5 Appropriate solution to the problem is performed

3.2.2.3 Information Sheet

Identification of Computer parts

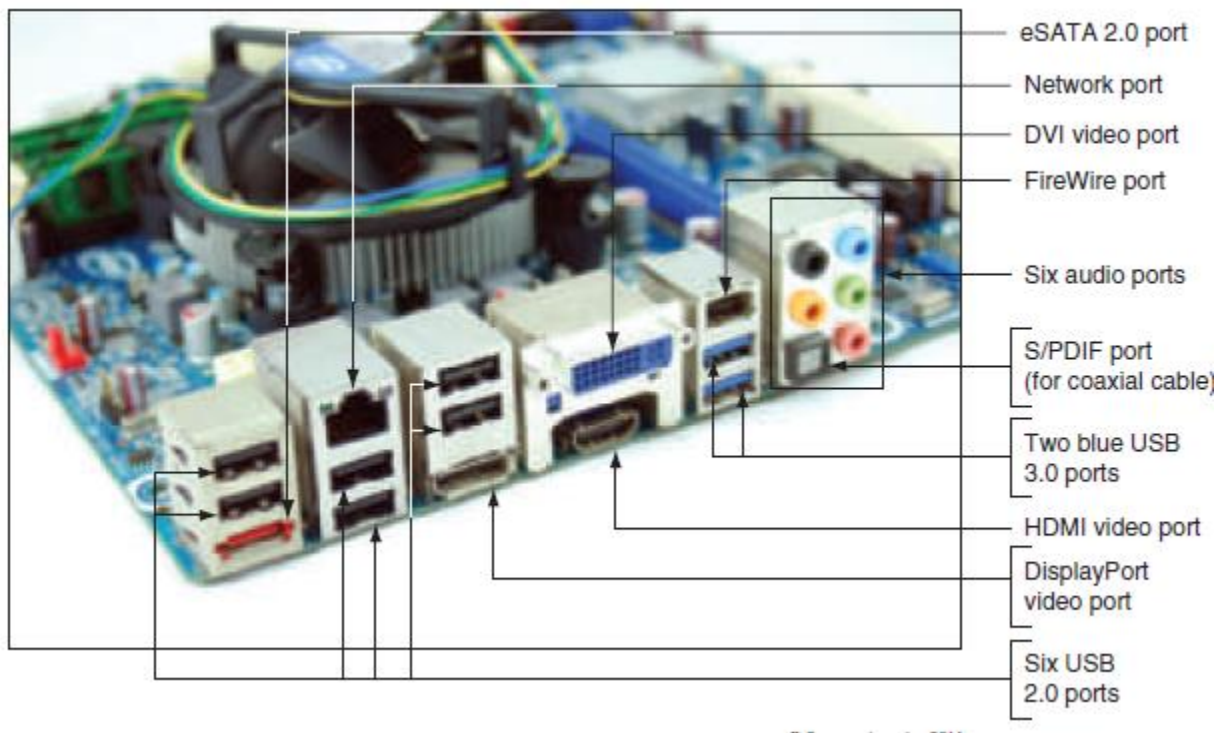
You need to understand the components of the computer casing. What is inside the case? What is the case?

Before we discuss the parts inside a computer case, let's take a quick look at the case and the ports and switches on it. The computer case, sometimes called the chassis, houses the power supply, motherboard, processor, memory modules, expansion cards, hard drive, optical drive, and other drives. A computer case can be a tower case, a desktop case that lies flat on a desk, an all-in-one case used with an all-in-one computer, or a mobile case used with laptops and tablet PCs.

A tower case sits upright and can be as high as two feet and has room for several drives. Often used for servers, this type of case is also good for PC users who anticipate upgrading because tower cases provide maximum space for working inside a computer and moving components around. A desktop case lies flat and sometimes serves double-duty as a monitor stand.

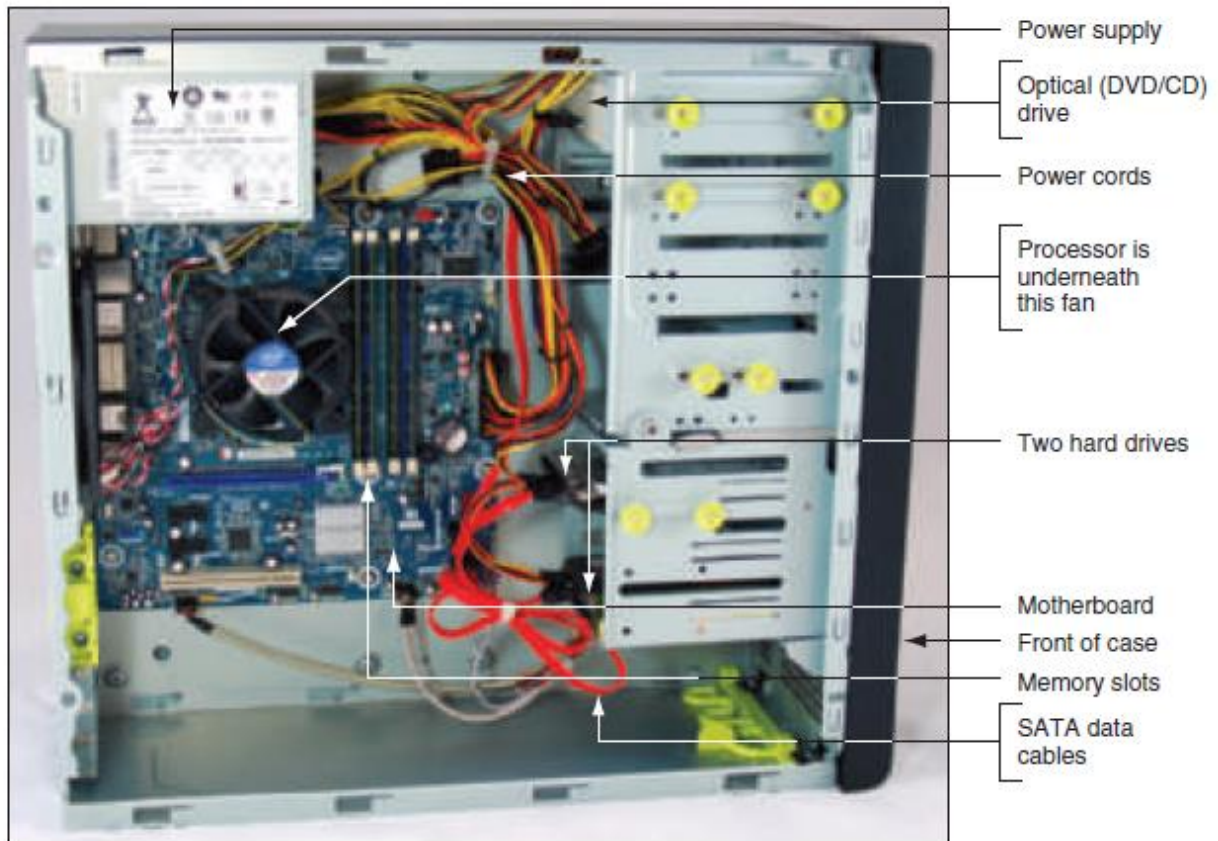


The figure below shows the most basic computer ports that are used to connect computer peripherals to the case:

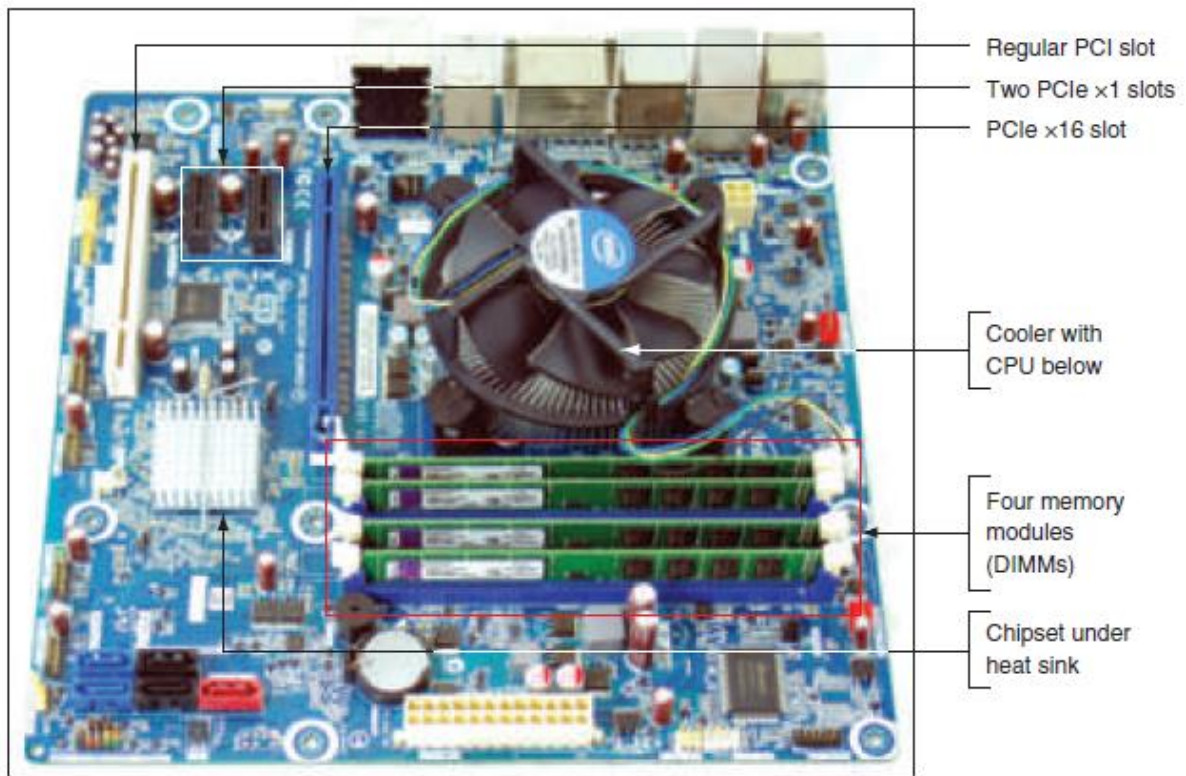


Have a look at it and familiarize with the parts.

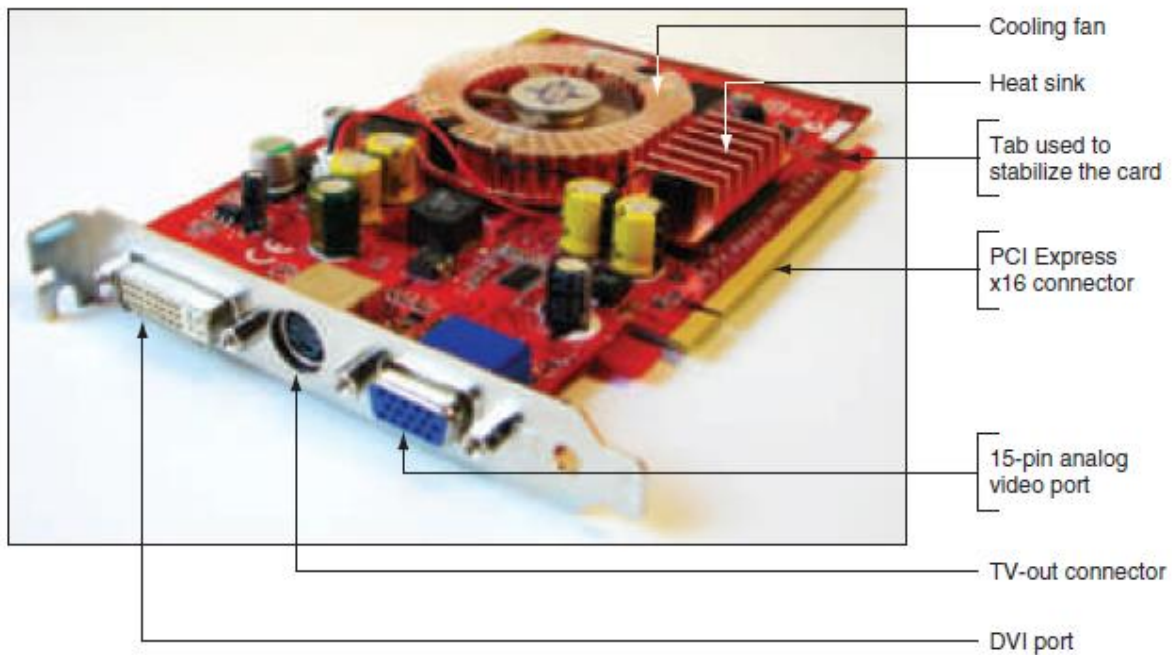
The following are the major components found in the computer casing:



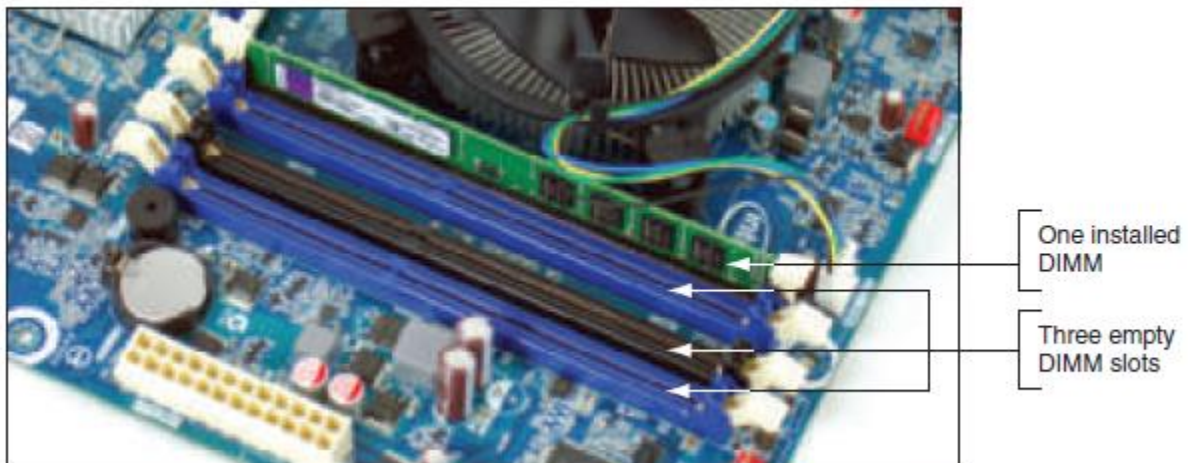
The motherboard, processor, and cooler. The motherboard, also called the main board, the system board is the largest and most important circuit board in the computer. The motherboard contains a socket to hold the processor or CPU. The central processing unit (CPU), also called the processor or microprocessor, does most of the processing of data and instructions for the entire system. Because the CPU generates heat, a fan and heat sink might be installed on top to keep it cool. A heat sink consists of metal fins that draw heat away from a component. The fan and heat sink together are called the processor cooler.



Expansion cards. A motherboard has expansion slots to be used by expansion cards. An expansion card, also called an adapter card, is a circuit board that provides more ports than those provided by the motherboard. the figure below shows a video card that provides three video ports. Notice the cooling fan and heat sink on the card, which help to keep the card from overheating. The trend today is for most ports in a system to be provided by the motherboard (called onboard ports) and less use of expansion cards.



Memory modules. A motherboard has memory slots, called DIMM (dual inline memory module) slots, to hold memory modules. the figure below shows a memory module installed in one DIMM slot and three empty DIMM slots. Memory, also called RAM (random access memory), is temporary storage for data and instructions as they are being processed by the CPU. The memory module shown below contains several RAM chips. Video cards also contain some embedded RAM chips for video memory.



Hard drives and other drives. A system might have one or more hard drives, an optical drive, a tape drive, or, for really old systems, a floppy drive. A hard drive, also called a hard disk drive (HDD), is permanent storage used to hold data and programs.

For example, the Windows 10 operating system and applications are installed on the hard drive. All drives in a system are installed in a stack of drive bays at the front of the case. The system shown in the figure below has two hard drives and one optical drive installed. Each drive has two connections for cables: the power cable connects to the power supply and another cable, used for data and instructions, connects to the motherboard.



Power supply. A computer power supply, also known as a power supply unit (PSU), is a box installed in a corner of the computer case (see figure below) that receives and converts the house current so that components inside the case can use it. Most power supplies have a dual-voltage selector switch on the back of the computer case where you can switch the input voltage to the power supply to 115 V used in the United States or 220 V used in other countries. See Figure 1-9. The power cables can connect to and supply power to the motherboard, expansion cards, and drives.





Form Factors used by computer cases, power supplies and motherboards

The computer case, power supply, and motherboard must all be compatible and fit together as an interconnecting system. The standards that describe the size, shape, screw hole positions, and major features of these interconnected components are called form factors. Using a matching form factor for the motherboard, power supply, and case assures you that:

- The motherboard fits in the case.
- The power supply cords to the motherboard provide the correct voltage, and the connectors match the connections on the board.
- The holes in the motherboard align with the holes in the case for anchoring the board to the case.
- The holes in the case align with ports coming off the motherboard.
- For some form factors, wires for switches and lights on the front of the case match up with connections on the motherboard.
- The holes in the power supply align with holes in the case for anchoring the power supply to the case.

The two form factors used by most desktop and tower computer cases and power supplies are the ATX and mini-ATX form factors. Motherboards use these and other form factors that are compatible with ATX or mini-ATX power supplies and cases.

ATX Form Factor

ATX (Advanced Technology Extended) is the most commonly used form factor today. It is an open, nonproprietary industry specification originally developed by Intel in 1995 and has undergone several revisions since then. The original ATX form factor for cases had case fans

blowing air into the case, but early revisions to the form factor had fans blowing air out of the case. Blowing air out of the case does a better job of keeping the system cool.

A listing of ATX connectors is given below:

- 20-pin P1 connect is the main motherboard power connector used in the early ATX systems.
- 24-pin P1 connector, also called the 20+4 pin connector, is the main motherboard power connector used today.
- 20+4 pin P1 connector with four pins removed so the connector can fit into a 20-pin P1 motherboard connector.
- 4-pin auxiliary motherboard connector used for extra 12 V power to the processor.
- 8-pin auxiliary motherboard connector used for extra 12 V power to the processor, providing more power than the older 4-pin auxiliary connector.
- 4-pin Molex connector is used for IDE (PATA) drives.
- 15-pin SATA connector used for SATA drives.
- 4-pin Berg connector used by a floppy disk drive (FDD).
- 6-pin PCIe connector provides an extra +12 V for high-end video cards using PCI Express, Version 1 standard.
- 6-pin plus 2-pin +12 V PCIe connector is used by high-end video cards using PCIe ×16 slots to provide extra voltage to the card. To get the 8-pin connector, combine both the 6-pin and 2-pin connectors.

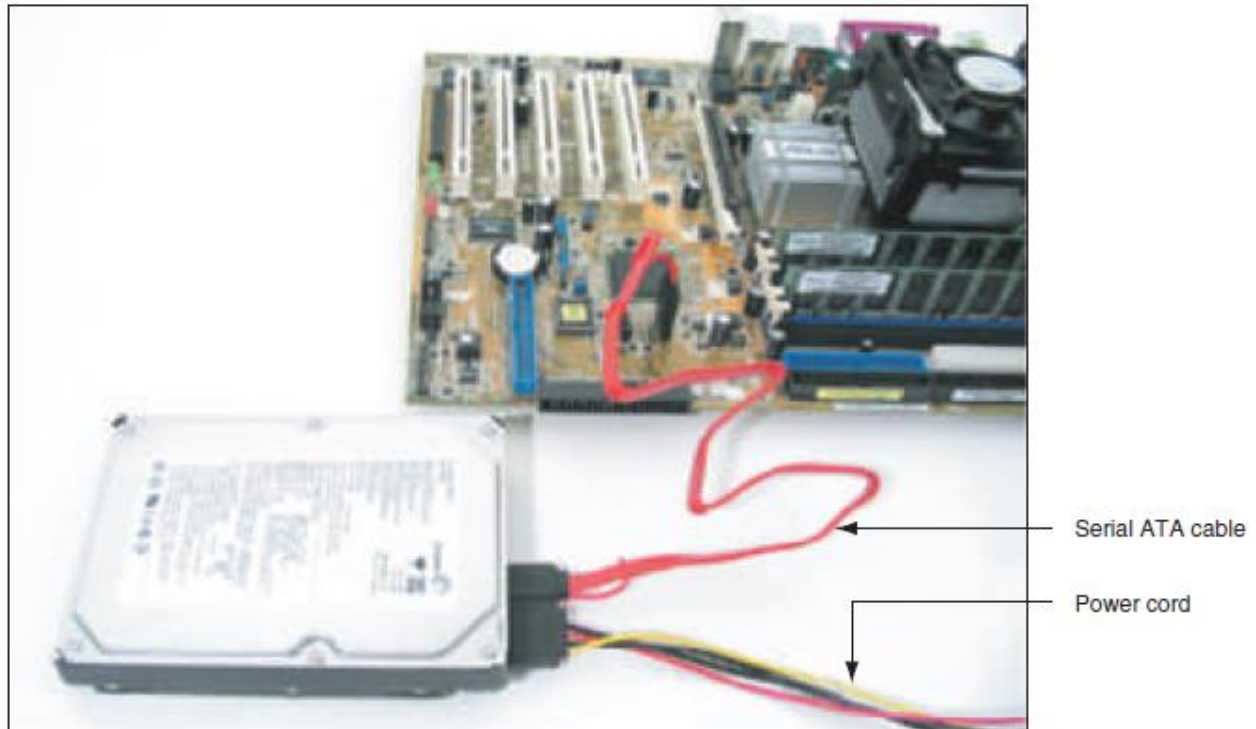
MicroATX (MATX)

The MicroATX (MATX) form factor is a major variation of ATX and addresses some technologies that have emerged since the original development of ATX. MicroATX reduces the total cost of a system by reducing the number of expansion slots on the motherboard, reducing the power supplied to the board, and allowing for a smaller case size. A micro- ATX motherboard will fit into a case that follows the ATX 2.1 or higher standard. A MicroATX power supply uses a 24-pin P1 connector and is not likely to have as many extra wires and connectors as those on an ATX power supply.

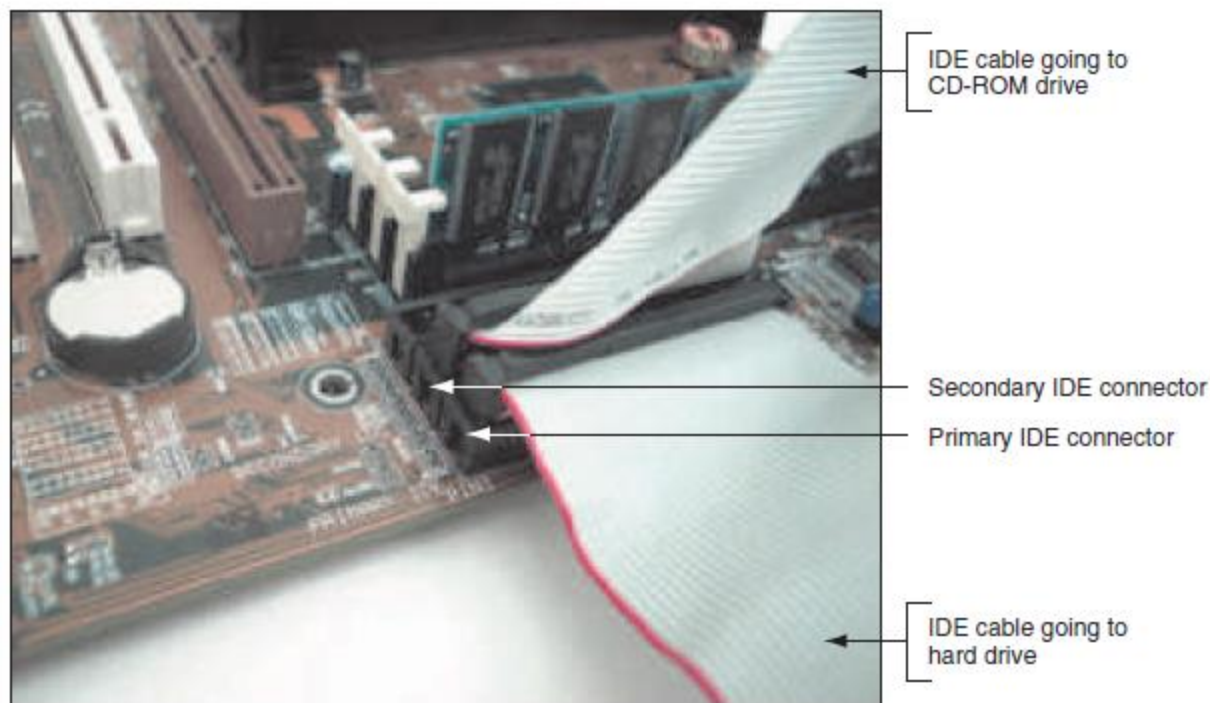


Drives, their Cables & Connectors

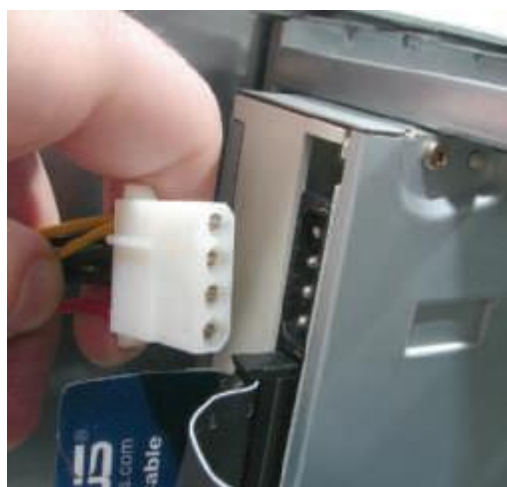
A computer might have one or more hard drives, an optical drive (CD, DVD, or Blu-ray), tape drive, floppy drive, or some other type of drive. A drive receives power by a power cable from the power supply and communicates instructions and data through a cable attached to the motherboard. Two standards that hard drives, optical drives, and tape drives use for both types of connections are the faster serial ATA (SATA) standard and the slower and older parallel ATA (PATA) standard. Both standards are published by the American National Standards Institute (ANSI, see www.ansi.org). Most drives today use the faster SATA interface.



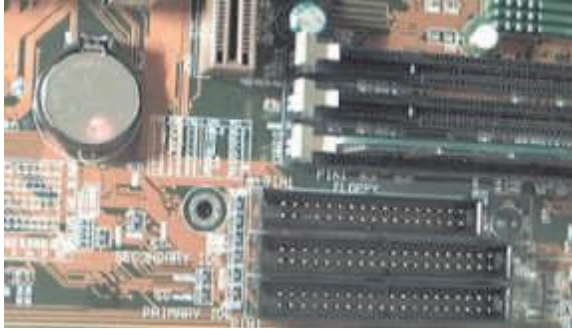
The PATA interface, also called the IDE interface, uses a wide 40-pin ribbon cable and connector. The standard allows for only two connectors on a motherboard for two data cables. Each IDE ribbon cable has a connection at the other end for an IDE drive and a connection in the middle of the cable for a second IDE drive. Using this interface, a motherboard can accommodate up to four IDE or PATA drives in one system.



PATA drives use a 4-pin power connector called a Molex power connector. A Molex connector is shaped so it connects in only one direction (see figure below).



Older motherboards provide a connection for a floppy drive data cable (see figure below). A floppy drive, also called a floppy disk drive (FDD), can hold 3.5 inch disks containing up to 1.44 MB of data. The floppy drive cable has 34 pins and a twist in the cable and can accommodate one or two drives. The 4-pin Berg power connector used by floppy drives is smaller than a Molex connector.



Troubleshooting Hardware Problems

When an end user brings any computer problem to you, begin the troubleshooting process by interviewing the user. When you interview the user, you might want to include these questions:

Can you describe the problem and describe when the problem first started and when it occurs?

1. Was the computer recently moved?
2. Was any new hardware or software recently installed?
3. Was any software recently reconfigured or upgraded?
4. Did someone else use your computer recently?
5. Does the computer have a history of similar problems?
6. Is there important data on the drive that is not backed up?
7. Can you show me how to reproduce the problem?

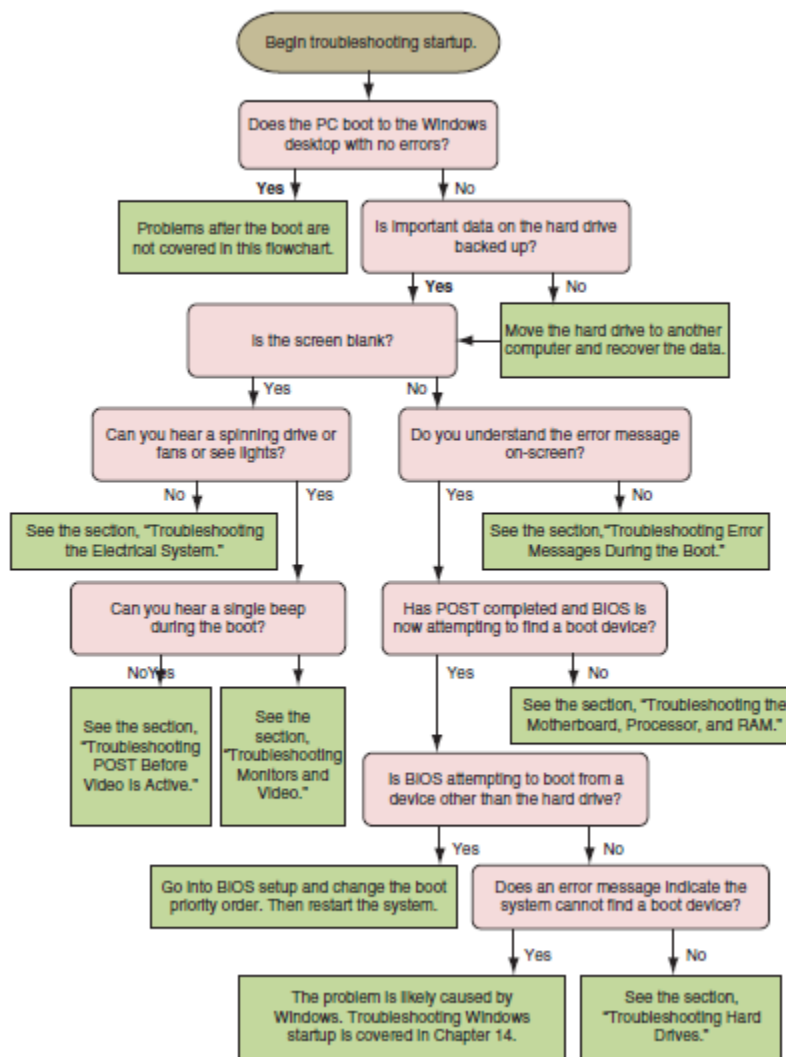
After you gather this basic information, you can prioritize what to do and begin diagnosing and addressing the problem.

A good PC technician builds over time a strong network of resources he or she can count on when solving computer problems. Here are some resources to help you get started with your own list of reliable and time-tested sources of help:

1. User manuals often list error messages and their meanings. They also might contain a troubleshooting section and list any diagnostic tools available.
2. The web can also help you diagnose computer problems. Go to the web site of the product manufacturer, and search for a support forum. It's likely that others have encountered the same problem and posted the question and answer. Most manufacturer websites have Frequently Asked Questions Sections (FAQ's) where users with similar problems discuss solutions.
3. Chat, telephone, or email technical support from the hardware and software manufacturers can help you interpret an error message, or it can provide general support in diagnosing a problem. Most technical support is available during working hours by way of an online chat session.
4. Manufacturer's diagnostic software is available for download from the web sites of many hardware device manufacturers. For example, you can download SeaTools for Windows

(must be installed in Windows) or SeaTools for DOS (used to create a bootable CD that contains the software) and use the software to diagnose problems with Seagate and Maxtor drives.

5. Technical associates in your organization can help. Be sure to ask for advice when you're stuck. Also, after making a reasonable and diligent effort to resolve a problem, getting the problem fixed could become more important than resolving it yourself.
6. There comes a time when you might need to turn the problem over to a more experienced technician (escalation) the flowchart below gives you a road map on how to perform PC troubleshooting.



Troubleshooting the Electrical System

Electrical problems can occur before or after the boot and can be consistent or intermittent. Many times PC repair technicians don't recognize the cause of a problem to be electrical because of the intermittent nature of some electrical problems.

Possible symptoms of a problem with the electrical system are:

- The PC appears “dead”—no indicator lights and no spinning drive or fan.
- The PC sometimes locks up during booting. After several tries, it boots successfully.
- Error codes or beeps occur during booting, but they come and go.
- You smell burnt parts or odors. (Definitely not a good sign!)
- The PC powers down at unexpected times.
- The PC appears dead except you hear a whine coming from the power supply.

Without opening the computer case, the following list contains some questions you can ask and things you can do to solve a problem with the electrical system.

- If you smell any burnt parts or odors, don’t try to turn the system on. Identify the component that is fried and replace it.
- When you first plug up power to a system and hear a whine coming from the power supply, the power supply might be inadequate for the system or there might be a short. Don’t press the power button to start up the system. Unplug the power cord so that the power supply will not be damaged. The next step is to open the case and search for a short. If you don’t find a short, consider upgrading the power supply.
- Is the power cord plugged in? If it is plugged into a power strip or surge suppressor, is the device turned on and also plugged in?
- Is the power outlet controlled by a wall switch? If so, is the switch turned on?
- Are any cable connections loose?
- Is the circuit breaker blown? Is the house circuit overloaded?
- Are all switches on the system turned on? Computer? Monitor? Surge suppressor or UPS (uninterruptible power supply)?
- Is there a possibility the system has overheated? If so, wait a while and try again. If the system comes on, but later turns itself off, you might need additional cooling fans inside the unit. How to solve problems with overheating is covered later in the chapter.
- Older computers might be affected by electromagnetic interference (EMI). Check for sources of electrical or magnetic interference such as fluorescent lighting or an electric fan or copier sitting near the computer case.

The next step is to open the computer case and then do the following:

- Turn off the computer, unplug it, press the power button to drain residual power, and open the case. Check all power connections from the power supply to the motherboard and drives. Also, some cases require the case’s front panel be in place before the power-on button will work.
- Are all cards securely seated?
- If you smell burnt parts, carefully search for shorts and frayed and burnt wires.
- Disassemble the parts until you find the one that is damaged.
- If you suspect the power supply is bad, test it with a power supply tester.

Troubleshooting Intermittent Problems

If a system boots successfully to the Windows desktop, you still might have a power system problem. Some problems are intermittent; that is, they come and go. Generally, intermittent problems are more difficult to solve than a dead system. There can be many causes of intermittent problems, such as an inadequate power supply, overheating, and devices and components damaged by ESD. Here are some symptoms that might indicate an intermittent problem with the electrical system after the boot:

The computer stops or hangs for no reason. Sometimes it might even reboot itself.

- Memory errors appear intermittently.
- Data is written incorrectly to the hard drive.
- The keyboard stops working at odd times.
- The motherboard fails or is damaged.
- The power supply overheats and becomes hot to the touch.
- The power supply fan whines and becomes very noisy or stops.

1. Consider the power supply is inadequate. If the power supply is grossly inadequate, it will whine when you first plug up the power. Make sure the wattage rating of the power supply is adequate for the system.

2. Suspect the power supply is faulty. You can test it using either a power supply tester (the easier method) or a Multimeter (the more tedious method).

3. The power supply fan might not work. Don't operate the PC if the fan does not work because computers without cooling fans can quickly overheat. If this has just happened, replace the power supply.

Power Problems with the Motherboard

A short might occur if some component on the motherboard makes improper contact with the chassis. This short can seriously damage the motherboard. For some cases, check for missing standoffs (small plastic or metal spacers that hold the motherboard a short distance away from the bottom of the case). A missing standoff most often causes these improper connections.

Shorts in the circuits on the motherboard might also cause problems. Look for damage on the bottom of the motherboard. These circuits are coated with plastic, and quite often damage is difficult to spot. Also look for burned-out capacitors that are spotted brown or corroded.

Problems with Overheating

Overheating can happen as soon as you turn on the computer or after the computer has been working a while. Overheating can cause intermittent errors, the system to hang, or components to fail or not last as long as they normally would. (Overheating can significantly shorten the lifespan of the CPU and memory.) Overheating happens for many reasons, including improper installations of the CPU cooler or fans, overclocking, poor air flow inside the case, an underrated power supply, a component going bad, or the computer's environment (for example, heat or dust).

Here are some symptoms that a system is overheating:

The system hangs or freezes at odd times or freezes just a few moments after the boot starts.

A Windows BSOD error occurs during the boot.

You cannot hear a fan running or the fan makes a whining sound.

You cannot feel air being pulled into or out of the case.

1. If the system refuses to boot or hangs after a period of activity, suspect overheating. Immediately after the system hangs, go into BIOS setup and find the CPU screen that reports the temperature. The temperature should not exceed 38 degrees C.
2. Use compressed air, a blower, or an antistatic vacuum to remove dust from the power supply, the vents over the entire computer, and the processor cooler fan. Excessive dust insulates components and causes them to overheat.
3. Check airflow inside the case. Are all fans running? You might need to replace a fan. Is there an empty fan slot on the rear of the case? If so, install a case fan in the slot. Orient the fan so that it blows air out of the case. The power cord to the fan can connect to a fan header on the motherboard or to a power connector coming directly from the power supply.
4. If there are other fan slots on the side or front of the case, you can also install fans in these slots. However, don't install more fans than the case is designed to use.
5. Can the side of the case hold a chassis air guide that guides outside air to the processor? If it has a slot for the guide and the guide is missing, install one. However, don't install a guide that obstructs the CPU cooler.
6. A case is generally designed for optimal airflow when slot openings on the front and rear of the case are covered and when the case cover is securely in place. To improve airflow, replace missing faceplates over empty drive bays and replace missing slot covers over empty expansion slots.
7. Are cables in the way of airflow? Use tie wraps to secure cables and cords so that they don't block airflow across the processor or get in the way of fans turning.
8. A case needs some room to breathe. Place it so there are at least a few inches of space on both sides and the top of the case. If the case is sitting on carpet, put it on a computer stand so that air can circulate under the case and also to reduce carpet dust inside the case. Many cases have a vent on the bottom front of the case and carpet can obstruct airflow into this vent. Make sure drapes are not hanging too close to fan openings.
9. Verify the cooler is connected properly to the processor. If it doesn't fit well, the system might not boot and certainly the processor will overheat. If the cooler is not tightly connected to the motherboard and processor or the cooler fan is not working, the processor will quickly overheat as soon as the computer is turned on. Has thermal compound been installed between the cooler and processor?

10. After you close the case, leave your system off for at least 30 minutes. When you power up the computer again, let it run for 10 minutes, go into BIOS setup, check the temperature readings, and reboot. Next, let your system run until it shuts down. Power it up again and check the temperature in BIOS setup again. A significant difference in this reading and the first one you took after running the computer for 10 minutes indicates an overheating problem.

11. Check BIOS setup to see if the processor is being overclocked. Overclocking can cause a system to overheat. Try restoring the processor and system bus frequencies to default values.

12. Have too many peripherals been installed inside the case? Is the case too small for all these peripherals? Larger tower cases are better designed for good airflow than smaller slimline cases. Also, when installing cards, try to leave an empty slot between each card for better airflow. The same goes for drives. Try not to install a group of drives in adjacent drive bays. For better airflow, leave empty bays between drives.

13. Flash BIOS to update the firmware on the motherboard.

14. Thermal compound should last for years, but eventually it will harden and need replacing. If the system is several years old, replace the thermal compound.

Troubleshooting POST before Video is Active

Error messages on the screen indicate that video and the electrical system are working. If you observe that power is getting to the system (you see lights and hear fans or beeps) but the screen is blank, turn off the system and turn it back on and carefully listen to any beep codes or BIOS speech messages. When a PC boots, one beep or no beep indicates that all is well after POST. If you hear more than one beep, look up the beep code in the motherboard or BIOS documentation or on the web sites of these manufacturers. Each BIOS manufacturer has its own beep codes; the table below lists the most common beep codes.

Beeps During Post	Description
One short beep or no beep	The computer passed all POST tests
1 long and 2 short beeps	Award BIOS: A video problem, no video card, bad video memory Intel BIOS: A video problem
Continuous short beeps	Award BIOS: A memory error Intel BIOS: A loose card or short
1 long and 1 short beep	Intel BIOS: Motherboard problem
1 long and 3 short beeps	Intel BIOS: A video problem
3 long beeps	Intel BIOS: A keyboard controller problem
Continuous 2 short beeps and then a pause	Intel BIOS: A video card problem
Continuous 3 short beeps and then a pause	Intel BIOS: A memory error
8 beeps followed by a system shutdown	Intel BIOS: The system has overheated
Continuous high and low beeps	Intel BIOS: CPU problem

Troubleshooting Error Messages during Boot

If video and the electrical systems are working, then most boot problems show up as an error message displayed on-screen. These error messages that occur before Windows starts to load apply to hardware components that are required to boot the system. Some possible error messages are listed in the table below and their meanings. For other error messages, look in your motherboard user guide or on the manufacturer's web site. You can also search the web on the motherboard brand and model and the error message.

Error Message Before Windows Starts	Meaning of the Error Message
CMOS battery low	The CMOS battery needs replacing.
CMOS checksum bad	CMOS RAM might be corrupted. Run BIOS setup and reset BIOS to default settings. If the problem occurs again, try flashing the BIOS
Memory size decreased	Startup BIOS recognized that the amount of installed RAM is less than that of the previous boot. A memory module might be bad. Begin troubleshooting memory.
Processor thermal trip error	The processor overheated and the system has restarted.
Intruder detection error	An intrusion detection device installed on the motherboard has detected that the computer case was opened.
Overclocking failed. Please enter setup to reconfigure your system.	Overclocking should be discontinued. However, this error might not be related to overclocking; it can occur when the power supply is failing.
No boot device available Hard drive not found Fixed disk error Invalid boot disk Inaccessible boot device or drive Invalid drive specification	Startup BIOS did not find a device to use to load the operating system. Make sure the boot device priority order is correct in BIOS setup. Then begin troubleshooting the hard drive.
Missing BOOTMGR Missing NTLDR Missing operating system Error loading operating system	The Windows program needed to start Windows is missing or corrupted. This program is called the OS boot manager program.

Troubleshooting the Processor, Motherboard & RAM

The field replaceable units (FRUs) on a motherboard are the processor, the processor cooler assembly, RAM, and the CMOS battery. Also, the motherboard itself is an FRU. As you troubleshoot the motherboard and discover that some component is not working, such as a network port, you might be able to disable that component in BIOS setup and install a card to

take its place. When you suspect a bad component, a good troubleshooting technique is to substitute a known-good component for the one you suspect is bad.

Symptoms that a motherboard, processor, or memory module is failing can appear as:

- The system begins to boot but then powers down.
- An error message is displayed during the boot. Investigate this message.
- The system becomes unstable, hangs, or freezes at odd times. (This symptom can have multiple causes, including a failing power supply, RAM, hard drive, motherboard or processor, Windows errors, and overheating.)
- Intermittent Windows or hard drive errors occur.
- Components on the motherboard or devices connected to it don't work.

If you can boot the system, follow these steps to eliminate Windows, software, RAM, BIOS settings, and other software and hardware components as the source of the problem:

1. The problem might be a virus. If you can boot the system, run a current version of antivirus software to check for viruses.
2. A memory module might be failing. In Windows 10, use the Memory Diagnostics tool to test memory. Even if Windows 10 is not installed, you can still run the tool by booting the system from the Windows setup DVD.
3. Suspect the problem is caused by an application or by Windows. In Windows, the best tool to check for potential hardware problems is Device Manager.
4. In Windows, download and install any Windows updates or patches. These updates might solve a hardware or application problem.
5. Ask yourself what has changed since the problem began. If the problem began immediately after installing a new device or application, uninstall the device or applications.
6. A system that does not have enough RAM can sometimes appear to be unstable. Using the System window, find out how much RAM is installed, and compare that to the recommended amounts. Consider upgrading RAM.
7. The BIOS might be corrupted or have wrong settings. Check BIOS setup. Have settings been tampered with? Is the system bus speed set incorrectly or is it overclocked? Reset BIOS setup to restore default settings.
8. Disable any quick booting features in BIOS so that you get a thorough report of POST. Then look for errors reported on the screen during the boot.
9. flash BIOS to update the firmware on the board.
10. Look on the CD that came bundled with the motherboard. It might have diagnostic tests on it that might identify a problem with the motherboard.

11. Update all drivers of motherboard components that are not working. For example, if the USB ports are not working, try updating the USB drivers with those downloaded from the motherboard manufacturer's web site. This process can also update the chipset drivers.

12. If an onboard port or connector isn't working, but the motherboard is stable, follow these steps:

a. Verify the problem is not with the device using the port. Try moving the device to another port on the same computer or move the device to another computer. If it works there, return it to this port. The problem might have been a bad connection.

b. Go into BIOS setup and verify the port is enabled.

c. Check Device Manager and verify Windows recognizes the port with no errors. Uninstall and reinstall the drivers for the device using the port.

d. Update the motherboard drivers for this port from the motherboard manufacturer's web site.

e. If you have a loop-back plug, use it to test the port.

f. If the problem is still not solved, disable the port in BIOS setup and install an expansion card to provide the same type of port or connector.

13. Suspect the problem is caused by a failing hard drive.

14. Suspect the problem is caused by overheating. How to check for overheating is covered earlier in the chapter.

15. Search the support section of the web sites of the motherboard and processor manufacturers for things to do and try. Then do a general search of the web using a search engine such as www.google.com. Search on the error message, symptom, motherboard model, processor model, or other text related to the problem. Most likely, you'll find a forum where someone else has posted the same problem, and others have posted a solution.

16. Verify the installed processor is supported by the motherboard. Perhaps someone has installed the wrong processor.

Problems with Installations

If you have just installed a new processor, DIMM, or other component and the system does not boot, do the following:

1. When troubleshooting an installation, it's easy to forget to check the simple things first. Are the system and monitor plugged in and turned on? Are the monitor, keyboard, and mouse connected to the system? Is the case front cover securely in place?

2. As you work inside the case, don't forget to use your antistatic bracelet. Open the case and check the installation of the new component:

- When installing DIMMs, verify each DIMM is securely seated in the memory socket. Make sure a new DIMM sits in the socket at the same height as other modules and clips on each side of the slot are in latched positions.
- For a new processor, did you install thermal compound between the processor and the heat sink? Is the cooler securely fastened to the frame on the motherboard? If the cooler and thermal compound are not installed correctly, the CPU can overheat during the boot, causing BIOS to immediately power down the system. Is the power cable from the cooler fan connected to the correct fan header on the motherboard?
- Look in the motherboard documentation for the correct header.
- For all types of installations, did other components or connectors become dislodged during the installation? Check memory modules, the P1 power connector, the 4-pin CPU auxiliary power connector, hard drive connectors, and auxiliary PCIe power connectors.

3. Try rebooting the system. If you still have a problem, verify you have installed a component that is compatible with the system. For a processor, double-check that the motherboard supports the processor installed. For memory, check that you have the right memory modules supported by your motherboard. Can your OS support all the memory installed?

4. For a processor installation, remove the processor from its socket and look for bent or damaged pins or lands on the socket and processor. For memory, remove the newly installed memory and check whether the error message disappears. Try the memory in different sockets. Try installing the new memory without the old installed. If the new memory works without the old, the problem is that the modules are not compatible.

5. Consider whether the case does not have enough cooling. Is a case fan installed and running at the rear of the case? Are cables and cords tied up out of the way of airflow?

6. For memory modules or expansion cards, clean the edge connectors with a soft cloth or contact cleaner. Blow or vacuum dust from the slot. Don't touch the edge connectors or the slot.

7. When upgrading a processor, reinstall the old processor, flash BIOS, and then try the new processor again.

Troubleshooting Hard Drives

Problems caused by the hard drive during the boot can be caused by the hard drive subsystem, by the file system on the drive, or by files required by Windows when it begins to load. When trying to solve a problem with the boot, you need to decide if the problem is caused by hardware or software. All the problems discussed in this section are caused by hardware.

Hardware problems usually show up at POST, unless there is physical damage to an area of the hard drive that is not accessed during POST. Hardware problems often make the hard drive totally inaccessible. If BIOS cannot find a hard drive at POST, it displays an error message similar to these:

- No boot device available
- Hard drive not found

- Fixed disk error
- Invalid boot disk
- Inaccessible boot device
- Inaccessible boot drive
- Numeric error codes in the 1700s or 10400s

The reasons BIOS cannot access the drive can be caused by the drive, the data cable, the electrical system, the motherboard, the SCSI host adapter (if one is present), or a loose connection.

Here is a list of things to do and check before you open the case:

1. If BIOS displays numeric error codes or cryptic messages during POST, check the Web site of the BIOS manufacturer for explanations of these codes or messages.
2. Check BIOS setup for errors in the hard drive configuration. If you suspect an error, set BIOS to default settings, make sure auto detection is turned on, and reboot the system.
3. Try booting from another bootable media such as the Windows setup DVD or a USB flash drive or CD with the Linux OS and diagnostics software installed (for example, Hiren's BootCD software at www.hirensbootcd.org). If you can boot using another media, you have proven that the problem is isolated to the hard drive subsystem.
4. For a RAID array, use the firmware utility to check the status of each disk in the array and to check for errors. After the array has rebuilt, your data should be available. However, if one of the hard drives in the array has gone bad, you need to replace the hard drive.

If the problem is still not solved, open the case and check these things. Be sure to protect the system against ESD as you work:

1. Remove and reattach all drive cables. For IDE drives, check for correct pin-1 orientation.
2. If you're using a RAID, SATA, PATA, or SCSI controller card, remove and reseal it or place it in a different slot. Check the documentation for the card, looking for directions for troubleshooting.
3. For new installations, check the jumper settings on an IDE drive.
4. Inspect the drive for damage, such as bent pins on the connection for the cable.
5. Determine if the hard drive is spinning by listening to it or lightly touching the metal drive (with the power on).
6. Check the cable for frayed edges or other damage.
7. Check the installation manual for things you might have overlooked. Look for a section about system setup, and carefully follow all directions that apply.
8. Windows includes several tools for checking a hard drive for errors and repairing a

corrupted Windows installation, here are a few simple things you can try:

a. Following directions given earlier in the chapter, boot from the Windows setup DVD and load the System Recovery Options menu. Select Startup Repair. This option restores many of the Windows files needed for a successful boot.

b. To make sure the hard drive does not have bad sectors that can corrupt the file system, you can use the `chkdsk` command. To use the command, select Command Prompt from the System Recovery Options menu. At the command prompt that appears, enter the `chkdsk C: /r` command to search for and recover data from bad sectors on drive C.

9. Check the drive manufacturer's web site for diagnostic software. Sometimes this software can be run from a bootable CD. Run the software to test the drive for errors.

10. If it is not convenient to create a bootable CD with hard drive diagnostic software installed, you can move the drive to a working computer and install it as a second drive in the system. Then you can use the diagnostic software installed on the primary hard drive to test the problem drive. While you have the drive installed in a working computer, be sure to find out if you can copy data from it to the good drive, so that you can recover any data not backed up.

11. If the drive still does not boot, exchange the three field replaceable units—the data cable, the adapter card (optional), and the hard drive itself—for a hard drive subsystem. Do the following, in order:

a. Reconnect or swap the drive data cable.

b. Reseat or exchange the drive controller card, if one is present.

c. Exchange the hard drive for a known good drive.

12. Sometimes older drives refuse to spin at POST. Drives that have trouble spinning often whine at startup for several months before they finally refuse to spin altogether. If your drive whines loudly when you first turn on the computer, never turn off the computer and replace the drive as soon as possible.

13. A bad power supply or a bad motherboard also might cause a disk boot failure.

Learning Activity 3.3: Sabotage and Repair a Computer

Open the computer case and create a hardware problem with your computer that prevents the system from booting without damaging a component. For example, you can disconnect a data cable or power cable or loosen a DIMM in a memory slot. Close the computer case and restart the system.

Describe the problem as a user would describe it who does not know much about computer hardware. Power down the system and fix the problem. Boot up the system and verify all is well.

The following table details Symptoms or error messages caused by hardware problems and what to do about them (appropriate solutions).

Symptom or Error Message	What to Do About the Problem
The system shuts down unexpectedly	Try to find out what was happening at the time of the shutdowns to zero in on an application or device causing the problem. Possible sources of the problem are overheating or faulty RAM, motherboard, or processor.
Error messages appear on a blue screen called a blue screen of death (BSOD)	These Windows errors are caused by problems with devices, device drivers, or a corrupted Windows installation. Begin troubleshooting by searching the Microsoft web site for the error message and a description of the problem
Error messages on a black screen	These error messages are most likely caused by an error at POST. Begin by troubleshooting the device mentioned in the error message.
The system freezes or locks up	If the system locks up immediately after a BSOD error screen, begin troubleshooting by investigating the error messages on the blue screen. If the system freezes while still displaying the Windows desktop, the problem is most likely caused by Windows or an application.
POST code beeps	Startup BIOS communicates POST errors as a series of beeps before it tests video. Search the web site of the motherboard or BIOS manufacturer to know how to interpret a series of beep codes.
Blank screen when you first power up the computer, and no noise or indicator lights	Is power getting to the system? If power is getting to the computer, address the problem as an electrical problem with the computer. Make sure the power supply is good and power supply connectors are securely connected.
Blank screen when you first power up the computer, and you can hear the fans spinning and see indicator lights	Troubleshoot the video subsystem. Is the monitor turned on? Is the monitor data cable securely connected at both ends? Is the indicator light on the front of the monitor on?
BIOS loses its time and date settings	This problem happens when the CMOS battery fails. Replace the battery.
The system attempts to boot to the	Go into BIOS setup and change the boot device

wrong boot device	priority order.
Continuous reboots	Continuous reboots can be caused by overheating, a failing processor, motherboard, or RAM, or a corrupted Windows installation. Begin by checking the system for overheating. Is the processor cooler fan working? Go to BIOS setup and check the temperature of the processor.
No power	If you see no lights on the computer case and hear no spinning fans, make sure the surge protector or wall outlet has power. Is the switch on the rear of the case on? Is the dual voltage selector switch set correctly? Are power supply connectors securely connected? Is the power supply bad?
Fans spin but no power gets to other devices	Begin by checking the power supply. Are connectors securely connected? Use a power supply tester to check for correct voltage outputs.
Smoke or burning smell	Consider this a serious electrical problem. Immediately unplug the computer.
Loud whining noise	Most likely the noise is made by the power supply or a failing hard drive. There might be a short. The power supply might be going bad or is underrated for the system.
Intermittent device failures	Failures that come and go might be caused by overheating or failing RAM, the motherboard, processor, or hard drive. Begin by checking the processor temperature for overheating. Then check RAM for errors and run diagnostics on the hard drive.

Learning Activities

Learning Activity 2.1: Identify Ports and Parts

Do the following to identify computer ports and parts that your instructor might have on display:

1. Look on the front and back of your computer case and list the type of ports the computer offers.
2. For a power supply, list the number and type of power connectors.
3. For a motherboard, list the number and type of expansion slots on the board. Does the board have a 20-pin or 24-pin P1 connector? What other power connectors are on the board? How many memory slots does the board have?
4. For expansion cards, examine the ports on the back of the card. By examining the ports, can you tell the purpose of the card? What type of slot does the card use?

Learning Activity 2.2: Examine the Power Supply, Motherboard, and Expansion Cards Inside a Case

If you have access to a computer with the case cover removed, examine its components and answer the following questions. As you look, remember to not touch anything inside the case unless you are properly grounded.

1. Identify the power supply, motherboard, and any expansion cards that might be installed on the motherboard. Remember: Don't touch a component unless you are properly grounded. If the case is plugged into a power source, don't touch inside the case even if you are grounded.
2. Identify the cooler that is installed on top of the processor. This cooler is likely to have a fan on top and a heat sink that you cannot see. The processor is hidden under the cooler.
3. Identify the memory modules and memory slots. How many memory slots are there? How many of these slots are populated?
4. If an expansion card is installed, what type of ports does the card provide at the rear of the case? Find the one screw that is used to attach the expansion card to the case.
5. Locate the screws that are attaching the motherboard to the case. How many screws are used? Do you see screw holes in the motherboard that are not being used? As a general rule of thumb, up to nine screws can be used to attach a motherboard to a case.
6. How many power cables are coming from the power supply? How many of these cables are connected to the motherboard? To other devices inside the computer? Identify each type of power cable the system is using.

7. Find the screws or clips that are attaching the power supply to the case. Is the power supply attached using screws, clips, or both screws and clips?

Learning Activity 2.3: Identify Drives and Their Connectors

If your instructor has provided a display of drives, for each drive identify the purpose of the drive (for example, a hard drive or optical drive) and the type of interface the drive uses (for example, IDE or SATA). If you have access to a computer with the case cover removed, answer the following questions:

1. List the drives installed, the purpose of each drive, and the type of interface and power connector it uses.
2. How many connectors does the motherboard have for drives? Identify each type of connector (SATA, IDE, or floppy drive connector).

Learning Activity 2.4: Research Beep Codes

Identify the motherboard and BIOS version installed in your computer. Locate the motherboard user guide on the web and find the list of beep codes that the BIOS might give at POST. If the manual doesn't give this information, search the support section on the web site of the motherboard manufacturer or search the web site of the BIOS manufacturer. List the beep codes and their meanings for your motherboard.

Learning Activity 2.5: Troubleshoot Memory

Do the following to troubleshoot memory:

1. Open the Windows System window and record the amount of memory in your system.
2. Follow the rules outlined in Chapter 1 to protect a computer against ESD as you work. Remove the memory module in the first memory slot on the motherboard, and boot the PC. Did you get an error? Why or why not? Replace the module and verify the system starts with no errors and that the full amount of memory is recognized by Windows.
3. Use the Windows 10 Memory Diagnostics tool to test memory. About how long did the test take? Were any errors reported?

Chapter 3: Repair/ replace & reassemble Computer Components

Introduction to the Unit of Learning

Summary of Learning Outcomes

Determine components to replace or repair

Procedures and Techniques for reassembling

Component testing

Repair/replace report

Determine components to replace or repair

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Procedures and Techniques for reassembling

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Component testing

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Repair/replace report

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Chapter 4: Test Computer/ component functionality

Introduction to the Unit of Learning

Summary of Learning Outcomes

Identify computer testing tools

Testing techniques are identified

Perform computer test functionality

status report

Identify computer testing tools

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Testing techniques are identified

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Perform computer test functionality

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

status report

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Chapter 5: Upgrade Computer Hardware

Introduction to the Unit of Learning

Summary of Learning Outcomes

Determine Reasons of upgrading

Identify procedures and techniques for upgrading

Test functionality of the upgraded software/hardware

Determine Reasons of upgrading

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Identify procedures and techniques for upgrading

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

Test functionality of the upgraded software/hardware

Information Sheet

Learning Activities

Self-Assessment

Tools, Equipment, Supplies and Materials

References

3.2.1.1 Introduction to the learning outcome

This unit covers competencies required to perform troubleshooting. It includes Identification of Computer parts, Hardware Software, assembling of computer maintenance tools, Theory of probable cause, Assembling and disassembling process, Test of theory of probable cause, Problem identification and Appropriate solutions.

3.2.1.2 Performance Standard

- 1.2.1.2.1 Identification of computer parts is done.
- 1.2.1.2.2 Assembling of appropriate computer maintenance tools and maintenance techniques is done.
- 1.2.1.2.3 Theory of probable cause is established.
- 1.2.1.2.4 Testing of the theory to determine cause is done.

- 1.2.1.2.5 Identification of the problem is established.
- 1.2.1.2.6 Appropriate solution to the problem is performed.

3.2.2.3 Information Sheet

Computer Terminologies

CPU (Central Processing Unit) is the brains of the computer

Application - a program in which you do your work.

Bit - the smallest piece of information used by the computer. In computer language, it is either a one (1) or a zero (0).

Backup - a copy of a file or disk you make for archiving purposes.

Hard Drive - a large capacity storage device made of multiple disks housed in a rigid case.

HDD: Hard Disk Drive

CD: Compact Disk

Icon - a graphic symbol for an application, file or folder.

Kilobyte (K) - 1024 bytes.

Launch - start an application.

Megabyte (MB) - 1024 kilobytes.

Software is a set of electronic instructions that tell a computer what to do.

Memory - the temporary holding area where data is stored while it is being used or changed; the amount of RAM a computer has installed.

Menu - a list of program commands listed by topic.

Menu Bar - the horizontal bar across the top of the screen that lists the menus.

Software - files on disks that contain instructions for a computer.

Upload - to send a file from one computer to another through a network.

Identification of Computer Parts

Hardware and Software

Hardware is any part of a computer system you can see or touch. A peripheral is any piece of hardware attached to a computer, such as a printer. You cannot see or touch software, but you can see and touch the packaging the software comes in. Application Software Application software lets you accomplish specific tasks. Popular application software includes Microsoft Word, Excel, Access, WordPerfect, Acrobat Reader, Internet Explorer, etc. Operating System Software Operating system software controls the overall activity of a computer. Some examples of operating systems are Windows, Unix Linux, DOS etc

Component Functions

CPU: All information goes through the CPU to be processed. The latest CPUs execute many millions of instructions per second.

MEMORY: Memory is where the information is stored. a. RAM: Random Access Memory stores programs and data as it is used. The information in RAM is lost when the power is turned off. b. ROM: Read Only Memory stores start up and basic operating information.

DISKS: Disks are where large amounts of information are stored, even when the power is off.

a. Floppy Disks - Information can be written to and read from floppy disks. The advantage of floppy disks is that they can be removed from the computer and the data taken to another machine. b. Hard disks - Hard disks are not removable like floppy disks, but hold more information. c. CD ROMs - Compact Disk Read Only Memory. They are useful for storing large amounts of data. A CD ROM holds about 650 MB of data and is removable.

Input/output Components: Allow a computer to communicate with the outside world. Following are some examples of input/output devices.

- a. Keyboard is used to enter information from the user to the computer.
- b. Monitors are used to display information.
- c. Video controller is a board in the computer that controls the monitor. It translates the data in the video memory into symbols on the monitor.
- d. Parallel/Serial ports allow the computer to send data to and receive data from printers, modems, etc.
- e. Mouse and Joystick are used to input positional information to the computer. f. Network Interface Card – A NIC connects the computer to a network. Networks are a high-speed method of transferring data from one computer to another.

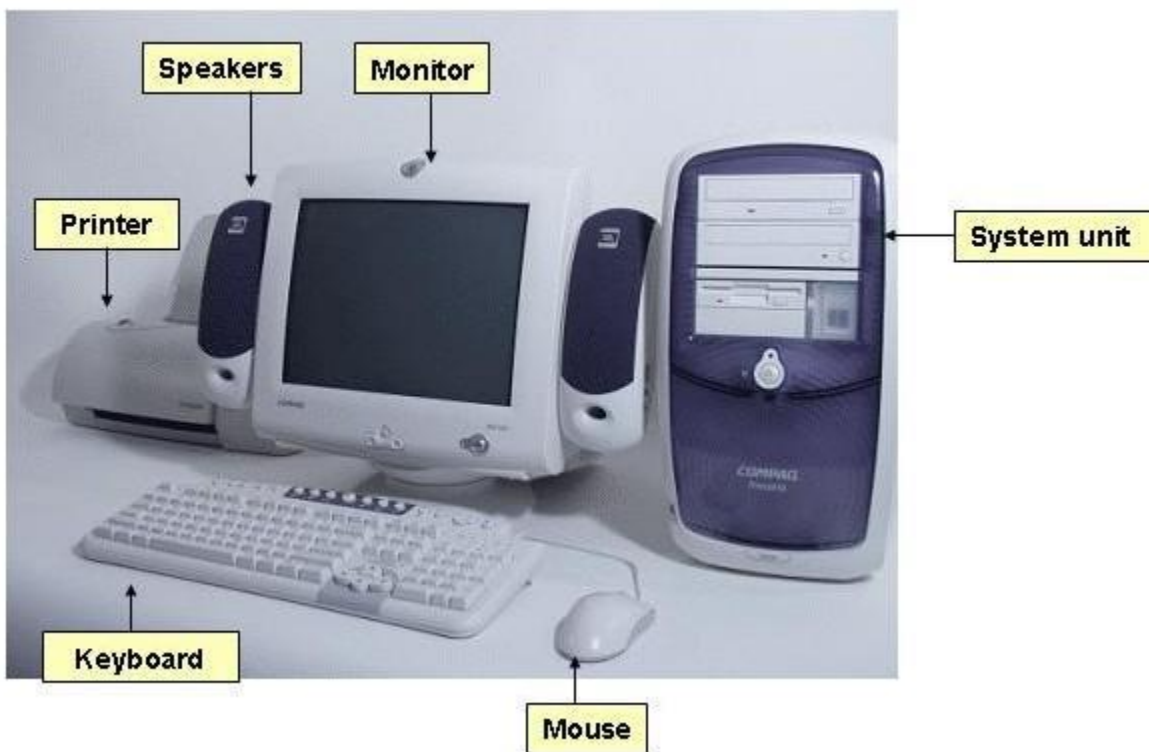


Figure 9 Hardware components of a Computer Desktop
(<https://www.example.com/computer-hardware/>)

How Computers Work

A computer collects processes, stores, and outputs information.

Input Devices

An input device lets you communicate with a computer. You can use input devices to enter information and issue commands. A keyboard, mouse and joystick are input devices.

Processing

The Central Processing Unit (CPU) also known as the system unit is the main chip in a computer. The CPU processes instructions performs calculations and manages the flow of information through a computer system. The CPU communicates with input, output, and storage devices to perform tasks.

Storage Devices

A storage device holds information . The computer uses information stored on these devices to perform tasks. The hard drive, the tape drive, the floppy disk, and the CD -ROM drive are storage devices .

Output Devices

An output device lets a computer communicate with you . These devices display information on a screen, create printed copies or generate sound. Monitor, printers, and speakers are output devices

Computer maintenance tools

Once you have gathered sufficient information to identify the problem, the next step in the Computer troubleshooting methodology is to “Establish a Theory of Probable Cause”. Here, you use your experience and knowledge to determine what you believe to be the underlying issue. Ask yourself, “What do I think caused the problem?”. Sometimes the first answer that comes to mind is indeed the cause. Other times that answer is not forthcoming. You may need to work through a series of tests to help you arrive at that theory.

There are six steps in the series of tests, and they include the following:

1. Identify the problem.
2. Establish a theory of probable cause.
3. Test the theory to determine cause.
4. Establish a plan of action to resolve the problem and implement the solution.
5. Verify full system functionality and if applicable implement preventative measures.
6. Document findings, actions, and outcomes.

Computers are a necessity everywhere; from homes to offices, schools, colleges, hospitals, banks, railway stations, etc., computers have become an indispensable part of all spheres of our lives. There is a plethora of hand tools available in the market and online today. Hand tools enable you to perform manual jobs quickly and efficiently. Choosing the right set of hand

tools for your computer repair kit is crucial to getting you through a large number of hardware malfunctions very easily and swiftly.

The following are the seven must-haves from a diverse number of hand tools available online for your computer hardware kit.

1 Flat-Tip Screwdrivers



Web source: <https://www.amazon.com/flat-head-screwdriver/s?k=flat+head+screwdriver>

Flat-tip screwdrivers are flat-headed and used to turn slotted screws.

1. Philips-Head Screwdrivers



Web source: <https://www.amazon.com/Phillips-head-screwdriver/s?k=Phillips+head+screwdriver>

Philips-head screwdrivers are used to tighten or loosen screws that are cross-headed.

3 Nut Drivers



Web source: <https://www.amazon.com/Nut-Drivers/b?ie=UTF8&node=553340>

Nut drivers are similar in appearance to a screwdriver, are an essential part of the computer repair toolkit. They are used to fasten bolts and nuts of varied dimensions. They possess a hollow shaft that empowers them with a stronghold of the threaded nut.

2. Wire Cutters



Web source: <https://www.amazon.com/wire-cutters/b?node=553186>

Wire cutters are helpful in stripping and cutting wires as per one's need.

3. Needle-Nose Pliers



Web source: <https://www.amazon.com/Needle-Nose-Pliers/b?ie=UTF8&node=553318>

Needle-nose pliers provide cutting and holding functionalities to the user. They are useful especially in hardware and electronics repair; because of their pointed needle-like tip, they come in handy if a nut or an element has become stuck in an otherwise unreachable cranny of the motherboard.

4. Wire Strippers



Web source: <https://www.amazon.com/DOWELL-Stripper-Multi-Function-Tool%EF%BC%8CProfessional-Craftsmanship/dp/B06X9875Z7>

Wire Strippers are pliers that help in stripping the wire off its insulation. A wire is generally coated with a covering of insulating material. If the situation demands, the wire has to be stripped-off of all its insulating covering to use it, say as a connector or a cable. A wire stripper consists of a pair of blades that function as a pair of scissors does.

5. Crimpers



Web source: https://www.google.com/search?q=crimpers&safe=active&sxsrf=ALeKk02B1i-jB5hgs6hTDJqxL4Q_jO5bEA:1608198692067&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiF_JL-3tTtAhWO2BQKHca-DCIQ_AUoAXoECCYQAw&biw=1600&bih=700#imgsrc=iGV740EZQJzzAM

Crimping tools or crimpers are used to connect wires in such a manner that they are able to transmit data. Two wires are joined together with the help of a crimping tool by deforming either one or both of the wires. Every single one of the wires need to be conjoined is first placed in the connector jack and then squeezed and held together to form a uniformly conducting wire.



Figure 10 Computer maintenance tools

The learning point here is about the tools required to assemble a kit that can perform basic, board-level service on PC systems. One of the best ways to start such a set of tools is to purchase a small kit sold especially for servicing PCs.

Because they work better than conventional screwdrivers, the use nut drivers to remove the hexagonal-headed screws that secure the computer system-unit covers, adapter boards, disk drives, and power supplies in most systems. There is, however, still need standard screwdrivers for systems that have substituted Phillips-head screws for the more standard hexagonal-head screws. If slotted screws are used, they should be removed and replaced with Phillips-head screws that capture the driver tool and prevent it from slipping off the head of the screw and potentially damaging the system.

Assembling and Disassembling Process

What is assembling a Personal Computer (PC)?

This part is all about CPU assembling. Specifically, you have to be very careful with this process.

Following are the steps to assemble CPU:

1. Take Inventory
2. Make space and time.
3. Prepare your CPU case.
4. Install motherboard.

5. Install the processor.
6. Install the processor heat sink.
7. Install the RAM.
8. Install the HDD.
9. Install CD/DVD drive
10. Connect Expansion cards
11. Install SYS/Rear cooling fan.
12. Bus cable connection
13. Power Cable connection
14. Front Panel connector connection

1. Take Inventory:

Before you start, take inventory of your parts. Make sure you have the following components and tools with you.

1. Case/ Tower/Cabinet
2. Motherboard
3. Processor
4. Heatsink and CPU Fan
5. SMPS
6. Hard disk drive
7. CD/ DVD drive
8. RAM
9. CMOS Battery
10. A good screwdriver sets.

2. Make Space, Make Time:

Building a PC takes space. You can use your dining room table to build your PC. So, make sure you have plenty of working space and a few hours to proceed with minimal interruption. You must work on a flat, stable tabletop surface or bare floor, where you have room to lay out all of the items, to begin with, assemble.

3. Prepare your CPU cabinet:

Now it is time to prepare the case. Remove the case cover from the CPU cabinet.

You need to check Screw brass standoffs are perfectly placed or not. If it is not in a proper position, in that case, you need to position them accurately. (always check the manual and follow their instructions)

4. Install The Motherboard:



Figure 11 motherboard and Back panel cover

(<https://www.tutorialsworld.com/computers/pc-motherboard.htm>)

You must take great care, especially when installing the motherboard. First, remove the motherboard of its packaging and put it on top of the antistatic bag it came in. Remember, you always want to safeguard your components from potentially hazardous static electricity.

1. You need to secure the motherboard onto the PC case/chassis and inspect carefully for any visible defects.
2. Next, review the motherboard handbook, to make sure you are familiar with the motherboard layout and understand which socket is which. Manuals are immensely helpful, usually easy to read, and include illustrations instructions.
3. Check the layout of the sockets on the motherboard. And confirm that the ports on your motherboard's back panel match the holes on the case's Input/output (I/O) shield installed in your case. If it is necessary, then remove the old I/O shield by tapping it firmly a few times with the thicker end of a screwdriver. And then replace it with the shield that came with the new motherboard.
4. There is need for carefully positioning the motherboard on top of the brass standoffs. After that line up all the holes, use the screws that accompanied the case to fasten down the motherboard.
5. Install the processor (CPU):

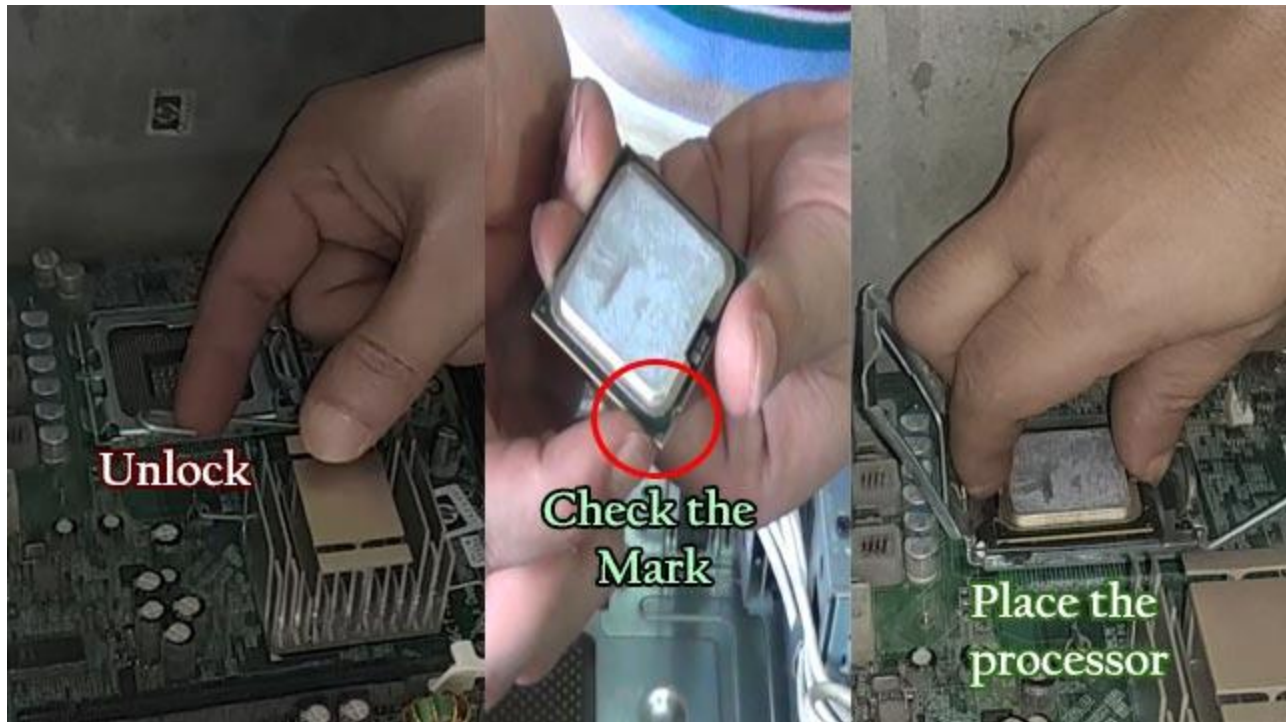


Figure 12 CPU (Central Processing Unit) placement)

<https://homepage.cs.uri.edu/faculty/wolfe/book/Readings/Reading04.htm>

1. Use the unlocking mechanism to open the CPU socket which is, usually a lever.
2. Carefully line up the pins and place the chip in its socket; it will fit only when oriented correctly. An arrow or a missing pin on one corner of the chip will show you how to line things up.
3. Align with the triangular symbol with the processor and socket key marks, as shown in the Figure.
4. Lower the lever to lock the CPU into place.

6. Install The CPU Heat Sink:

Following the manufacturer instructions to install the heat sink and the cooling fan. If buying a CPU and a separate heat sink, then there is need to spread a thin layer of the thermal grease over the chip. The thermal grease ensures proper transfer of heat.

There are some heat sinks that come with this grease already applied. In that case, there is no need to use thermal grease over the chip.

1. Attach the clip that holds the heat sink in place, keeping in mind that it may require a fair amount of force. Again, follow the instructions that came with the heat sink. They will show you how to fit it correctly. If you are in doubt, you can visit the manufacturer's website for more information.
2. Plug the CPU fan's power connector into the proper connector on the motherboard.

7. INSTALL RAM MEMORY:



Figure 13 Installing RAM (Random Access Memory)

https://www.google.com/search?q=installing+ram&safe=active&sxsrf=ALeKk00W1se9FJhW0XJS2d0j9f1pkQ6xhQ:1608546343154&tbm=isch&source=iu&ictx=1&fir=dZQL_jAYPZFy4M%252CWkNWvJ-ZkygBTM%252C_&vet=1&usg=AI4_-kQ01bll5FQKixC2YMPJvwLisFyHZw&sa=X&ved=2ahUKEwitqo2L7t7tAhUM8hoKHQsNCTgQ_h16BAgTEAE#imgsrc=dZQL_jAYPZFy4M

1. Unlock the two tabs from both ends of the RAM slot.
 2. To install the RAM, insert them into the proper sockets and push down firmly but evenly until the clips on both sides of the socket pop into place. If your motherboard supports dual-channel memory, consult the user manual to determine which pairs of RAM sockets you should use.
8. Install the Power Supply Unit (SMPS):



Figure 14 Installing SMPS (Power supply unit)

<https://medium.com/@kekreaditya/how-to-install-smmps-in-your-computer-6a19736813c2>

1. Place the SMPS inside the CPU cabinet in the proper position. If you are not able to find the correct location, then check the manual.
2. Final steps, to install SMPS, you need to tighten the screw to secure the SMPS to the case.
9. To install HDD:

You can see a 3.5 inch bay inside the CPU cabinet. If you are unable to find it, then check the manual of the case to identify the bay location.

Place the HDD inside the bay properly and tighten the screw.



Figure 15 Installing drives

<https://medium.com/@kekreaditya/how-to-install-smmps-in-your-computer-6a19736813c2>

10. To install CD/DVD:

You can see a 5.25 inch bay inside the CPU cabinet. If you are unable to find it, check the manual of the case to identify the bay location.

Place the CD/DVD inside the CPU cabinet to align with the 5.25-inch bay. And, finally, you need to tighten all the screws to hold firmly.

11. Install Expansion cards:

Expansion cards help to increase the functionality of your computer. You can place Expansion cards on the motherboard.

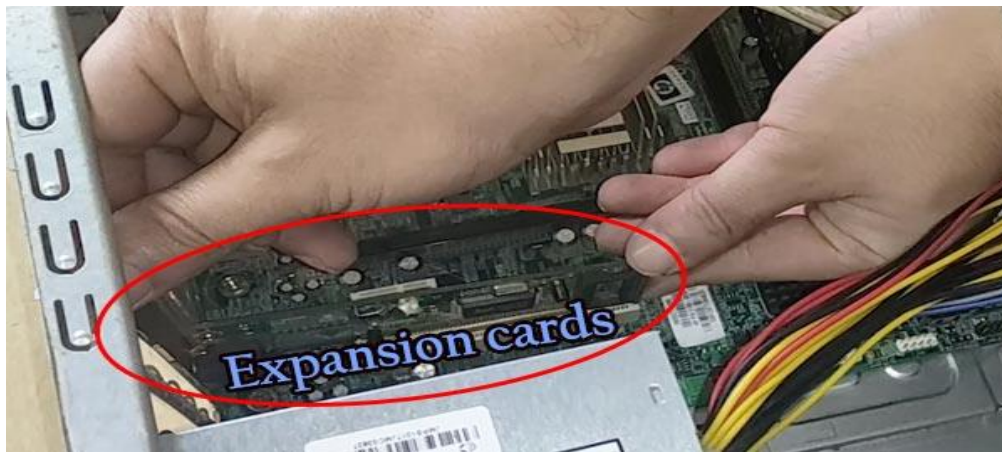


Figure 16 Installing Expansion Cards

https://www.google.com/search?q=Installing+Expansion+Cards&safe=active&sxsrf=ALeKk01Dy_dux99FURhQjg6JnNBXj_zqGA:1608546492677&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiwuLPS7t7tAhX2UhUIHQj1BqkQ_AUoAXoECCIQAw&biw=1600&bih=700#imgsrc=hLdDTSdoQRqgiM

PCI compatible expansion cards can place on the PCI slots of the motherboard.

PCI-e compatible expansion cards can place on the PCI-e slots of the motherboard.

Video cards or graphics cards can place on the AGP slot of the motherboard.

You must know about various parts of a motherboard such that, you can effortlessly identify the different connectors.

12. Install Sys/Rear cooling fan:



Figure 17 Cooling Fans

<https://www.amazon.com/Internal-Fans-Cooling-Components/b?ie=UTF8&node=3012290011>

Find the location where you can place the Sys/Rear cooling Fan. Generally, SYS/Rear cooling can place below the SMPS.

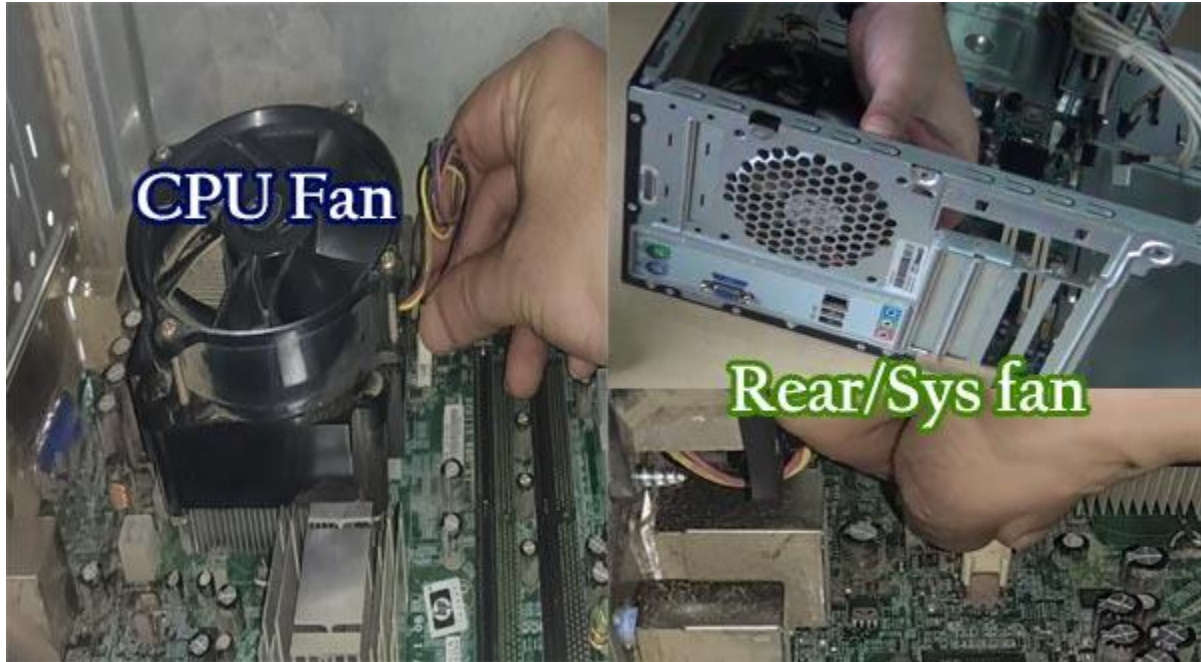


Figure 18 Cooling fans

<https://www.amazon.com/Internal-Fans-Cooling-Components/b?ie=UTF8&node=3012290011>

13. Bus cable connection:

Amazingly, bus cable or data cable connections are prime connections. Bus cable helps to share information or data between the storage device and motherboard.

14. Power Cable connection:

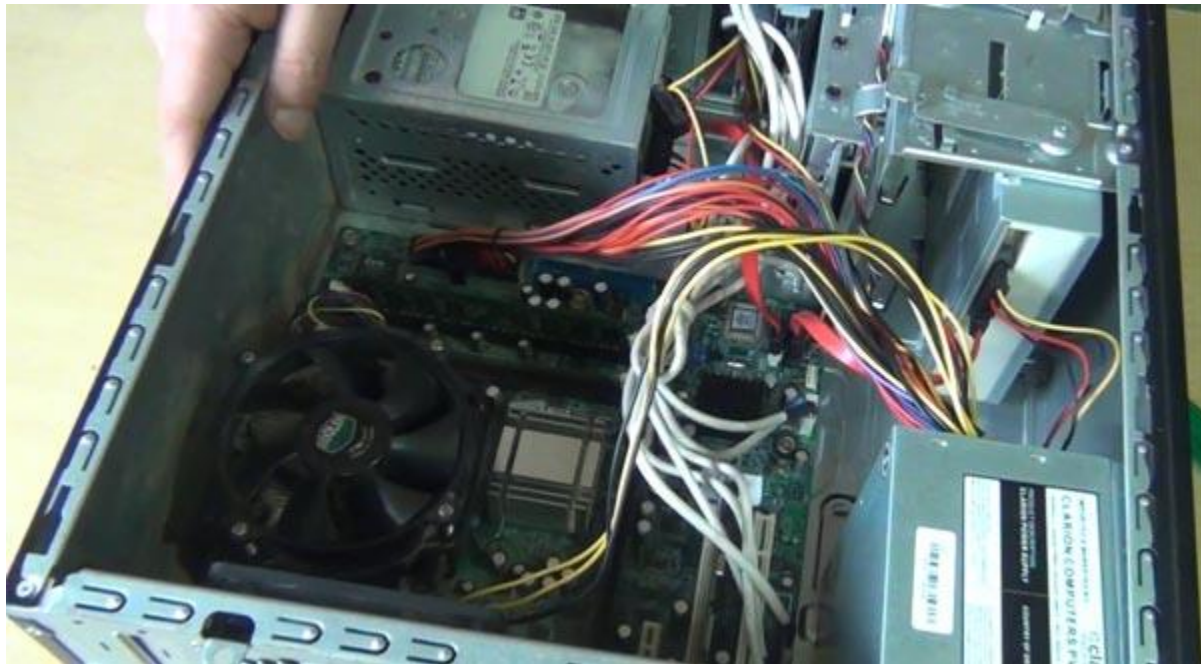


Figure 19 Cable connection

<https://www.educba.com/types-of-computer-cables/>

15. Front Panel connector connection:

Use your motherboard user manual and find the description of front-panel connectors.

First, attach each of the tiny leads from the power and reset switches. After that, the hard-disk activity lights, the PC speaker, and any front-panel USB to the corresponding pin on your motherboard.

Part2: How to assemble PC.

This one is the final part of assembling a computer system.

1. Check your keyboard connector port. If it is a USB connector, then connect your keyboard into the proper USB port. And if it is a PS/2 connector, then connect to the correct, PS/2 port.
 2. Same steps you need to follow to connect your mouse into the proper port.
 3. You require a VGA (Video Graphic Array) cable to connect the monitor and CPU. Find the 15 pins male connector on the backside of the CPU cabinet and your monitor. Use the VGA cable to connect the CPU cabinet and the monitor. Finally, you need to tighten the lock screws.
 4. If you have a speaker, you can connect the speaker on the backside of your CPU cabinet. To get sound from the speaker, you need to plug the speaker's cable with the Aux port.
 5. And if you have a printer, you can connect the printer on the backside of your CPU cabinet.
- These days, you can connect your speaker BUS cable on the USB port.

Finally, connects power to the various parts of your computer. You have to connect the power cable with the CPU case, monitor, speaker, and printer.

Check your PC Set-Up:

It is time to turn on your system and check your PC set up. Make sure the keyboard, mouse, and monitor are all plugged into the appropriate ports on the back of the PC. Plug the power cord back in, and turn the machine on.

Most Common Computer Problems Needing Troubleshooting

Although most complex computer issues at work can often be solved by the business IT support team, there are many other small, but common, issues that occur on a regular basis on a personal computer. The good news is that many problems with computers have simple solutions, and learning to recognize a problem and fix it yourself will save you a lot of time and money. The following are the top 10(ten) common computer problems that you shouldn't panic over.

1. The Computer Won't Start

A computer that suddenly shuts off or has difficulty starting up could have a failing power supply. Check that the computer is plugged into the power point properly and, if that doesn't work, test the power point with another working device to confirm whether or not there is adequate power.

2. The Screen is Blank

If the computer is on but the screen is blank, there may be an issue with the connection between the computer and the screen. First, check to see if the monitor is plugged into a power point and that the connection between the monitor and computer hard drive is secure. If the problem is on a laptop, then you may need to get a professional to fix it as some of the internal wires may be worn.

3. Abnormally Functioning Operating System or Software

If the operating system or other software is either unresponsive or is acting up, then try restarting your computer and run a virus scan. To avoid having this happen, install reliable anti-virus software.

4. Windows Will not Boot

If you are having troubles booting Windows, then you may have to reinstall it with the Windows recovery disk.

5. The Screen is Frozen

When your computer freezes, you may have no other option than to reboot and risk losing any unsaved work. Freezes can be a *sign of insufficient ram, registry conflicts, corrupt or missing files, or spyware*. Press and hold the power button until the computer turns off, then restart it and get to work cleaning up the system so that it doesn't freeze again.

6. Computer is Slow

If your computer is slower than normal, you can often fix the problem simply by cleaning the hard disk of unwanted files. You can also *install a firewall, anti-virus and anti-spyware tools, and schedule regular registry scans*. External hard drives are great storage solutions for overtaxed CPU's and will help your computer run faster.

7. Strange Noises

A lot of noise coming from your computer is generally a sign of either hardware malfunction or a

noisy fan. Hard drives often make noise just before they fail, so you may want to back up information just in case, and fans are very easy to replace.

8. Slow Internet

To improve your Internet browser performance, you need to clear cookies and Internet temporary files frequently. In the Windows search bar, type ‘%temp%’ and hit enter to open the temporary files folder.

9. Overheating

If a computer case lacks a sufficient cooling system, then the computer’s components may start to generate excess heat during operation. To avoid your computer burning itself out, turn it off and let it rest if it is getting hot. Additionally, you can check the fan to make sure it’s working properly.

10. Dropped Internet Connections

Dropped Internet connections can be very frustrating. Often the problem is simple and may be caused by a bad cable or phone line, which is easy to fix. More serious problems include viruses, a bad network card or modem, or a problem with the driver.

Trouble Shooting Process

Performing trouble shooting process involve a six-step troubleshooting methodology. The first step in their methodology is to identify the problem. Step two is to establish a theory of probable cause. The third step is to test that theory of probable cause. Step four is to develop an action plan and implement that plan. The fifth step is to verify complete system functionality. And step six is to document the process. In the section below, each of these steps is covered in more detail. The six steps of troubleshooting.

1. Identify the problem.

The first thing that you need to be aware of when troubleshooting a problem is that the symptoms are not the problem. When troubleshooting, it is critical that you actually identify the underlying problem—what’s actually causing the symptoms to manifest themselves. To do that, you should question the user. Ask detailed questions about when the symptoms occurred and why they may have occurred. If the user can re-create the issue for you, this can be extremely helpful. Determine what, if anything, has changed, which may have caused the problem. Importantly, before you take any action, make a backup copy of the system, so that you can preserve everything as it is.

Highlights:

- Question the user.
- Remember that the symptoms are not the underlying problem.
- Determine what has changed.
- Make a backup of the system before moving on.

2. Establish a theory of probable cause.

Once you have identified the base problem that is causing the symptoms, you will establish a list of probable causes. Once you have a list of all of the probable causes, use your technical

knowledge to prioritize that list. Your list should have the probable causes listed from most likely to least likely. Incidentally, be sure to question the obvious. For instance, if the symptom is a power situation at the workstation, is the power cord plugged in and, if it is plugged in, is the outlet actually getting power? Additionally, if no probable cause can be determined, you will need to escalate the problem to a higher level.

Highlights:

- Make a list of probable causes.
- Using your knowledge, prioritize the list.
- Question the obvious (i.e., if the symptom is a power issue at the workstation, first check to make sure that the power cord is plugged in).
- Escalate to a higher level if a probable cause cannot be determined.

3. Test probable cause theory to determine actual cause.

Once you have established your theory of probable cause, you should take a moment to consider whether or not you can troubleshoot the issue on your own, or if escalating it to a higher authority is called for. If it falls within your capabilities, you will need to test your theory to determine if it is, indeed, the actual cause. Your theory was created from the most likely probable cause, so you need to determine how best to test it. If your theory is confirmed, you will move on to the next step. If the theory is disproved, you will need to go back to step two or step one, as needed, and work your way through the troubleshooting methodology.

Highlights:

- Create your theory from the most likely probable cause.
- If the theory is confirmed, move on to the next step.
- If the theory is not confirmed, go back to step two or step one (if needed).

4. Establish an action plan and execute the plan.

Once you have determined the actual cause by testing your probable cause, you will need to establish an action plan and then execute that plan. Simple problems will probably only need simple plans. However, if it is a complex problem, you may need to write out the plan so that you can be sure to execute it correctly. This is another opportunity to escalate the problem to a more senior level if necessary.

Highlights:

- Simple problems probably just need simple plans.
- Complex problems may need written out action plans.
- Escalate to a higher level if required.

5. Verify full system functionality.

After you have executed your plan, you will need to verify that the system is fully functional. If everything works—that's great. Based on your findings and the issue, you may find that you have the opportunity to implement preventative measures so that the problem does not occur again. If full system functionality has not occurred, you will need to go back to step one and continue to work through the troubleshooting methodology.

Highlights:

- If everything works, great! If applicable, use your findings to implement preventative measures.
- If not everything works, go back to step one.

6. Document the process.

Once everything is fully functional, documenting the process becomes important. This is where you document findings, actions, and outcomes. When the problem occurs again, there will be information available to walk someone through the means of troubleshooting and resolving the issue.

This documentation also captures a history of equipment and users so that perpetual issues become known and recorded. An important aspect of this is that both positive and negative outcomes should be documented. This can save time during future troubleshooting and prevent others from taking the same missteps you may have taken.

Highlights:

- Capture your findings, actions, and outcomes.
- Issues that need to be troubleshot may occur again.
- Documentation provides a history of equipment and users so that problem issues are known.

The importance of having a methodology.

A methodology gives a systematic approach to solving IT problems. It reduces wasted time and frustration for both the technician and the end user.

Six-step troubleshooting methodology.

Identify the problem; establish theory of probable cause; test the theory; establish a plan of action and implement it; verify system functionality; and document everything.

3.2.1.4 Learning Activities

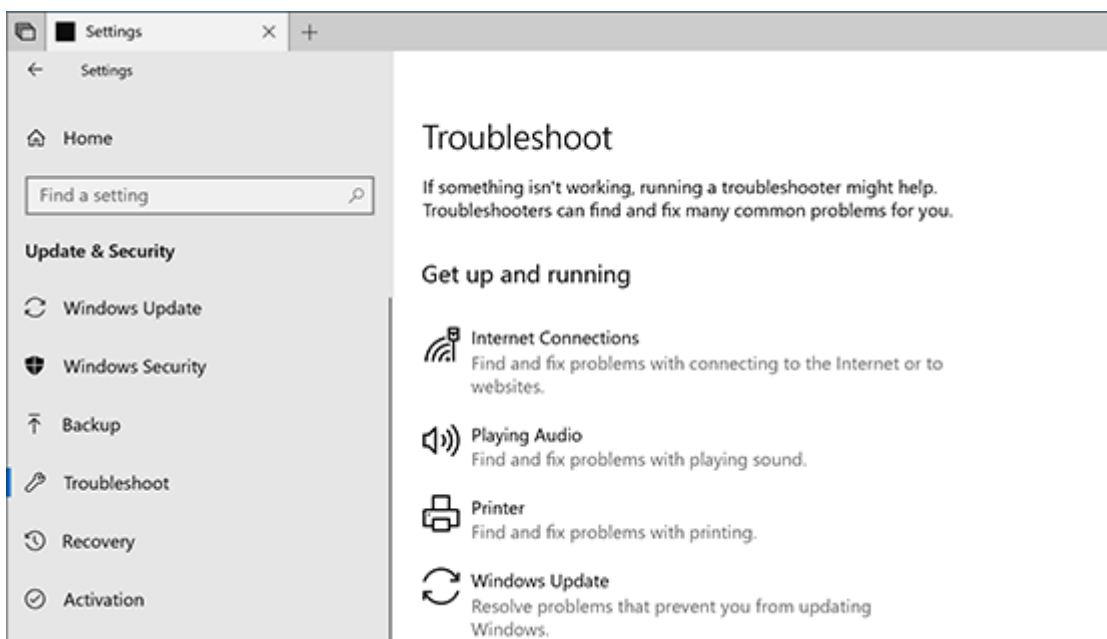
Practical Activity

The learner needs to undertake both assemble and disassemble of a computer. Therefore, below is a list of activities to help you to assemble and disassemble a computer system.

- Unplugged the AC power supply to the PC from the wall socket.
- Remove the Cover or chassis or case.
- Remove Adapter Cards if any.
- Now Remove the processor and the heatsink and fan.
- Remove hard disk and CD/ DVD drives
- Next, remove the Memory Modules.
- Remove the Power Supply (SMPS)
- Finally, Remove the Motherboard

The learner needs to run a troubleshooter of a Computer Windows. As such, a list of activities to help solve problems with a Computer is as follows:

1. Select **Start > Settings > Update & Security > Troubleshoot** or select the **Find troubleshooters** shortcut at the end of this topic.



<https://edu.gcfglobal.org/en/windowsbasics/troubleshooting-basic-problems/1/>

2. Select the type of troubleshooting you want to do, then select *Run the troubleshooter*.
3. Allow the troubleshooter to run and then answer any questions on the screen. If you see a message that no changes or updates were necessary, you can try recovery options, or find out more about Outlook error codes and upgrade and installation error codes.

3.2.1.5 Self-Assessment

1. What are the three (3) components of a computer system?
2. Why magnetic screwdrivers are not preferred in troubleshooting and repair maintenances of PC systems?
3. What does tweezers used for?
4. Which is the proper procedure of removing the hard drive of a computer system?
5. What are the steps to properly assemble the front panel cables of the CPU?

3.2.1.6 Tools, Equipment, Supplies and Materials

Screwdrivers

Nut drivers

Chemicals (such as contact cleaners), component freeze sprays, and compressed air for cleaning the system

Foam swabs, or lint-free cotton swabs if foam isn't available

Small nylon wire ties for “dressing” or organizing wires.

3.2.1.7 References

Christenson, P. (2018). *PCI Definition*. <https://techterms.com>

Computer Basics: Basic Parts of a Computer. (2020).
<https://edu.gcfglobal.org/en/computerbasics/basic-parts-of-a-computer/1/>
<https://www.youtube.com/watch?v=MGqJa20Lqwc>
<https://www.youtube.com/watch?v=ctAVC2JwEwI>

3.2.1.8 Model answers to self-assessment

1. While hardware and software components co-exist to make up the actual computer, the humanware component adds in the human face to bring the complete computer into a functional and productive existence. When installed separately, each may be useful to an extent but incapable of achieving complete computing potential. Hardware and software need the human factor in order to make input and connectivity possible.
2. Magnet's not strong enough to do much real damage, but if you want to be safe, keep the magnetic bits away from exposed circuitry as they may harm your hard drives.
3. Tweezers are small tools used for picking up objects too small to be easily handled with the human fingers. The tool is most likely derived from tongs, pincers, or scissors-like pliers used to grab or hold hot objects.

4.

Step 1: Take Out the Battery. ...

Step 2: Remove the Screws of the Main Access Panel. ...

Step 3: Remove the Drive Mount. ...

Step 4: Pull Out the Drive from the Connectors. ...

Step 5: Take it out from the Bracket.

Desktop web link: <https://www.youtube.com/watch?v=9xofddy0jQE>

3.2.2 Learning Outcome 2: Disassemble faulty components.

3.2.2.1 Introduction to the learning outcome

This unit covers competencies required to perform disassembling faulty components. It include Tools for disassembling, Procedures and techniques for disassembling and Repair or replace and reassemble components

3.2.2.2 Performance Standard

3.2.2.2.1 Tools for disassembling are assembled.

3.2.2.2.2 Faulty components are disassembled.

3.2.2.2.3 Disassembling is performed according to provide instruction manuals.

3.2.2.2.1 Information sheet

Diagnostic tools: They are tools used to test and diagnose components.

Flat-head screwdriver: Used to tighten or loosen slotted screws.

Phillips-head screwdriver: Used to tighten or loosen cross-headed screws.

Torx screwdriver: Used to tighten or loosen screws that have a star-like depression on the top, a feature that is mainly found on laptops.

Hex driver: Used to tighten or loosen nuts in the same way that a screwdriver tightens or loosens screws (sometimes called a nut driver).

Needle-nose pliers: Used to hold small parts.

Wire cutters: Used to strip and cut wires.

Tweezers: Used to manipulate small parts.

Part retriever: Used to retrieve parts from locations that are too small for your hand to fit.

Flashlight: Used to light up areas that you cannot see well.

Wire stripper: A wire stripper is used to remove the insulation from wire so that it can be twisted to other wires or crimped to connectors to make a cable.

Crimper: Used to attach connectors to wires.

Punch-down tool: Used to terminate wire into termination blocks. Some cable connectors must be connected to cables using a punch down tool.

Significance of Disassembling a Computer System

When disassembling a computer the following consideration is useful:

Do not remove the motherboard battery or the configuration information in CMOS will be lost.

Use proper grounding procedures to prevent ESD damage.

Keep paper and pen nearby for note taking and diagramming. Even if you have taken computers apart for years, you might find something unique or different inside.

Have ample work space.

When removing adapters, do not stack the adapters on top of one another.

If possible, place removed adapters inside a special ESD protective bag.

Handle each adapter or motherboard on the side edges. Avoid touching the gold contacts on the bottom of adapters. Sweat, oil, and dirt cause problems.

Hard disk drives require careful handling. A very small jolt can cause damage to stored data.

You can remove a power supply, but do not disassemble a CRT-style monitor or power supply

Using tools properly helps prevent accidents and damage to equipment and people. This section describes and covers the proper use of a variety of hardware, software, and organizational tools specific to working with computers and peripherals.

Hardware Tools

For every job there is the right tool. Make sure that you are familiar with the correct use of each tool and that the correct tool is used for the current task. Skilled use of tools and software makes the job less difficult and ensures that tasks are performed properly and safely.

A toolkit should contain all the tools necessary to complete hardware repairs. As you gain experience, you learn which tools to have available for different types of jobs. Hardware tools are grouped into four categories:

- ESD tools
- Hand tools
- Cleaning tools
- Diagnostic tools

The figure below shows some common tools used in computer repair.



Figure 20 Computer Tools

<https://www.electronicshub.org/electronics-repair-tool-kit-beginners/>

ESD Tools

There are two ESD tools: the antistatic wrist strap and the *antistatic mat*. The antistatic wrist strap protects computer equipment when grounded to a computer chassis. The antistatic mat protects computer equipment by preventing static electricity from accumulating on the hardware or on the technician.

Hand Tools

Most tools used in the computer assembly process are small *hand tools*. They are available individually or as part of a computer repair toolkit. Toolkits range widely in size, quality, and price.

Cleaning Tools

Having the appropriate *cleaning tools* is essential when maintaining and repairing computers. Using the appropriate cleaning tools helps ensure that computer components are not damaged during cleaning. Cleaning tools include the following:

- **Soft cloth:** Used to clean different computer components without scratching or leaving debris.
- **Compressed air:** Used to blow away dust and debris from different computer parts without touching the components.
- **Cable ties:** Used to bundle cables neatly inside and outside of a computer.
- **Parts organizer:** Used to hold screws, jumpers, fasteners, and other small parts and prevents them from getting mixed together.

Diagnostic Tools

Diagnostic tools include the following:

- A *digital multimeter*, as shown below, is a device that can take many types of measurements. It tests the integrity of circuits and the quality of electricity in computer components. A digital multimeter displays the information on an LCD or LED.



Figure 21 Multimeter

A *loopback adapter*, also called a loopback plug, tests the basic functionality of computer ports. The adapter is specific to the port that you want to test.

- The *toner probe*, is a two-part tool. The toner part is connected to a cable at one end using specific adapters, such as an RJ-45, coaxial, or metal clips. The toner generates a tone that travels the length of the cable. The probe part traces the cable. When the probe is in near proximity to the cable to which the toner is attached, the tone can be heard through a speaker in the probe.



Figure 22 Toner Probe

Although an *external hard drive enclosure* is not a diagnostic tool, it is often used when diagnosing and repairing computers. The customer hard drive is placed into the external enclosure for inspection, diagnosis, and repair using a known-working computer. Backups can also be recorded to a drive in an external enclosure to prevent data corruption during a computer repair.

Software Tools

Like hardware tools, there are a variety of software tools that can be used to help technicians pinpoint and troubleshoot problems. Many of these tools are free and several come with the Windows operating system.

Disk Management Tools

Software tools help diagnose computer and network problems and determine which computer device is not functioning correctly. A technician must be able to use a range of software tools to diagnose problems, maintain hardware, and protect the data stored on a computer.

You must be able to identify which software to use in different situations. *Disk management tools* help detect and correct disk errors, prepare a disk for data storage, and remove unwanted files.

Personal Reference Tools

They include troubleshooting guides, manufacturer manuals, quick reference guides, and repair journals. A technician keeps a journal of upgrades and repairs. The documentation in the journal includes descriptions of the problem, possible solutions that have been attempted, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. This documentation is valuable when you encounter similar situations in the future.

- **Notes:** Make notes as you go through the troubleshooting and repair process. Refer to these notes to avoid repeating previous steps and to determine what steps to take next.
- **Journal:** Document the upgrades and repairs that you perform. Include descriptions of the problem, possible solutions that have been tried to correct the problem, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. Your journal, along with your notes, can be valuable when you encounter similar situations in the future.
- **History of repairs:** Make a detailed list of problems and repairs, including the date, replacement parts, and customer information. The history allows a technician to determine what work has been performed on a specific computer in the past.

Faulty Components in a Computer Component

Hard drives have a built in S.M.A.R.T. (Self-Monitoring, Analysis, and Reporting Technology) feature. The idea is that the hard drive monitors itself and will notice if it starts to fail, providing you with some advance notice before the drive fails completely. This isn't perfect, so your hard drive may fail even if SMART says everything is okay.

If you see any sort of "SMART error" message, your hard drive is failing. You can use SMART analysis tools to view the SMART health status information your hard drives are reporting

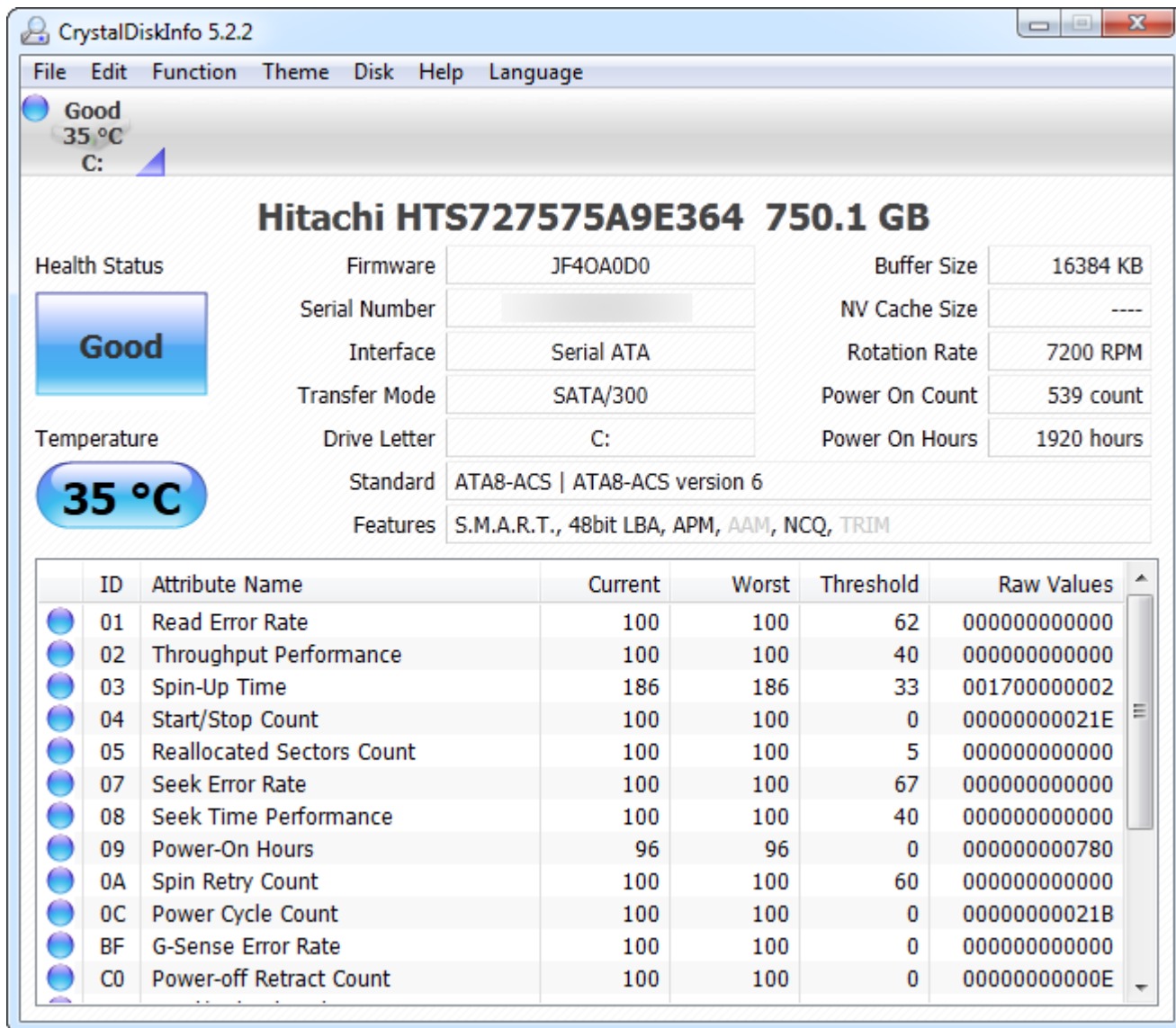


Figure 23

Web source: <https://www.pcmag.com/how-to/how-to-check-your-hard-drives-health>

Test the RAM

RAM failure can result in a variety of problems. If the computer writes data to RAM and the RAM returns different data because it's malfunctioning, you may see application crashes, blue screens, and file system corruption.

To test your memory and see if it's working properly, use Windows' built-in Memory Diagnostic tool. The Memory Diagnostic tool will write data to every sector of your RAM and read it back afterwards, ensuring that all your RAM is working properly.



Figure 24

Web source: <https://www.howtogeek.com/260813/how-to-test-your-computers-ram-for-problems/>

Check Heat Levels

How hot is it inside your computer? Overheating can result in blue screens, crashes, and abrupt shut downs. Your computer may be overheating because you're in a very hot location, it's ventilated poorly, a fan has stopped inside your computer, or it's full of dust.

Your computer monitors its own internal temperatures and you can access this information. It's generally available in your computer's BIOS, but you can also view it with system information utilities such as SpeedFan or Speccy. Check your computer's recommended temperature level and ensure it's within the appropriate range.

If your computer is overheating, you may see problems only when you're doing something demanding, such as playing a game that stresses your CPU and graphics card. Be sure to keep an eye on how hot your computer gets when it performs these demanding tasks, not only when it's idle.

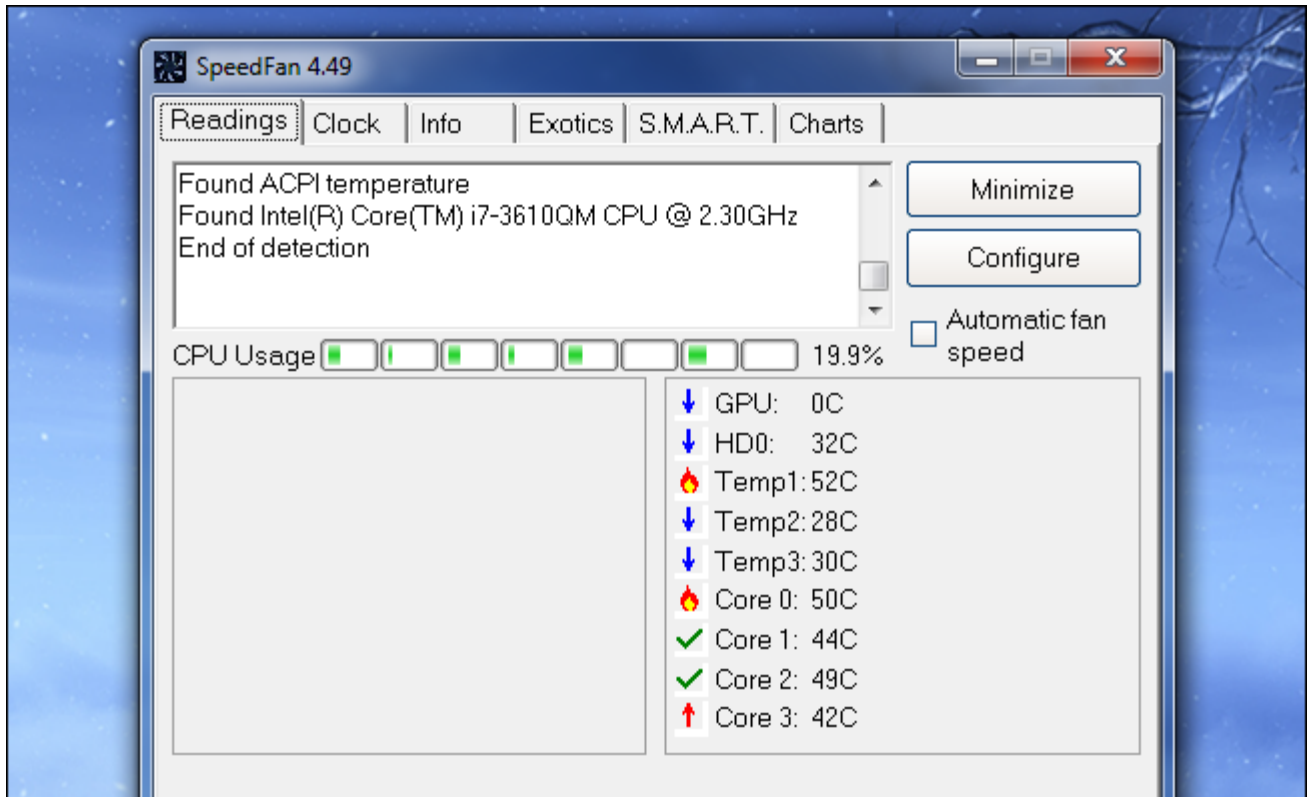


Figure 25

Web source: <https://www.howtogeek.com/260813/how-to-test-your-computers-ram-for-problems/>

Stress Test the CPU

You can use a utility like Prime95 to stress test your CPU. Such a utility will force your computer's CPU to perform calculations without allowing it to rest, working it hard and generating heat. If your CPU is becoming too hot, you'll start to see errors or system crashes. Overclockers use Prime95 to stress test their overclock settings — if Prime95 experiences errors, they throttle back on their overclocks to ensure the CPU runs cooler and more stable. It's a good way to check if your CPU is stable under load.

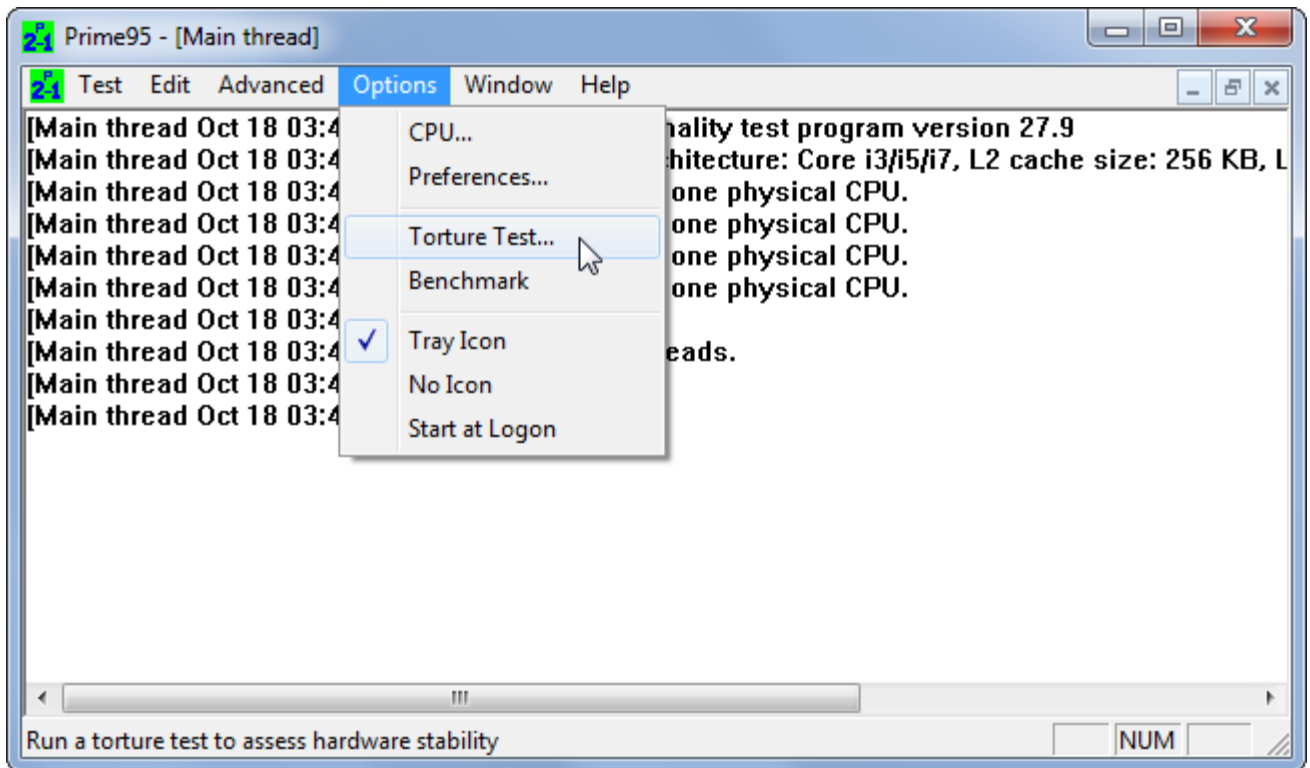


Figure 26

Web source: <https://www.howtogeek.com/260813/how-to-test-your-computers-ram-for-problems/>

Stress Test the Graphics Card

Your graphics card can also be stress tested. For example, if your graphics driver crashes while playing games, the games themselves crash, or you see odd graphical corruption, you can run a graphics benchmark utility like 3DMark. The benchmark will stress your graphics card and, if it's overheating or failing under load, you'll see graphical problems, crashes, or blue screens while running the benchmark.

If the benchmark seems to work fine but you have issues playing a certain game, it may just be a problem with that game.



Figure 27

Web source: <https://www.howtogeek.com/260813/how-to-test-your-computers-ram-for-problems/>

Swap it Out

Not every hardware problem is easy to diagnose. If you have a bad motherboard or power supply, their problems may only manifest through occasional odd issues with other components. It's hard to tell if these components are causing problems unless you replace them completely.

Ultimately, the best way to determine whether a component is faulty is to swap it out. For example, if you think your graphics card may be causing your computer to blue screen, pull the graphics card out of your computer and swap in a new graphics card. If everything is working well, it's likely that your previous graphics card was bad.

This isn't easy for people who don't have boxes of components sitting around, but it's the ideal way to troubleshoot. Troubleshooting is all about trial and error, and swapping components out allows you to pin down which component is actually causing the problem through a process of elimination.

Procedures and Techniques for Disassembling a Repair/Replace a Computer System

The following are techniques and procedural steps for disassembling and repair of a computer system;

Step 1: Unplugging



Figure 28

web source: <https://edu.gcfglobal.org/en/computerbasics/setting-up-a-computer/1/>

The first thing you do, is unplug every cable that's plugged in to your computer. That includes the following cables:

- Power
- USB
- Firewire
- Mouse
- Keyboard
- Internet
- Ethernet
- Modem
- AM\FM Antenna
- Cable TV

etc...

So pretty much just unplug every cable from your computer.

Step 2: Outer Shell/Casing



Figure 29

Web source: <https://edu.gcfglobal.org/en/computerbasics/setting-up-a-computer/1/>

Now that your computer is fully unplugged, move your PC to a clean work space, preferably a carpet. The carpet is better than tile, because screws and other small parts will roll around.

If you are working on a carpet, about every five minutes touch something that is grounded (Sink faucet\pipe, wire coming from the ground part of a wall outlet). This is so you don't shock your motherboard or other parts.

First off, unscrew the four screws on the back of the computer. On most computer cases, there will be large knobs that you can unscrew by hand or by screw driver on the back-right side of the computer. The left side has small screws because on that side you can't access much on the inside.

Once the screws are removed, you can remove the side panels. On most computers, they just slide off. Start with the left side panel (the side that once had the knobs), slide it towards the back of the computer. Now you can remove the left panel. Just like the other one, slide it towards the back of the computer

Step 3: Outer Shell/Casing (cont.)



Figure 30

Removing both side of the panels

<https://content.instructables.com/ORIG/FJA/0KCK/FTY4BQAJ/FJA0KCKFTY4BQAJ.jpg?auto=webp&frame=1&width=1024&height=1024&fit=bounds&md=2960401d4ba88227e6782a75e68cde32>

In the last step I removed both side panels. In this step, I will be removing the front and top panels.

Just like the side panels, the top panel slides off. Also like the side panels, the top one slides toward the back of the computer. The front panel clips on to the metal frame with four tabs, so you must push them in and slide the whole panel forward.

Step 4: System Fan

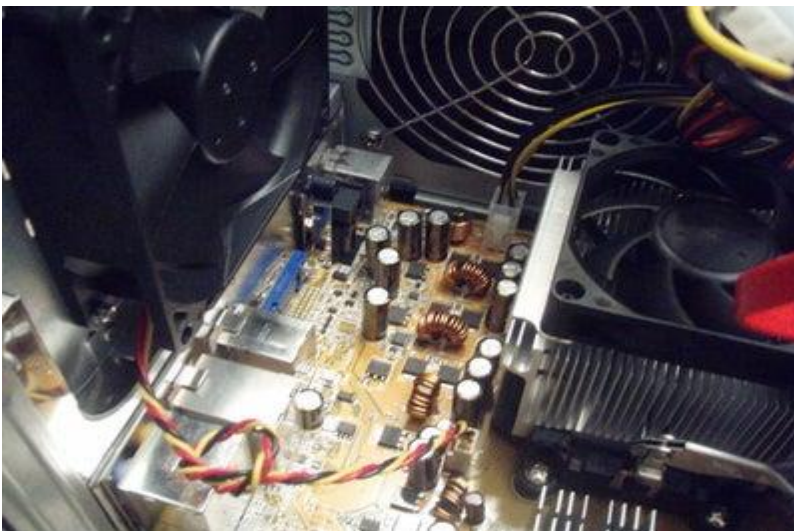


Figure 31

Web source: <https://www.amazon.com/Computer-Case-Fans/b?ie=UTF8&node=11036291>

Figure 16.1: Internal Components

Now that the case is off, I will begin to remove the internal components.

Most computers have two fans: the system fan, the one blowing air into the computer, and the CPU fan, the one blowing air onto the CPU heat sink. I will start by removing the system fan first. It is located at the back side of the computer, the side with all the component plugins.

First, unplug the fan from the motherboard. You can find the plug by following the wire from the fan. It should be labeled "SYS_FAN1". Next, you will have to unscrew the fan from the outside. You should now be able to lift the fan out of the PC.

Step 5: CPU Fan

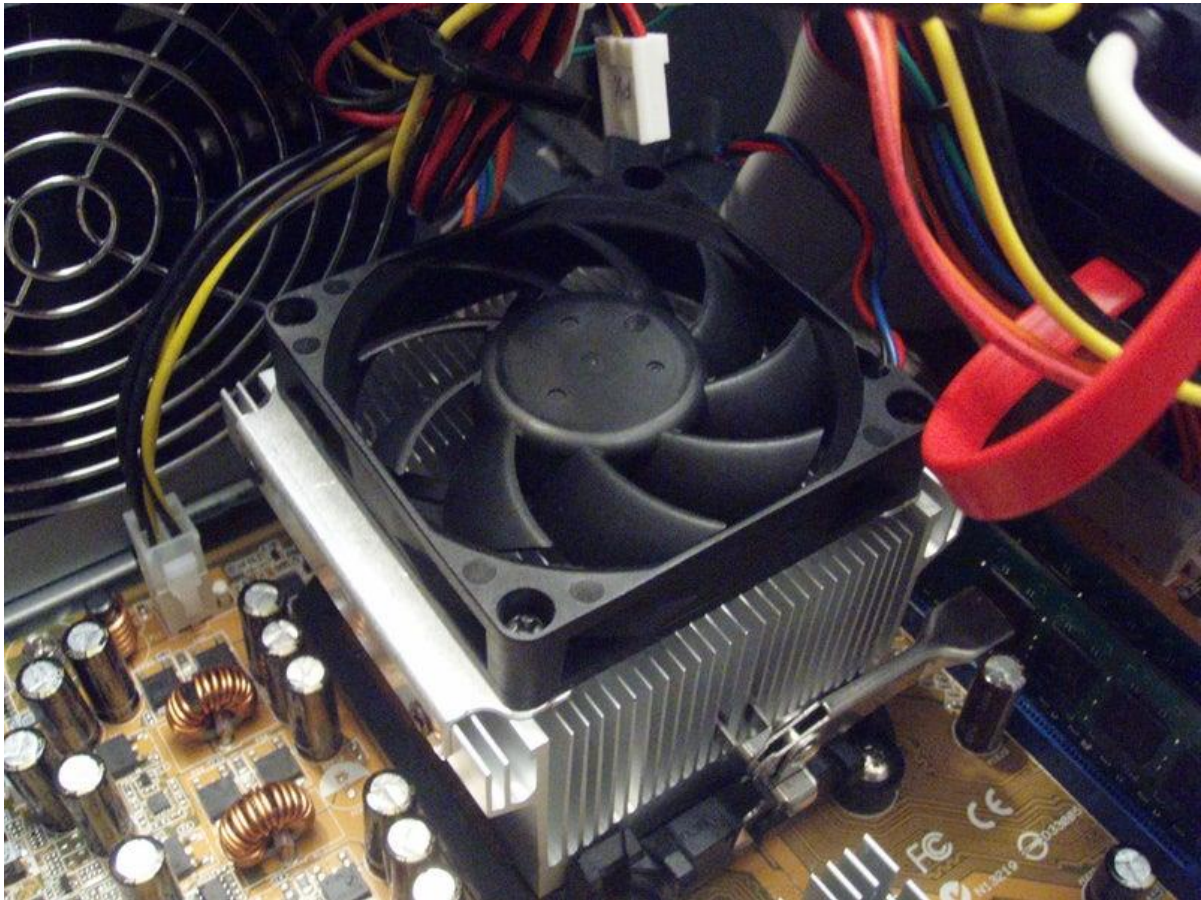


Figure 32

Web source: <https://www.amazon.com/Computer-Case-Fans/b?ie=UTF8&node=11036291>

Figure 17.1 : System fans

Now that the system fan is out, we can remove the CPU fan.

The CPU fan is located right on top of the CPU heat sink, which is a large piece of metal with fins on the top. The CPU fan plugs into the motherboard in an awkward place, that is hard to access. But just follow the wires and you should easily find it. It is labeled "CPU FAN1". To remove the fan from the heat sink, remove the four screws securing it in place.

Step 6: Power Supply



Figure 33 Internal components

Web source: <https://edu.gcfglobal.org/en/computerbasics/inside-a-computer/1/>

Figure 34 Internal components

The power supply manages all the power for the machine.

The power supply is a large metal box located at the upper-back part of the computer. They sometimes come with an on/off switch that is accessible from the back of the computer. The main power cord also plugs into the back of the power supply.

The power supply supplies power to every component in a computer, therefore it has the most wires out of every other component in the computer. The first thing I will do is unplug every

wire coming from the power supply. The list below is everything that I had to disconnect.

- Motherboard (very large connector/plug)
- CD/DVD drive[s] power
- Internal hard drive power
- Portable hard drive slot power

Once everything is unplugged, unscrew the four screws holding the power supply in place, on the back of the computer. Next, push the power supply from the outside, and then lift it out.

7: CD/DVD Drive[s]



Web source: <https://edu.gcfglobal.org/en/computerbasics/inside-a-computer/1/>

Figure 35 CD/DVD Drive[s]

I have one CD/DVD drive, but you might have two. If so, follow this step twice!

The CD/DVD drive is one of the easiest components to remove. First, unplug the ribbon from the back of the drive. Once that is completed, pull on the tab securing the drive in place, and then push it out from the inside.

If nothing as a second drive, there should be a flat piece of metal covering the drive slot. Follow the inscribed instructions to remove it.

Step 8: Card Reader



Figure 36 Card Readers

Web source: https://en.wikipedia.org/wiki/Card_reader

Most new computers have built in card readers, but old computers almost never have them. Just like every other component, unplug the wire first. On my computer, there is just one screw holding the card reader in place. Your computer might have more, so just unscrew them all! After that, the card reader should be removeable. Most card readers have a protective plastic cover on the part that you can see from the external computer, which can be removed by lifting the tabs on the top and bottom. Refer to the pictures.

Step 9: Hard Drive & Portable Hard Drive Slot



Figure 37 Hard Drive & Portable Hard Drive Slot(s)

Web source: https://en.wikipedia.org/wiki/Card_reader

First off, de-attach the connector at the back of the slot, and unplug the other end from the motherboard. Also unplug the SATA cable from the motherboard and the hard drive. The portable hard drive slot is secured the same way the CD/DVD drive is, with a tab. Pull on the tab, then slide the slot out.

To remove the hard drive from the side of the slot, unscrew the four screws securing it in place. You must be very careful to not drop the hard drive, as it is very delicate!

Step 10: Expansion Cards



Figure 38 Expansion cards

Expansion cards are like small upgrades to your computer.

Expansion cards give computer new capabilities, once installed. Different examples are:

- Bluetooth
- Wireless Internet
- Ethernet
- TV

Different computers come stock with different cards. My computer came stock with a TV and Ethernet card. If you only have one, remove that one. If you have two, remove the two!

There should be a single screw on top of each expansion card slot, whether it's occupied, or empty. Remove the screws on the occupied card slots. Once the screws are removed, you should be able to remove the cards by pulling them carefully upward. Some expansion cards have cables leading to other parts of the computer, for example, my TV card is connected to the connectivity center on the front of my computer. You will have to unplug any cables attached to an expansion card.

Step 11: Connectivity Center Cables

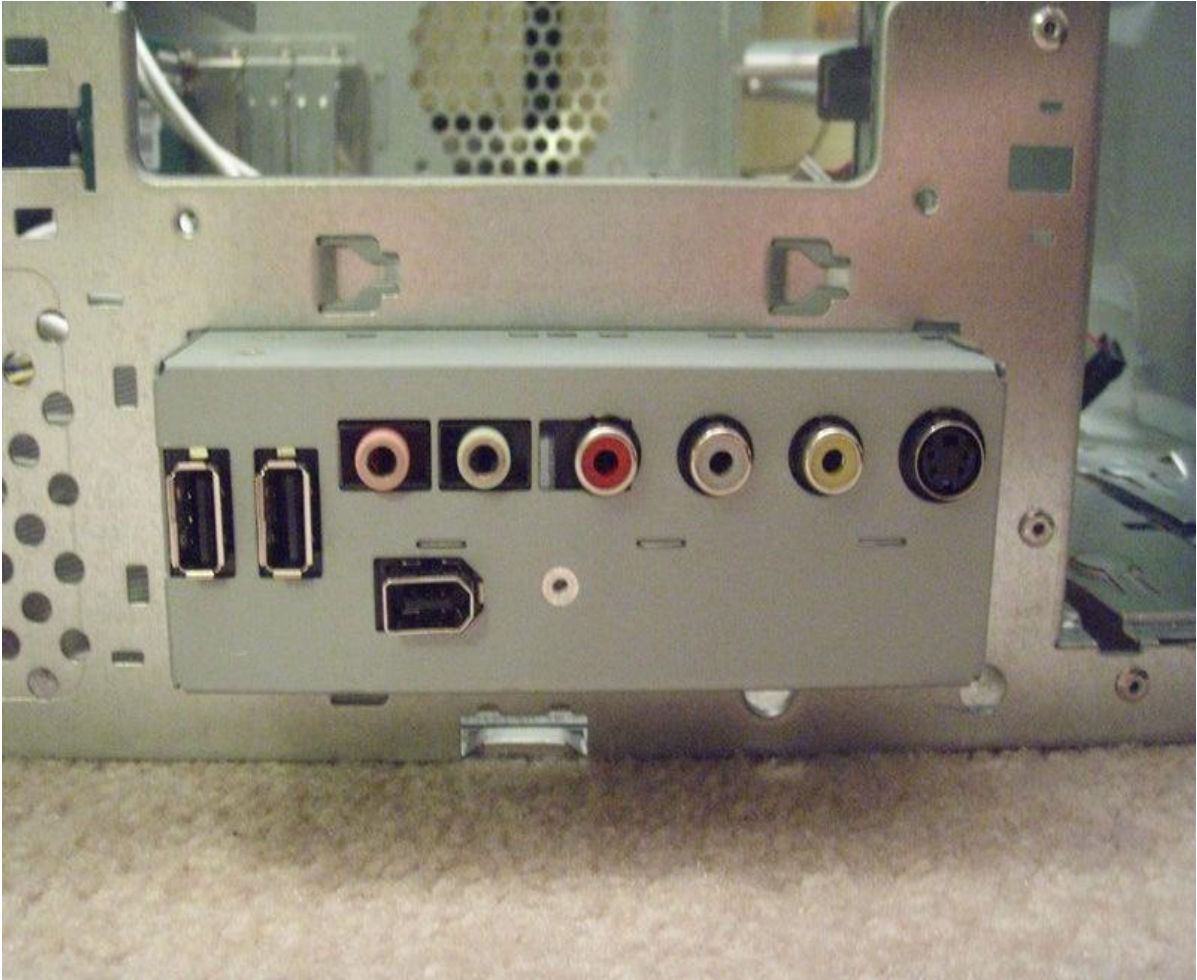


Figure 39 Connectivity Center Cables

Web source: <https://fcit.usf.edu/network/chap4/chap4.htm>

Most new computers have a connectivity center located at the front of the computer.

The connectivity center is the area on the front of the computer where there is many input sections, like usb, firewire, microphone, headphones, video, etc.. I won't remove the whole connectivity center in this step, but I will unplug all the cables coming from it.

Do that (unplug all cables), then unplug the wires leading from the power button, hdd light, and power light.

Step 12: RAM (Random Access Memory)

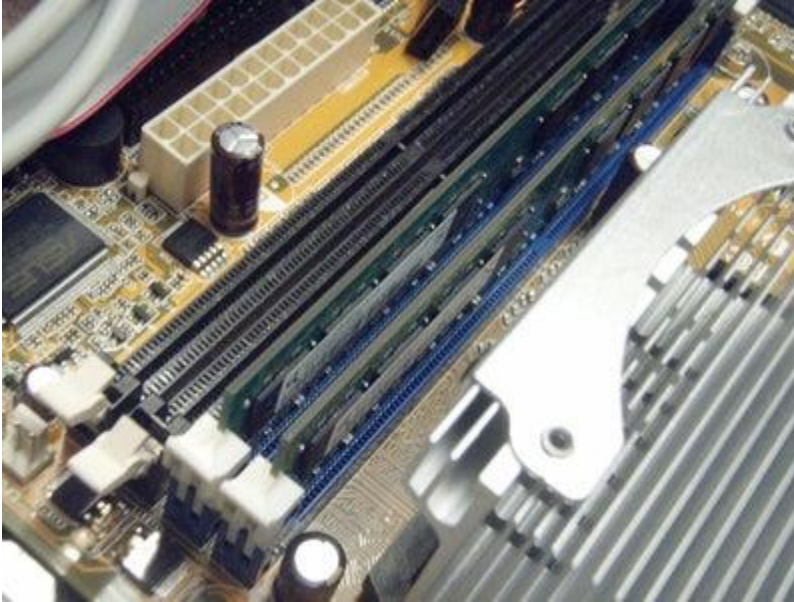


Figure 40 RAM (Random Access Memory)

Web source: <https://www.crucial.com/articles/about-memory/support-what-does-computer-memory-do>

RAM allows for the near instantaneous transfer of information to and from the CPU.

So pretty much, the more RAM you have, the faster your computer runs. Most computers have 4 RAM slots, and two RAM chips. My computer came stock with two, but yours might have more or less. To remove the RAM, push down on both tabs holding the RAM in place, which are located at both ends of the RAM. Please see the pictures.

Step 13: Power Button & Power LED + HDD LED

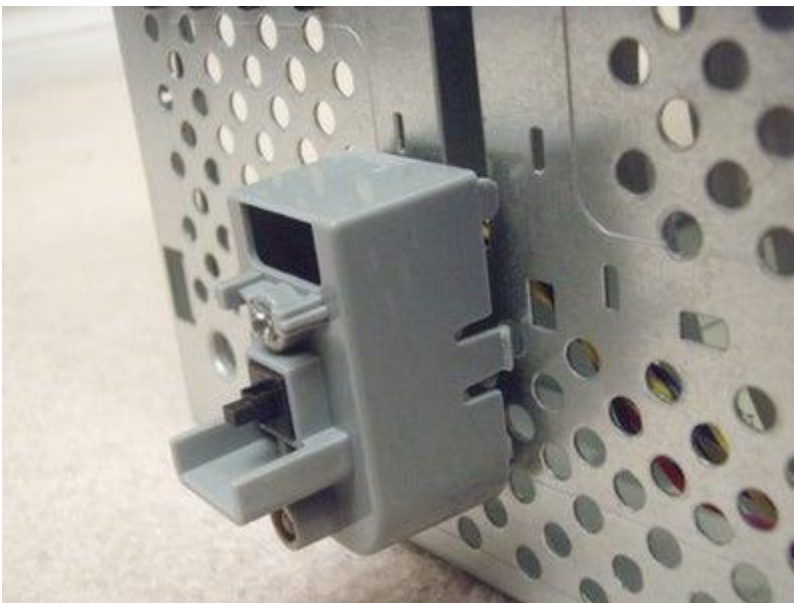


Figure 41 Power Button & Power LED + HDD LED

Web source: <https://www.crucial.com/articles/about-memory/support-what-does-computer-memory-do>

The power button, power LED, and hard drive LED are all within a plastic "chassis".

There is a zip tie holding the wires/cables for the front connectivity center and front power button/LEDs. Cut it.

To remove the chassis, press in on the tabs that are located on the chassis' side. Refer to the pictures to see the tabs. Once the tabs are being pressed in, pull the whole chassis out of the computer.

To remove the LEDs from the "chassis", push them from the front with a screw driver. To remove the button, you will need to push it from the back, the side with the wires. For clarification, see the pictures.

Not all computers may be set up like this, so your computer will probably be different. Just use common sense to find a way!

Step 14: Connectivity Center

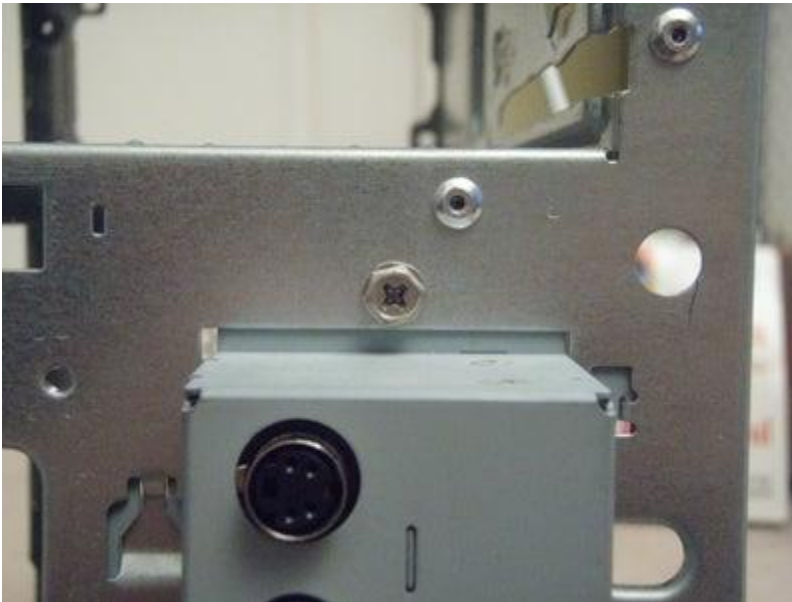


Figure 42 Connectivity Center

Web source: <https://fcit.usf.edu/network/chap4/chap4.htm>

Not every computer has a connectivity center, but most new ones do.

Like I said in step 11, "The connectivity center is the area on the front of the computer where there is many input sections, like usb, firewire, microphone, headphones, video, etc.". But this time, I will remove the whole component, not just unplug the cables\wires!

First thing, unscrew the single screw holding it in place. There might be a different amount of

screws, in different locations on your computer, but just unscrew them all! Once the screw[s] are removed, the whole component should slide into the inside of the computer, which can then be removed.

Just like every other step, refer to the pictures if you are confused!

Step 15: Motherboard



Figure 43 Motherboards

Web source: <https://en.wikipedia.org/wiki/Motherboard>

The motherboard is well, the mother of the computer! It is what links every component in the computer together.

My motherboard is fried, but I will remove it anyway. The motherboard links every component in the computer together. The CPU, RAM, and expansion cards are attached directly to it, and every other part of the computer is in one way or another attached to it.

The motherboard has seven screws holding it to the frame, which are indicated by large white circles around them. Remove those seven, then lift the motherboard out of the frame.

Reassembling Components of a Computer

The reassembling of the computer system is exactly the opposite of disassembling operation. Before starting assembling the computer system, make sure you have the screws and a screwdriver for those.

The first step for assembling the computer system starts with mounting the processor on the processor socket of the motherboard. To mount the process, you don't need to apply any force. The special ZIF (zero insertion force) sockets are usually used to prevent any damage to the processor pins. Once the processor is mounted, the heat sink will be attached on top of the processor. The CPU fan is also attached on top of the heat sink.

Now the motherboard is to be fixed vertically in the tower case and the screws are fixed from behind of the motherboard.

Now line up the power supply at the top back end of the cabinet and screw it. The power connectors for motherboard power supply and CPU fan power supply are to be connected. If the cabinet cooling FAN is required then it is to be screwed at the back end grill of the cabinet and its power connector is to be connected from SMPS.

Install the CD/DVD drives at the top front end of the cabinet and screw it. Install the Hard disk drive and floppy disk drive below CD/DVD drive and screw it. Make sure once screwed there is no vibration in either of the CD/DVD, Hard disk or Floppy disk drives.

Now select the appropriate data cable and connect one end of the cable to its drive socket and another end at its appropriate connector on the motherboard. For SATA hard disk drive or CD/DVD drives use SATA cable and its power cable, else use IDE data cable. Do the proper jumper settings as per the usage requirement.

It is time now to mount the memory modules on the motherboard by aligning the RAM to its socket on the motherboard and press it downward. Make sure the side tab are fixed into the RAM notch. If not, you may still have to press a bit.

Install the internal cards to its socket and attach the cables or power cable to it. The selection of right socket or slot is required as per the type of socket.

Cover the tower by placing it and pressing towards front side and screw it.

Connect the external devices with CPU at its appropriate socket. It includes mouse and keyboard at PS2 or USB connectors. Monitor at the video output socket. Connect the power cable to the back of tower in SMPS. Plug in the power cable to the electric board.

3.2.2.4 Learning activities

Project Work

1. You are provided with the following activities on Disassembling a Computer. In this, you need to explain the practical activities of at least four (4) hardware components listed below.

- 1) CD/DVD Drive
- 2) Motherboard
- 3) Power Supply

- 4) Card Reader
- 5) Expansion Cards
- 6) RAM Chips

Practical Activity

2. You are needed to undertake a physiological computing disassembly and reassembly activities as follows;
 - Shut down the computer system before the commencement of the activities. It is hazardous to perform any such activity with the computer system power on and connected with the power supply. Detach the power cable.
 - Remove all the interfaces of the devices connected with the cabinet (computer system).
 - Perform the task at the dry, non humid area to prevent environmental problem.
 - If you are inexperienced, take a picture of the inside assembly of the cabinet, so that you can attach the right thing at the right place at the time of reassembly.
 - Keep all the screw properly and fix all of them at the appropriate place

3.2.2.5 Self-assessment

Why should you avoid using a magnetic screwdriver in disassembling a computer system?

1. What are some basic tools to carry with you when servicing a computer?
2. .What is the impact of Moore's Law on the various hardware components?
3. What factors should be considered before disassembly and reassembly of a computer?

3.2.2.6 Tools, Equipment, Supplies and Materials

- ✓ Medium flat-tipped screwdriver
- ✓ Screwdriver
- ✓ 1/4-inch nut driver
- ✓ 3/16-inch nut driver
- ✓ Pair of small diagonal cutters
- ✓ Pair of needle-nose pliers
- 33 Screws
- ✓ Drive Slot Cover

✓

3.2.2.7 References

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(2020). from <https://www.tekmoz.com/how-to-disassemble-a-laptop/>

3.2.2.8 Model answers to self-assessment

1. Magnetic screwdriver can cause permanent loss of data on hard drives or floppy disks. Magnetism can also induce currents into components and damage them.
2. **Flat-Tip Screwdrivers:** Flat-tip screwdrivers are flat-headed and used to turn slotted screws. Buy the Taparia Flat Tip Screwdriver or the JK Files Flat Tip Screw Driver.

Philips-Head Screwdrivers: Philips-head screwdrivers are the ones that are used to tighten or loosen screws that are cross-headed.

Torx Screwdrivers and Nut Drivers: Torx Screwdrivers are used to fasten or loosen screws that have star-shaped depression; these screwdriver tips have a firmer grip and do not slip out that easily whilst fastening. Of late, Torx screwdrivers are used to tighten or unscrew almost all laptop fittings.

Nut drivers, which are similar in appearance to a screwdriver, are an essential part of the computer repair toolkit. They are used to fasten bolts and nuts of varied dimensions. They possess a hollow shaft that empowers them with a stronghold of the threaded nut. You could use the Focus Nut Driver or the Wera Werk Nut Driver to fasten or loosen your nuts and bolts quickly. You could also make use of the JE tech Toll Nut Driver which comes with a soft grip to tighten your nuts.

Wire Cutters: Wire cutters are helpful in stripping and cutting wires as per one's need. Grab the Ambika Heavy Duty Wire Rope Cutter to snip your wires.

Needle-Nose Pliers: Needle-nose pliers provide cutting and holding functionalities to the user. They are useful especially in hardware and electronics repair; because of their pointed needle-like tip, they come in handy if a nut or an element has become stuck in an otherwise unreachable cranny of the motherboard.

Wire Strippers: Wire Strippers are pliers that help in stripping the wire off its insulation. A wire is generally coated with a covering of insulating material. If the situation demands, the wire has to be stripped-off of all its insulating covering to use it, say as a connector or a cable. A wire stripper consists of a pair of blades that function as a pair of scissors does.

Crimpers: Crimping tools or crimpers are used to connect wires in such a manner that they are able to transmit data. Two wires are joined together with the help of a crimping tool by deforming either one or both of the wires. Every single one of the wires to be conjoined is first

placed in the connector jack and then squeezed and held together to form a uniformly conducting wire.

3. The trainee should pick one of the components and discuss the impact of the fact that computing doubles in speed every two years. Most devices are getting smaller, faster, cheaper, and this should be indicated in the answer.
4.
 - 1) Shut down the computer system before the commencement of the process. It is hazardous to perform any such activity with the computer system power on and connected with the power supply. Detach the power cable .
 - 2) Remove all the interfaces of the devices connected with the cabinet(computer system).
 - 3) Perform the task at the dry, non humid area to prevent environmental problem.
 - 4) If you are inexperienced, take a picture of the inside assembly of the cabinet, so that you can attach the right thing at the right place at the time of reassembly.
 - 5) Keep all the screw properly and fix all of them at the appropriate place

3.2.3 Learning Outcome 3: Repair/Replace and reassemble components.

3.2.3.1 Introduction to the learning outcome

This unit covers competencies required to perform Determine components to replace or repair, Procedures and Techniques for reassembling, Component testing, and Repair/replace report

3.2.3.2 Performance Standard

3.2.3.2.1 Faulty parts to be repaired or replaced are identified

3.2.3.2.2 Acquisition of new parts is done as per the specifications of the components in the case of replacement and repair is done on faulty components.

3.2.3.2.3 Reassemble the repaired or replaced components.

3.2.3.3 Information Sheet

Operating System - the system software that controls the computer.

S.M.A.R.T. (Self-Monitoring, Analysis, and Reporting Technology) feature. The idea is that the hard drive monitors itself and will notice if it starts to fail, providing you with some advance notice before the drive fails completely.

Shut Down - the command from the Special menu that shuts down the computer safely.

Hardware: refers to the physical components that make up a computer and allow it to operate.

Acquisition of New Computer Parts in Case Of Repair And/or Replacement Of Faulty Components

There are three main options for acquisition of computer hardware are buying, leasing, or renting it. There are advantages and disadvantages that ought to be weighed for each of the decisions, as shown in the table illustration below. Some of the more influential factors to consider in deciding which option is best for a particular installation include initial versus long-term costs, whether the business can afford to tie up capital in computer equipment, and whether the business desires full control of and responsibility for the computer equipment.

	Advantages	Disadvantages
Buying	Cheaper than leasing or renting over the long run Ability to change system Provides tax advantages of accelerated depreciation Full control	Initial cost is high Risk of obsolescence Risk of being stuck if choice was wrong Full responsibility

	Advantages	Disadvantages
Leasing	No capital is tied up No financing is required Leases are lower than rental payments	Company doesn't own the system when lease expires Usually a heavy penalty for terminating the lease Leases are more expensive than buying
Renting	No capital is tied up No financing is required Easy to change systems Maintenance and insurance are usually included	Company doesn't own the computer Cost is very high because vendor assumes the risk (most expensive option)

Buying implies that the business itself will own the equipment. One of the main determinants of whether to buy is the projected life of the system. If the system will be used longer than four to five years (with all other factors held constant), the decision is usually made to buy. Notice in the example in illustration below that the cost of purchase after three years is lower than that of leasing or renting. As systems become smaller, more powerful, and less expensive, and as distributed systems become more popular, more businesses are deciding to purchase equipment.

Leasing, rather than purchasing, computer hardware is another possibility. Leasing equipment from the vendor or a third-party leasing company is more practical when the projected life of the system is less than four years. In addition, if significant change in technology is imminent, leasing is a better choice. Leasing also allows the business to put its money elsewhere, where it can be working for the company rather than be tied up in capital equipment. Over a long period, however, leasing is not an economical way to acquire computer equipment.

Renting computer hardware is the third main option for computer acquisition. One of the main advantages of renting is that none of the company's capital is tied up, and hence no financing is required. Also, renting computer hardware makes it easier to change system hardware. Finally, maintenance and insurance are usually included in rental agreements. Because of the high costs involved and the fact that the company will not own the rented equipment, however, renting should be contemplated only as a short-term move to handle nonrecurring or limited computer needs or technologically volatile times.

Evaluation of Vendor Support for Computer Hardware

Several key areas ought to be evaluated when weighing the support services available to businesses from vendors. Most vendors offer testing of hardware on delivery and a 90-day warranty covering any factory defects, but you must ascertain what else the vendor has to offer. Vendors of comparable quality frequently distinguish themselves from others by the range of support services they offer.

A list of key criteria that ought to be checked when evaluating vendor support is provided in the illustration below. Most of the extra vendor support services listed there are negotiated separately from hardware lease or purchase contracts.

Vendor Services	Specifics Vendors Typically Offer
Hardware Support	Full line of hardware Quality products Warranty
Software Support	Complete software needs Custom programming Warranty
Installation and Training	Commitment to schedule In-house training Technical assistance
Maintenance	Routine maintenance procedures Specified response time in emergencies Equipment loan while repair is being done

Support services include routine and preventive maintenance of hardware, specified response time (within six hours, next working day, etc.) in case of emergency equipment breakdowns, loan of equipment in the event that hardware must be permanently replaced or off-site repair is required, and in-house training or off-site group seminars for users. Peruse the support services documents accompanying the purchase or lease of equipment and remember to involve appropriate legal staff before signing contracts for equipment or services.

Unfortunately, evaluating computer hardware is not as straightforward as simply comparing costs and choosing the least expensive option. Some other eventualities commonly brought up by users and management include

1. the possibility of adding on to the system if the need comes up later;
2. the possibility of interfacing with equipment from other vendors if the system needs to grow;
3. the benefits of buying more memory than is projected as necessary, with the expectation that business will eventually “grow into it”; and
4. The corporate stability of the vendor.

Competition among vendors has made the idea of producing hardware that is compatible with competitors’ hardware important for vendors’ survival. Before becoming convinced that buying cheaper compatibles is the way to endow your system with add-on capability, however, do enough research to feel confident that the original vendor is a stable corporate entity.

Reassembling Of the Repaired or Replaced Computer Components

Computers are still largely designed using the Von Neumann architecture, which describes the use of a central processing unit interacting with a memory unit, to facilitate the processing of data from input sources like external mass storage to output devices like the screen.

Computers usually consist of some relatively similar componentry across designs, although several of the components which traditionally were modular in early computer designs have been absorbed into an integrated central motherboard. These components include the CPU, memory unit (RAM), data storage drive (HDD/SDD), graphics card, sound card, network card, and cooling unit, along with peripherals like the keyboard, speakers, mouse, and screen. Other devices may also work in tandem with the computer, and are also considered hardware, such as a printer, scanner, game controller, or webcam.

For repairing or troubleshooting a computer use the following procedure: Gather together your toolkit: e.g. air blowing machine, screw drivers, software, back up disk etc. q Check for power FIRST, before doing anything else. 10 - 15 percent of all computer Issues/Problems emanate from power surge. Check this BEFORE doing anything else. Check to be sure if the computer is plugged in to an AC outlet properly.

Check your external connections to the computer. Specifically, check the mouse, keyboard, monitor, modem and/or printer cables, making sure that all are secure and in the right sockets. Perform the Power On Self-Test (POST) POST is a set of procedures that a computer runs through each (me it is turned on. It ensures that all of the system's hardware is working properly before trying to load the operating system. If the computer does not pass POST, it will not boot. Note: Make sure the computer turns on. If nothing happens (no lights, no sound, no fans, etc.), the computer has a power related issue.

If the computer is still malfunctioning, go ahead then and open the case. Check to see that all of the cards are fully pressed down into the bus connections, that any socketed chips are fully pressed into their sockets, and that all cable connections are fully attached. Make sure that the drive cables are attached correctly. q Clean any dust or foreign material out of the case while it is open. Dust can cause overheating problems and electrical shorts. Sometimes, insects will nest inside the case as well. All of this needs to be cleaned out before you close up the case. Take precautions to avoid inhaling excess dust, and consider using protective eyewear if necessary. The computer is unable to start up – If the computer does not turn on when you press the power button, the following suggestions may help you to determine why the computer will not start up. q First of all, check if the computer is plugged in to an AC outlet properly. q Plug another electrical device into the outlet to be sure that the outlet is providing adequate power. A surge protector can be used in this case, because voltage surges can be very damaging to computers and other electrical components. Then put on the system to perform a POST. After the POST and it is confirmed that, the computer is producing all of the usual startup sounds and lights, but the monitor is not displaying any information, perhaps there is a problem with the monitor. Make sure that it is connected to a power source, and also that the VGA cable is connected to the computer.

Basic computer Hardware Repairs

Replacing a Power Supply. The power supply failure is a common problem in our country. This is due to an uneven or “poor” voltage and power surges. • Replacing a Hard Drive or formatting and installing Fresh OPERATING SYSTEM.

Replacing RAM. RAM can fail or can loose from its housing and need to be reseated. If a computer needs new or additional RAM, it is important to make sure that the RAM used is compatible with the computer system. RAM is very easily damaged by electrostatic charges, so it is very important for the user to be grounded before picking up RAM. Also RAM should only be handled by the edges.

Peripheral Hardware Use and Maintenance

Peripheral hardware will also last longer if it is well maintained. Peripheral hardware such as printers, scanners will last longer if proper care about heat, dust and power surge control is taking to consideration. Troubleshooting and fixing Printer problems

Let’s assume that your printer’s drivers are up-to-date, q and that it has enough paper and ink or toner to print. q Try turning the printer off and on. q Unplug the printer and plug it back in. Check your printer’s print queue by looking for the printer icon in the system tray and double-clicking it.

The print queue shows you the status of each job as well as the general status of your printer. q makes sure that ‘Use Printer Offline’ isn’t selected.

Ensure that ‘Use Printer Offline’ isn’t checked. Sometimes, printing while your printer is turned off can cause Windows to set your printer to work offline, and that can stall jobs sent later.

Maintaining the Battery for your Computer

Most laptop batteries will last at least four hours when fully charged. If not maintained, however, the battery will require charging more frequently. For maximum performance. Use the battery as your power source un(l the low battery warning emerges. Using your laptop with the AC adapter plugged into an electrical outlet will overcharge the battery. Overcharging decreases the life of the battery. Eventually the battery will be unable to hold a charge and will require a replacement. Condition the battery for maximum performance 1. Discharge the battery – use the battery until the low battery warning emerges. 2. Charge the battery – use the AC adapter until the battery is fully charged. 3. Then immediately disconnect the AC adapter from the notebook. The procedure above insures both maximum performance and long life for the battery

Web link: <https://www.youtube.com/watch?v=AqFY7vJiaac>

3.2.3.4 Learning Activities

Special instructions related to learning activities.

- Practical activities can be performed in the computer lab of the trainee’s institution or a personal computer.

Trainees taking this unit are highly recommended to own a working computer.

- The learner is required to perform the following step by step activities in reassembling of repaired components of a Computer System.

STEP 1

Put the motherboard back into the case and reconnect the sound cable.

Put all screws back into the white arrow holes.

Put the case parts back together. Remember to thread the cables including the antennae cable back through. Make sure no cable is snagged or caught up anywhere.

STEP 2

Put the retaining screws back into the bottom half of the computer. Then put the top screws back in.

STEP 3

Put the screen back in place and reconnect the antennae and the data cable.

Replace the display hinge screws.

STEP 4

Replace the keyboard. First of all put the ribbon cable back in. Remember there is a plastic hinge which holds the ribbon in place; remember to lift this up first (gently).

The ribbon has a darker side and a lighter side. It is the lighter side that faces upward, so there is no twist in the ribbon.

Replace the keyboard retaining screws.

STEP 5

Click the Hinge Cover Plate (HCP) back into place. Use even pressure to ensure it fits properly.

STEP 6

Replace the RAM. Remember it is fed into the slots at 30 degree angles and not straight on.

Once it has been fed at a 30 degree angle, click it downwards into place.

Replace the other components such as the wireless card, again remember it has to be inserted at a 30 degree angle. Click it into place and gently replace the gold connector.

Replace the Hard Disk Drive (HDD) by sliding it in the opposite direction to the arrow. Make sure it fits securely and is not loose.

Insert the CD/DVD drive and put the retaining screw back into the underside of the laptop.

STEP 7

Finally, replace the component covers and replace all of the screws

3.2.3.5 Self-Assessment

1. What is the relationship between hardware and software problem in a computer system?
2. Why is proper and regular maintenance significant for any computer system?
3. What are the basic computer maintenance guidelines which assist in improving hardware and software performance?
4. What is the distinction between hardware repair and software repair?

5. When the screen is blank, the computer may not be set to display the image on the computer screen. What are the two (two) 2 basic tips to troubleshoot and fix/ repairs the computer issue?

3.2.3.6 Tools, Equipment, Supplies and Materials

Medium flat-tipped screwdriver

- Small flat-tipped tweaker screwdriver
- Screwdriver
- 1/4-inch nut driver
- 3/16-inch nut driver
- Pair of small diagonal cutters
- Pair of needle-nose pliers

3.2.3.7 References

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3.2.3.8 Model Answers to Self-Assessment

1. Without software, computer hardware is useless. Conversely, computer software cannot be used without supporting hardware. Similarly, computer software has to first be loaded into the computer's hardware and then executed. There are several categories of software, with the two main categories being operating-system software, which makes the hardware usable, and application software, which does something useful. Examples of operating systems include Microsoft Windows on a personal computer and Google's Android on a mobile phone. An example of application software is Microsoft Excel.
2. Since computers are such an integral part of our lives, it is crucial that we take care of them by having them properly maintained. Here are five great reasons why regular computer maintenance is a good idea.
3. **Early Detection of Issues:** Computers can be temperamental, and we all know that small issues can become huge problems before we know it. But, having regular maintenance check done on your computer can eradicate small issues before they become big problems. Small issues can crop up at any time, even when your computer is new, nipping them in the bud during a regular maintenance session can save you a lot of headaches when the computer starts to age.

Prevention against Viruses and Malware: It seems like no matter how often we sweep our computers or run virus checks on them; our computers are still vulnerable to harmful viruses.

There are innumerable viruses and malware already out there just waiting to infect computers, and more are being created every day. Some are meant to be a daily annoyance and slow down the processing time of the computer or make pop-up messages appear, but others can infect entire operating systems. When this occurs either at home or a business, it can be costly to fix and can even cost a company money in other ways such as loss of productivity. But, keeping computers well-maintained can keep both viruses and malware away and keep your computer running in tip-top shape. Regular maintenance can also help you ensure your antivirus software is up-to-date and working properly.

Speed up Your Computer: Nothing can be more frustrating than a computer that processes too slowly. But, as most of us can attest, over time our computers get clogged up with files and everything gets disorganized and fragmented. The result is slow processing times. Computer maintenance techs are experts at running speed and optimization checks that can pinpoint issues and keep your computer running at an optimal speed.

Maximize your Software Efficiency: Another reason your computer may slow down over time is that your software package is getting old. Since this change happens gradually, your computer simply gets used to it and thinks that it is normal. But, having regularly scheduled maintenance on your computer will clean out any issues and have your software running perfectly again.

Prevent Data Loss: Although data loss is uncommon, if it does happen, it can wreak havoc on your life. When your computer starts running slowly or begins having occasional hiccups, it can require a system reboot that can ultimately result in lost data. However, keeping your computer maintained will lessen the likelihood of these instances and keep your data safe and secure for when you need to access it.

4. These essential maintenance tips for a computer system will see many more years of powerful performance and great appeal.

Protect with padding: Everyone has been there; drops, bumps, and slips result in unsightly cosmetic dings that leave your computer looking less-than-loved. If you're like most people who travel with their PC, safeguarding against accidents can feel next to impossible when packing your PC away into a carry-on. An exposed laptop is vulnerable to all of the elements of travel you likely want to protect it from.

Whether you're traveling business-class or to a classroom across campus, shielding your PC against the elements starts with a protective case. There are a few different styles of protection that offer differing levels of armor and functionality. These include:

Skins: Functioning as a full-body laptop sticker, laptop skins are best for protecting the chassis from light damage and scratches.

Hardshell snap-on covers: Polycarbonate, plastic, or rubberized hard shell laptop covers protect your PC while still granting easy access to ports, buttons, lights, and fans.

Sleeves: A simple, soft, envelope-style pouch typically made of gentle materials like nylon, polyester, suede, or microfiber, laptop sleeves are lightweight protection.

Messenger bag: A shoulder bag specifically designed to accommodate your laptop and necessary peripherals, the dedicated laptop messenger bag offers the most padded protection.

Organize cords: The only thing more frustrating than dealing with long, confusing cables is getting them all mixed up and tangled in the process. Keeping your digital world connected is a must, so nixing the cables isn't a feasible option. Taking the time to declutter and organize the snake-like mass of wires spawning from your power strip and PC ports is a great first step for both desktop and laptop users. Try these wire organization tips:

A rotating power strip: Traditional power strips offer a single line or panel of surge inputs. A rotating power strip gives you the freedom to modify the positioning of your many chargers, monitors, and docks.

Color-coding cables: Computer cables tend to be two colors; black and white. Organizing your mess of wires may be as simple as color coding them with reds, blues, yellows, greens, and or using labels in distinguishable hues.

Cable clips: Wire management is made simple when you attach cable clips to your desk, wall, or floor. These small clips are designed to hold cables of all different sizes.

Organizer panel: Functioning as a panel of cable clips, a wire organizer panel accommodates multiple wires. Stick it in place with an adhesive or keep it desk-side when you use a weighted panel.

Awesome tip: Be sure to keep your wires away from any footpaths. Tripping over wires could result in the toppling of your devices, doing more damage in an instant than years of use could ever do.

Update your operating system: If you're looking for basic computer maintenance, keeping your operating system up to date is one of the easiest solutions. Regardless of whether you're a Windows, Mac, or Linux loyalist, updating your PC when new patches are available ensures your PC stays at the cutting-edge of performance power.

Windows 10 is known for keeping users in-tune with once-a-day update checks. This automated scan occurs in the background and always notifies you if there are any important software or operating system patches that need to be made. The end goal is to optimize your PC performance, so when Windows suggests you update, you should do it.

Awesome tip: Some updates take longer than others. Set aside time before bedtime or during a daytime break to let Windows do its thing without interrupting your workflow.

Unplug to avoid overcharging: With heightened dependence on wireless devices, optimizing battery power is a top priority for many. There are few things more dreadful than a draining battery when you've got hours of work and play left on your day's schedule. However, it's better to resist the temptation of plugging in the moment your PC falls under 50% battery life.

Unnecessary charging can lead to overcharging, which then leads to regenerative capability deterioration. This often looks like a laptop that can't hold a charge as well as it could in its earlier days.

Being shackled to the weight of a charger defeats the purpose of a laptop's wireless portability. To avoid a bad battery fate, unplug your device after it reaches 100% charge, and don't plug in until power is actually low.

Purge your system of junk files and programs: Computers tend to show their age best in the number of unused files living on their hard drives. Useless programs and old junk files likely take up more space than you realize. From old versions of software to retired versions of your resume, your PC is sure to have its fair share of digital debris festering on your desktop or in your start menu. These programs and files can quickly turn into performance hogs if they continue to accumulate.

Before your computer gets to a point where it's begging for more storage space, use these PC purge tips to relieve your system.

- Uninstall trialware
- Run disk cleanup software
- Empty the recycle bin
- Delete temporary files
- Remove cache of offline web pages

Run regular antivirus scans: Malware attacks can sneak up on you at any given moment, and in the event one does, having a savvy antivirus living on your PC will protect you against the damage viruses bring. Weekly antivirus scans ensure your computer is always clear of malicious software infections. A basic scan will examine your computer for any glaring dangers or outstanding activity.

For those who are frequent web-users and download programs and files regularly, consider running a virus scan twice a week. It's always better to err on the side of safety, especially when your personal data could be at risk.

Malware infections can compromise the performance of your computer and expose your confidential information to third-party cybercriminals. Depending on the type of malware installed on your system, a virus could also:

- Slow web browser speeds
- Disrupt network connections
- Freeze or crash your system
- Alter computer settings
- Allow unauthorized access to system resources

By running regular antivirus scans you can rest assured that nothing slips by. Be sure to choose an antivirus scan service that also scans all of your downloads, too.

Clean the keyboard and case: You'd be surprised to see just how much dust and debris lives underneath your keyboard's keys. From food crumbs and dog hairs to dust and dirt, and everything else that can fit in between the keys, a number of dirty particles can clog your keyboard. This usually results in sticky or difficult-to-press buttons.

Clearing out these hard-to-reach parts of your laptop or desktop setup is most easily done with a compressed air canister, available from office supply stores, computer stores, and hardware stores.

For external keyboards: Unplug the keyboard from the USB port or power it off if it's wireless. Tilt the keyboard upside down and shake any loose debris out first. Spray compressed air at an angle and approximately 1-inch away from the keys. Use a damp microfiber cloth to finish the job, removing any excess dust or grime.

For the laptop user: Power your laptop off and unplug any USB or power supply inputs. Tilt the laptop upside down and gently tap it to encourage any loose debris to come out. Set the laptop down in its natural position and spray between keys from about 1-inch away. Spray in short bursts moving from one side of the keyboard to the other.

If you find certain spots tougher to clean than others, use a cotton ball dipped in isopropyl alcohol as a great alternative. Alcohol evaporates more quickly than water which makes it the perfect solution for hardened debris.

Pro-tip: When cleaning your laptop or desktop, absolutely avoid pouring any type of liquid onto the body. Water and electronic devices do not mix well and could result in extreme damage to your computer.

Update your passwords: Believe it or not, updating your passwords is a task as crucial as backing up your data. Verizon's 2017 Data Breach Investigations Report found that an alarming 81% of hacking-related breaches leveraged either stolen and/or weak passwords [1]. Poor password behavior encompasses everything from using the same password for every account to using simple, guessable passwords like "password" or "123456."

When it comes to basic computer maintenance, protecting your digital world against cybercriminals should always be at the forefront of your task list. No security system is perfect, and more today than ever before, consumers are realizing this on a large scale.

If you're overdue for a password update, consider using these strong password generation tips:

- i. Use at least 10 characters
- ii. Use a combination of uppercase and lowercase letters
- iii. Include both numbers and special symbols
- iv. Add emoticons if possible (:O, :(, :D, :), T.T)

A strong password safeguards all of your data against potential third-party hackers which is precisely why it's such an essential part of computer maintenance.

Organize your data: It's easy to let your computer's data organization run awry when your work and play lifestyle doesn't leave much time for calculated file management. Whether it's old music files from your garage band days or downloaded add-ons for your favorite simulation game, your PC's many folders can grow crowded.

If you can't remember the last time you took a look through your downloads folder, you're likely overdue for a visit. The same applies to the rest of your default folders (documents, photos, etc.).

Dealing with a cluttered desktop or crowded computer folders may be a daunting task, but with these tips and tricks, you'll be well on your way to a functioning system of files and folders.

Create large, main folders: Everyone uses their computers for different primary purposes. A freelance writer will likely have completely different main folder assignments than a business owner. It's important to narrow down your digital world into easy folder divisions to make your first round of organization a breeze, and your future rounds even easier.

Create small sub-folders: Within your larger primary folders, smaller sub-folders make your organization operation even smoother. Being able to categorize files by their functionality or content will help you access them whenever you need them. No search button necessary.

Empty your downloads folder: Your downloads folder should function as a temporary cache for recently downloaded files. Get into the habit of placing recent downloads in their proper folders or deleting them once they've served their purpose.

Clear your desktop: When you power on your computer and saddle up for your day's work or some light social media browsing, you want to be able to do so without the stress of clutter. Clear your desktop of any files, folders, or programs you don't need readily available at every power-on.

Choose thoughtful filenames: If you're frequently saving images, PDFs, and other common files, you know how easy it is to type in gibberish for a successful "Save As" operation. Instead of rushing through, take the time to come up with intentional file names so you always know what's living on your hard drive and where it's located.

Back up your data: Part of owning a modern computer is to prepare for the unexpected. Sudden crashes, untimely glitches, and random hardware failure all have the potential to damage the data living on your PC. Backing up files is one of the most vital computer maintenance procedures PC users can do for themselves. That's why we've ranked it at our final spot. Your computer is replaceable, but without a backup, your information is not.

Full backups are usually done on storage-heavy external hard drives and on the cloud. By making duplicate copies of everything on your PC (actually having your data in 3 places is safest), all of your valuable data lives both on your computer and inside of the external drive or cloud.

4. Computer hardware maintenance involves taking care of the computer's physical components, such as its keyboard, hard drive and internal CD or

DVD drives. Cleaning the computer, keeping its fans free from dust, and defragmenting its hard drives regularly are all parts of a computer hardware maintenance program.

5. Tip 1. Make sure the monitor has power and the power light comes on when the power button is pressed. ...

If you have a flat panel LCD monitor, unplug the monitor power cable, wait about 30 seconds, reconnect the cable and then turn on the monitor.

Tip 2. Choose Start→Control Panel and click the System and Security Link. Under Action Center, click the Find and Fix Problems (Troubleshooting) link. You see the Troubleshooting screen. Make sure that the Get the Most Up-to-Date Troubleshooters check box is selected.

3.2.4 Learning Outcome 4: Test computer functionality

3.2.4.1 Introduction to the learning outcome

This unit covers competencies required to identify computer testing tools, Testing techniques are identified, perform computer test functionality, and generate status report.

3.2.4.2 Performance Standard

3.2.4.2.1 Testing tools are gathered according to the manufacturers manual

3.2.4.2.2 Testing techniques are outlined

3.2.4.2.3 Testing procedures are identified.

3.2.4.2.4 Testing of the repaired or replaced component is done as per the instructions/standards .

3.2.4.3 Information Sheet

Boot - to start up a computer.

Byte - a piece of computer information made up of eight bits. Card or Expansion Card – a printed circuit board that adds some.

Document - a file you create, as opposed to the application that created it.

Download - to transfer data from one computer to another. (If you are on the receiving end, you are downloading. If you are on the sending end, you are uploading).

Driver - a program on a computer that tells it how to communicate with an add-on piece of equipment (like a printer).

Expansion slot - a connector inside the computer that allows one to plug in a printed circuit board that provides new or enhanced features.

File - the generic word for an application, document, control panel, or other computer data

Switching on the Computer for Power-On Self-Tests (Post) Test

The Power on Self-Test happens each time the turn a computer on. It sounds complicated and that's because it kind of is. A computer does so much when it is turned on and this is just part of that.

The POST is an automated test that is controlled by the Bios. It happens during the boot process. The first step of the POST, which is operated by the Bios, is to verify the Bios code.

After it has completed that, the POST then continues to check all the computer hardware. If there are no errors the POST will proceed very quickly. However, if any errors are found, these will be displayed via an error message, or if the video hasn't been turned on, or if there is some error in it, then the computer will make a number of beeps. These are known as the POST beep codes.

Booting (or **booting up**) is the initialization of a computerized system. The system can be a computer or a computer appliance. The booting process can be "hard", after electrical power to the CPU is switched from off to on (in order to diagnose particular hardware errors), or "soft",

when those power-on self-tests (POST) can be avoided. Soft booting can be initiated by hardware such as a button press, or by software command. Booting is complete when the normal, operative, runtime environment is attained.

The computer may make one or two beeps on startup anyway, however these are normal. It is only when the beep continues, and the computer does not start up correctly. Then there may have problems.

A **boot loader** is a computer program that loads an operating system or some other system software for the computer after completion of the power-on self-tests; it is the loader for the operating system itself, which has its own loader for loading ordinary user programs and libraries. Within the hard reboot process, it runs after completion of the self-tests, then loads and runs the software. A boot loader is loaded into main memory from persistent memory, such as a hard disk drive or, in some older computers, from a medium such as punched cards, punched tape, or magnetic tape. The boot loader then loads and executes the processes that finalize the boot. Like POST processes, the boot loader code comes from a “hard-wired” and persistent location; if that location is too limited for some reason, that primary boot loader calls a second-stage boot loader or a secondary program loader.

On modern general purpose computers, the boot up process can take tens of seconds, and typically involves performing a power-on self-test, locating and initializing peripheral devices, and then finding, loading and starting an operating system.

The process of hibernating or sleeping does not involve booting. Minimally, some embedded systems do not require a noticeable boot sequence to begin functioning and when turned on may simply run operational programs that are stored in ROM.

All computing systems are state machines, and a reboot may be the only method to return to a designated zero-state from an unintended, locked state.

Performing Specific Component Test

Although hardware failures most certainly may occur in your computer, it is important to check for as many software issues as you can before proceeding. The fact is, most errors are caused by software (such as drivers) related problems, not by a failing hardware device. See basic troubleshooting for a good starting point.

Remove new hardware.

If any new hardware was recently added to the computer, remove that hardware to make sure it is not causing your issue. If a computer works after removing the new hardware, it can mean a few things. Either the new hardware is not compatible with your computer, a system setting needs to be changed, or the new hardware is defective.

Remove any disks or USB devices.

USB cable and port



ComputerHope.com

Web source:

https://www.google.com/search?q=usb+port&safe=active&sxsrf=ALeKk022_VvALmPzJi9EeR2nzXYrmBg5Mw:1608548383438&tbm=isch&source=iu&ictx=1&fir=XvyTwE0i8aVwuM%252CR6PElcFxFbh-_M%252C_&vet=1&usg=AI4_-kR_EJEaoRXpka-zRhUQ3zZddTqdNg&sa=X&ved=2ahUKEwjTov7X9d7tAhWEsnEKHZ2ICH0Q_h16BAgSEA#imgsrc=XvyTwE0i8aVwuM

Remove any disks, CDs, or DVDs that are in the computer. If any USB devices (iPods, drives, phones, etc.) are connected, disconnect all of them as well. Reboot the computer and see if anything changes.

Disconnect external devices

Remove everything from the back of the computer, except the power cable. Turn on the computer and see if it beeps normally. If the computer has never beeped, keep the monitor or display connected to see if any change occurs.

Reconnect and check power cords

If the computer is not getting enough power or the power is getting interrupted, the computer can encounter problems. Disconnect your power cables from any power strip or UPS (uninterruptible power supply) and connect the computer directly to a known good wall outlet.

Identify beep code

If you are receiving a sequence of beeps, see the beep code page for a listing of different beep codes and their explanation. You can also check your motherboard or computer documentation

for information on the beep codes. These beep codes are meant to help identify which computer component is failing or bad. If your beep code is not listed, continue troubleshooting.

<https://www.manualsearcher.com/hp/elitedesk-800-g2/manual?p=6>

<https://support.hp.com/us-en/product/hp-elitedesk-800-g2-small-form-factor-pc/7633277/manuals>

Check all fans

Make sure all fans are running on the computer. If a fan has failed (especially the heat sink fan for the CPU), your computer could be overheating or detecting the fan failure, causing the computer not to boot.

Check all cables

Verify all the cables are securely connected to the computer and that there are no loose cables by firmly pressing in each cable.

- All disk drives should have a data cable and power cable connected to them.
- Your power supply should have at least one cable going to the motherboard. Many motherboards may also have additional cables connected to them to supply power to the fans.

Disconnect all expansion cards

If the above recommendations still have not resolved the irregular POST, disconnect the riser board (if applicable) and each of the expansion cards. If this fixes the problem or allows the computer to POST, connect one card at a time until you determine which card is causing the problem.

Disconnect all drives

If you cannot diagnose the problem by the beep code (or you do not hear a beep code), power off the computer. Then, disconnect any IDE, SATA, SCSI, or other data cables from the motherboard. When they are disconnected, try booting the computer again.

If this resolves your irregular POST or generates error messages, reconnect each device until you determine which device or cable is causing the issue. In some situations, it can also be a loose cable connection that causes the issue.

Remove the RAM

If you continue to experience the same problem with all the above hardware removed, remove the RAM from the motherboard and turn on the computer. If the computer has a different beep code or was not beeping but is now, turn off your computer and try the suggestions below. Make sure to turn off the computer before adding and removing the memory and then turning it back on to see if the suggestion resolves the issue.

1. Re-insert the memory into the same slot.
2. If you have more than one stick of memory, remove all but one stick of memory and try rotating through each stick.

3. Try one stick of memory in each slot.

If you can get the computer to boot with one or more of the sticks of memory installed, you are likely dealing with some bad memory. Try to identify which stick of memory is bad and replace it.

If you can get the memory to work in one slot but not another slot, the motherboard is likely defective. You can either workaround the issue by running the memory in a different slot that does work or replace the motherboard.

Power cycle the computer

In some situations, a computer may have power related issues often caused by either the power supply or the motherboard. To help determine if this is the issue, try turning the computer on, off, and back on as fast as possible, making sure the computer power light goes on and off. In some situations, you may be able to temporarily get the computer to boot.

3.2.4.4 Learning Activities

The trainee needs to perform the following activities for identification and assembling and disassembling of faulty components of a computer:

- Assemble a working system from components.
- Disassemble a working system and identify the purpose of each component.
- Redesign a working system to make it more ergonomic, more environmentally friendly, or more cost effective.
- Repair a nonworking or faulty system by replacing one or more components.
- Operate a system (or system of systems) to achieve a specified outcome.
- Observe a debate (portrayed by actors or animated figures) about a controversial new technology, choose a point of view, and defend it using information gathered from the Web.

3.2.4.5 Self-Assessment

1. Why is it desirable to switch on the computer system for Power On Self Test (POST) analysis?
2. What does the following POST beep codes mean:

Beeps	Meaning
1 short beep	
2 short beeps	

No beep	
Continuous beep	
Repeating short beeps	
1 long, 1 short beep	
1 long, 2 short beeps	
1 long, 3 short beeps	
3 long beeps	

3.2.4.6 Tools, Equipment, Supplies and Materials

- 1/4-inch nut driver
- 3/16-inch nut driver
- Pair of small diagonal cutters
- Pair of needle-nose pliers

3.2.4.7 References

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Williams, Gregg (January 1982). "A Closer Look at the IBM Personal Computer". *BYTE*. p. 36. Retrieved 19 October 2013.

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Model Answers for Self-Assessment

1. The power supply unit (PSU) may cause problems if it is not connected properly or does not produce enough power for the system. If the PSU is badly connected, the system will either not run or be very unreliable. A PSU that does not produce enough power (measured in watts) may not be an obvious cause of problems. This is because the system is likely to start up well but may crash a lot when used. Additionally, When a system starts up it carries out a Power On Self-Test (POST) to check all the hardware is working properly before the operating system is loaded. The POST starts by showing how much memory is in the system and the main devices attached and then loads Windows® or whatever operating system the computer uses. POST will beep if anything is badly wrong with the hardware. The beeps give a signal which an ICT technician can look up to find out what's wrong. For example, one beep then three beeps then one beep from a Dell means there is a problem with the RAM, which is probably not in the socket properly. Beeps are useful as an ICT technician can interpret this information, even if there is no screen display.
- 2.

Beeps	Meaning
1 short beep	Normal POST – system is OK
2 short beeps	POST error – error code shown on screen
No beep	Power supply, system board problem, disconnected CPU, or disconnected speaker
Continuous beep	Power supply, system board, RAM or keyboard problem

Repeating short beeps	Power supply, system board or keyboard problem
1 long, 1 short beep	System board problem
1 long, 2 short beeps	Display adapter problem (MDA, CGA)
1 long, 3 short beeps	Enhanced Graphics Adapter problem (EGA)
3 long beeps	3270 keyboard card error
Beeps	Meaning
1	Memory refresh timer error
2	Parity error in base memory (first 64 KiB block)
3	Base memory read/write test error
4	Motherboard timer not operational (check all PSU to MB connectors seated)
5	Processor failure
6	8042 Gate A20 test error (cannot switch to protected mode)
7	General exception error (processor exception interrupt error)

8	Display memory error (system video adapter)
9	AMI BIOS ROM checksum fix
10	CMOS shutdown register read/write fix
11	Cache memory test failed
continuous beeping	Motherboard does not detect a RAM module (continuous beeping)

3.

3.2.5 Learning Outcome 5: Upgrade computer software/hardware

3.2.5.1 Introduction to the learning outcome

This unit covers competencies required to Determine Reasons of upgrading, Identify procedures and techniques for upgrading, and Test functionality of the upgraded software/hardware

3.2.5.2 Performance Standard

- 3.2.5.2.1 Identify hardware component to be upgraded.
- 3.2.5.2.2 Install and configure the component
- 3.2.5.2.3 Test the functionality of the installed component

3.2.5.3 Information Sheet

The central processing unit (CPU) is the brain of your computer. It receives information (fetches), processes data (decodes), and performs calculations (executes). You can find your Windows computer's CPU specs by navigating to Settings > System > About. Then, click "Device specifications."

Random access memory (RAM) temporarily stores the data that you're actively using while on your computer. This is why if you tend to open 40 tabs at once, you'll notice a decline in overall performance. RAM allows you to more quickly access data than if it was coming straight from your hard drive. To see real-time usage of your CPU, you can open up the Task Manager on your computer and click the "Performance" tab.

Hard drive is where all of the data on your computer is stored. It's different than RAM because it's your computer's long term storage, as opposed to the short term memory RAM delivers. The most common types of hard drives are hard disk drives (HDD) and solid-state drives (SSD).

Solid-state drives (SSD) are a newer type of hard drive without any moving parts. It's a much faster hard drive but a pricier option found in high-end computers.

A graphics processing unit (GPU), or graphics card, receives information from the CPU and then decides how the pixels on the screen should display that information. A GPU should last between 10 and 20 years in most cases.

Running Diagnostic Programs of a Computer

Symptoms of an over-stressed and failing CPU include an operating system not loading despite the fans running. Also, if the computer turns on but nothing loads or powers on and then it shuts off suddenly, it may have CPU issues.

Check your CPU usage record if you suspect the CPU is at the heart of a computer issues. If a CPU is maxing out on all cores, it may want to upgrade it.

Note: If an upgrade a CPU, you may also need to upgrade a motherboard and RAM along with it.

There are two common types of RAM, Dynamic RAM (DRAM) and Static RAM (SRAM). Dynamic RAM (DRAM) is more common than SRAM. It consists of transistors and capacitors and refreshes at a rate of thousands of times per second.

Static RAM (SRAM) has more transistors per memory cell than DRAM and doesn't need to refresh. Due to its more advanced features, it's significantly faster - but also more expensive - than DRAM.

How long does RAM last on average?

Typically, it will not need to replace your RAM completely. Rather, you may find that a need to upgrade it depending on the use of a computer for and what types of applications it run.

The amount of RAM it need depends on what the computer is used for. 4GB is sufficient for general internet browsing and/or running non-memory-intensive applications. 8GB to 12GB is better for gaming, video streaming, and/or running memory-intensive applications.

16GB and beyond is necessary for running applications related to high-resolution photo editing, video editing, animation, and illustrations.

What are signs my RAM is failing?

If experiencing performance issues like lagging or freezing with everyday tasks, it may need to upgrade your RAM.

Note: In some laptop models, the RAM is soldered to the motherboard, meaning that it can't upgrade the RAM yourself. Check the computer's service/hardware manual to determine if the RAM is soldered.

An HDD features a traditional spinning hard drive. While it's cheaper than SSD, it's also slower, louder, and can run hot.

How long does a hard drive last on average?

A typical hard drive will last between 3 and 5 years.

What are signs that the hard drive is failing?

Signs of the hard drive dying can range from overall slower performance to corrupted data.

Note: It's important to back up the hard drive as soon as it provide notice signs that the hard drive is close to failure. Common backup solutions include external hard drives and remote cloud storage.

Two common types of graphics cards include video graphics array (VGA) which renders 256 colors. Quantum Extended Graphics Array (QXGA), on the other hand, is more high performance and is capable of rendering millions of colors.

How long does a graphics card last on average?

Typically, expect the graphics card to last more than 5 years. With that said, the lifespan may depend on if it is a single GPU or dual GPU configuration. A single GPU is more cost-effective and better for casual users. A dual GPU, in contrast, is more expensive but users who need great graphics will enjoy the increased graphics performance.

What are signs GPU is failing?

When random lines or dots appear, or incorrect colors appear on your screen, known as artifacting, it might be time to upgrade the graphics card.

Note: Artifacting can also be a sign that your graphics card is overheating, so check the cooling system before upgrading. Prevent overheating by regularly cleaning vents and fans to remove dust buildup.

The best way to ensure you can depend on your laptop or desktop PC is by investing in quality technology from the beginning. The lure of cheap deals is strong but while a cheap PC might be lower cost at the outset, you will likely have to replace it faster than you would if you had spent more money in the first place. HP Store holds a variety of quality, capable computers that can suit a variety of purposes.

Infographic transcription:

If a computer is acting up or performance is slowing, it may be time to upgrade one or more components on the PC.

When it comes to making upgrades, there are 4 components that, when upgraded, tend to solve most common problems plaguing a computer:

- CPU
- RAM
- Hard Drive
- GPU

Find out what these components do, how long they should last, and signs that it's time to upgrade.

1) CPU

The central processing unit (CPU) is the brain of the computer. It receives information (fetches), processes data (decodes), and performs calculations (executes).

CPU Functions:

- Fetch
- Decode

- Execute

How long does a CPU last on average?

10-20 years

Installation of Updates and Computer Upgrades

Check your CPU usage record - if the CPU is maxing out on all cores, you may want to upgrade.

Note: If upgrading a CPU, there is need to upgrade the motherboard and RAM along with it.

2) RAM

Random access memory (RAM) temporarily stores the data that is actively in use while on a computer. RAM allows for more quickly access data than if it was coming straight from the hard drive.

Two most common types of RAM:

Dynamic **RAM (DRAM)**

- More common than SRAM
- Consists of transistors and capacitors.
- Refreshes thousands of times per second

Static **RAM (SRAM)**

- Consists of more transistors per memory cell than DRAM.
- Does not need to refresh.
- Faster and more expensive than DRAM

How long does RAM last on average?

Typically, it needs to replace the RAM completely. Rather, may find the need to upgrade it depending on what use of a computer for and what types of applications it runs.

Amount of RAM you may need based on your computing needs:

- General internet browsing and/or running non-memory-intensive applications (4GB)
- Gaming, video streaming, and/or running memory-intensive applications (8GB to 12GB)
- Running applications related to high-resolution photo/video editing/animation/illustration (16GB to 64GB)

Signs for upgrade

If experiencing performance issues like lagging or freezing with everyday tasks, you may need to upgrade your RAM.

Note: In some laptop models, the RAM is soldered to the motherboard, meaning that they can't be RAM upgraded. Check the computer's service/hardware manual to determine if the RAM is soldered.

3) Hard Drive

A hard drive is where all of the data on a computer is stored.

Common types of hard drives:

Hard disk drive (HDD)

- Traditional spinning hard drive
- Cheaper than SSD, but slower as well
- Can be louder and get hotter than solid state drives.

Solid state drive (SSD)

- Newer technology
- Does not have any moving parts.
- Smaller than hard disk drives

How long does a hard drive last on average?

3-5 years

Signs you should upgrade.

Signs can range from slower performance to corrupted data - these issues may suggest your hard drive is close to failing.

Note: It is important to back up your hard drive as soon as you notice signs that your hard drive is close to failure. Common backup solutions include external hard drives and remote cloud storage.

4) GPU

A graphics processing unit (GPU), or graphics card, receives information from the CPU and then decides how the pixels on the screen should display that information.

Types of graphics cards:

1. Video Graphics Array (VGA)

- Minimum standard
- Allows 256 colors.

2. Quantum Extended Graphics Array (QXGA)

- High performance
- Allows millions of colors.

How long does a graphics card last on average?

5+ years

This may depend on if you have a single GPU or dual GPU configuration:

1. Single GPU

- More cost effective
- Better for standard users

2. Dual GPU

- More expensive
- Increased graphics performance, making it better for gamers.

Learn more about how to upgrade your laptop or PC to get the most out of an existing computer, and how to customize for highest performance when buying a new laptop.

1. Test components. Check that the components work using the tests you selected in preparation for the hardware upgrade. The selected tests should ensure that everything is checked – if any tests are missed, it is possible that a component will give problems later.

2. System testing. Make sure the computer works with all the peripherals and the network.

1. Restoring data. This will be needed if the hard disk has been replaced or formatted. If the data is not restored it will not be on the disk, so the user will not be able to access their work.

•

2. Software installation. This is often needed for hardware upgrades, such as a new scanner. The software will allow the user to control the hardware properly, e.g. changing the scan resolution, and to edit the scanned images.

3. Software configuration. This may be needed to set the defaults for a new printer driver, so that the printer uses a quick and economical print quality setting (unless the user chooses otherwise)

Related web links:

- HP Laptop Buying Guide
- How to Choose the Best HP Laptop

3.5.5.4 Learning Activities

Practical Activity

Special instructions related to learning activities.

Practical activities can be performed in the computer lab of the trainee's institution or a personal computer.

Trainees taking this unit are highly recommended to own a working computer.

Case 1.

The learner needs to do the following activities on software upgrading to check if the computer's performance improves:

- Uninstall any unnecessary software you are not using.
- Remove viruses, spyware, and other malware.

- Defragment the hard drive (primarily an issue for Windows computers).

Case 2.

Ask yourself whether a component upgrade is worth it to weigh the time and cost of making the upgrade against the time and productivity you may be losing by not making it.

3.2.5.5 Self-Assessment

1. What are the potential risks to consider when installing hardware components?
2. Why is it desirable to install or upgrade hardware components safely, configuring associated software?
3. Why is it necessary to test the computer system for functionality?
4. What are the reasons for and implications of registering installed product components?
5. Why is it important to produce updated documentation for the modifications?

3.2.5.6 Tools, Equipment, Supplies and Materials

- 1/4-inch nut driver
- 3/16-inch nut driver
- Pair of small diagonal cutters
- Pair of needle-nose pliers

3.2.5.7 References

Williams, Gregg (January 1982). "A Closer Look at the Personal Computer". BYTE. Retrieved 19 October 2019.

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3.2.5.8 Model Answers to Self-Assessment

1. As an ICT technician, there needs a good understanding of the health and safety regulations from early on in the career, so that one understands the good practices demanded by law. In particular, you need to:
 - report any accidents
 - take reasonable care of your own health and safety when moving heavy components
 - not cause any electrical hazards
 - make sure that workstations meet safety requirements.

A need to adhere to health and safety regulations as they will help to protect and others and will avoid any unnecessary legal action for reckless and unsafe working practices. If one identifies any health and safety problems, you should tell the line manager or the health and safety representative immediately.

2. One can use diagnostic software to thoroughly test hardware in a computer system and give a report on any problems found. An example of diagnostic software is BurnInTest Standard, which can test your computer components, such as the processor, hard drive, optical drive, sound and graphics cards, RAM, network connections and ports. This software will even report on the temperature of your processor. The results from tests can be saved to disk or printed.
3. When a system starts up it carries out a Power on Self-Test (POST) to check all the hardware is working properly before the operating system is loaded. The POST starts by showing how much memory is in the system and the main devices attached and then loads Windows® or whatever operating system the computer uses. At the beginning of POST, you can enter the computer set-up by pressing the correct key. (There may be a message displayed on-screen to inform you which is the correct key, perhaps the F2 or Del key, or you may need to look this up in the manual.) Once in set-up you can change how the computer uses hardware, such as whether to start from the hard disk or to use an optical disk to start the computer. The computer will usually be set to start from the hard disk, but if you want to re-install the operating system you will need to change this so the computer starts from an optical drive, which will be the operating system installation CD. POST will beep if anything is badly wrong with the hardware. The beeps give a signal which an ICT technician can look up to find out what is wrong. For example, one beep then three beeps then one beep from a Dell means there is a problem with the RAM, which is probably not in the socket properly. Beeps are useful as an ICT technician can interpret this information, even if there is no screen display.
4. Product registration is when you inform the manufacturer of your details when you install the product. Product registration is often good practice as it helps get faster technical support and advice from manufacturers about components. This is because the manufacturer then has a record of when the warranty started and who is covered by the warranty. Another reason why registration can be useful is that the manufacturer may send out technical advice or useful information to purchasers if any problems are found with the product.
5. Documentation needs to be kept up to date, recording any new hardware installations or upgrades. This ensures that:
 - The organization knows which components are in which systems
 - Users know how to get the best from their hardware
 - Warranties can be implemented for faulty kit.

CHAPTER 4: APPLICATION OF MICROSOFT OFFICE TOOLS

Unit of learning code: IT/CU/ICTA/CR/04/4/A

Related Unit of Competency in Occupational Standard: Apply Microsoft Office Tools

4.1 Introduction to the unit of learning

This unit describes the competencies required in applying word processing using Ms Word, applying spreadsheet using Ms Excel, applying database management using Ms Access, applying graphic presentation using Ms PowerPoint and managing personal information using Ms Outlook.

4.2 Summary of Learning Outcomes

1. Apply word processing using Ms Word
2. Apply spreadsheet using Ms Excel
3. Apply database management using Ms Access
4. Apply graphic presentation using Ms PowerPoint
5. Manage personal information using Ms Outlook

4.2.11 Learning Outcome 1: Apply word processing using Ms Word

4.2.1.1 Introduction to applying word processing using Microsoft word

Word Processing applications continue to play a prominent role in people's professional and personal lives. Traditionally, typewriters were used to create text documents such as memos, letters of appointment, exams etc. However, with the introduction of computers and their prices going down, most people prefer creating documents using electronic word processors.

The learner is required to demonstrate ability to Create, edit, format, save and print documents using MS word.

4.2.1.2 Performance Standard

- 4.2.1.2.1 Features of a word processor are outlined
- 4.2.1.2.2 Features of Ms Word interface are identified
- 4.2.1.2.3 Creation and formatting of document is done according to office tasks.
- 4.2.1.2.4 Printing of document is done

4.2.1.3 Information Sheet

Word processing: This is the process of manipulating text, characters, words, and sentences in such a manner as to make the final document free of errors and attractive to look at.

Word processor: An application software that enables the user to create, save, edit, format and print text-rich documents. Some common word processors are **Microsoft word, WordPad, WordPerfect, Google docs, Apple works, openofficewriter** etc.

Today, the word processor is one of the most frequently used software programs on a computer, with Microsoft Word being the most popular word processor.

A word processor allows you to;

- Create, save and edit documents
- Format text properties like font, alignment, font color, background color, etc.
- Check spelling and grammar
- Add images
- Add header and footer, set page margins and insert watermarks
-

Purpose of Word Processing

A Word processor is a tool that can be used to prepare & produce documents. It can be used in:

- (i). Writing Letters (i.e., Business & general mail).
- (ii). Writing Memos.
- (iii). Writing Books.
- (iv). Writing Articles, Research letters such as Reports/thesis and Term papers.
- (v). Writing Essays and Projects.
- (vi). Writing Curriculum vitae and Resumes.
- (vii). Writing weekly Newsletters on sports, entertainment, etc.
- (viii). Writing Lease agreements and other legal documents.
- (ix).

Advantages of Electronic Word Processor programs

- Easier to use due to automated features such as Word-wrap, autocorrect and auto complete.
- They have superior editing tools such as spelling checker, the Thesaurus etc. hence making editing easier.
- Can store documents for future retrieval.
- They have superior formatting features that make a document more appealing to the reader.
- The user can produce multiple copies more easily.
- Copy and move (cut) operation make it easier to manipulate a document.

Features of word processors

Word processor offers several features that can give your document or other text a more professional appearance. Below is a listing of some of the most popular features of a word processor.

- 1 It allows the user to create a file, save it and open it again and again for reuse, editing and formatting
- 2 **Text formatting: Changing** the font, font size, font, color, bold, italicizing underline, etc.
- 3 **Find:** Word processors give you the ability to quickly find any word or text in any size of the document.
- 4 **Search and Replace** - You can use the Search and Replace feature to replace any text throughout a document.
- 5 **Insert tables** -tables are features that allow us to organize our work in rows and columns.
- 6 **Copying, cutting, and pasting** :Once text is entered into a document, it can be copied or cut and pasted in the current document or another document.
- 7 **Grammar checking:** Microsoft Word checks spelling and grammar automatically as you type, indicating possible spelling mistakes with a wavy red underline and possible grammatical mistakes with a wavy green underline.
- 8 **Footnotes and cross-references:** Automate the numbering and placement of footnotes and enables you to easily cross-reference other sections of the document.
- 9 **Automated lists:** Automatically creates bulleted or numbered lists, including multi-level outlines.
- 10 **Graphics:** Allows you to embed illustrations, graphs, and possibly even videos into a document. Some word processors let you create the illustrations within the word processor; others let you insert an illustration produced by a different program.
- 11 **Headers, footers:** Allows you to specify customized headers and footers that the word processor will put at the top and bottom of every page.
- 12 **Page numbering:** The word processor automatically keeps track of page numbers so that the correct number appears on each page.
- 13 **layout:** Allows you to specify different margins within a single document and to specify various methods for indenting paragraphs.
- 14 **Macros:** Enables users to define and run macros, a character or word that represents a series of keystrokes. The keystrokes can represent text or commands. This allows you to Setup macros to perform common tasks.

- 15 **merge:** Allows you to merge text from one file into another file. This is particularly useful for generating many files that have the same format but different data. Generating mailing labels is the classic example of using merges.
- 16 **Tables of contents and indexes:** Allows you to automatically create a table of contents and index based on special codes that you insert in the document.
- 17 **Thesaurus:** Allows you to search for synonyms without leaving the word processor.
- 18 **Collaboration:** Allows users to track changes to the document when more than one person is editing. Some cloud-based word processors also allow multiple users to edit the same document at the same time.
- 19 **Internet features:** Allows users to embed Web links into their documents and format their documents for the Web. Some also link to Web services that can help users create their documents.
- 20 **Translation and speech:** As artificial intelligence capabilities become more commonplace, some word processors have gained the ability to read text aloud, to accept voice commands, and to translate text from one language to another.
- 21 **Word wrap** - Word processors can detect the edges of a page or container and automatically wrap the text using word wrap.
- 22 **Multiple windows** - While working on a document, you can have additional windows with other documents for comparison or move text between documents.
- 23 **AutoCorrect** - Automatically correct common errors (e.g., typing "teh" and having it autocorrected to "the").
- 24 **Import data** - Import and format data from CSV, database, or another source.
- 25 **Preview:** this refers to seeing how the information will appear on printed paper before printing.
- 26 **Editing modes:** Word processors have two editing modes; **Insert mode** and **Type over mode**.
In **Insert mode**, every character typed between words, lines or characters is placed at the cursor position. This pushes all the text in front of the cursor away without deleting it.
In **Type over mode**, every character typed deletes what was there before and replaces it with new text at the cursor position.
- 27 **Printing** – Printing is a process of reproducing text and images on a paper using printers.
- 28 **Scrolling:** This is the vertical movement of text document on the screen, either using the Up or Down arrow keys, Page Up or Page Down keys, or using the Mouse in Windows based word processors.

- 29 **Help:** Contains instructions, tips, pointers, explanations and guidance on how to use an application.
- 30 **Rulers:** Word has two rulers - a horizontal ruler and a vertical ruler. The horizontal ruler appears just beneath the Ribbon and is used to set margins and tab stops. The vertical ruler appears on the left edge of the Word window and is used to gauge the vertical position of elements on the page.

Starting word using office 2010

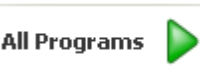
To start Microsoft word, follow the following steps

To start Microsoft Word:

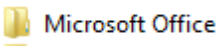
1. Select the Start button on the taskbar. The Start menu appears.

Click 

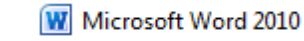
2. Point to All Programs. The All Programs menu appears.

Click 

3. Select Microsoft Office 2010. The Microsoft Office 2010 submenu appears.

Click 

4. Select Microsoft Word 2010. The Microsoft Word 2010 window opens.

Click 

The Microsoft Word 2010 user interface uses ribbons and tabs, just like its predecessor, Microsoft Office 2007.

Following is the basic window which you get when you start the Word application. Let us understand the various important parts of this window.

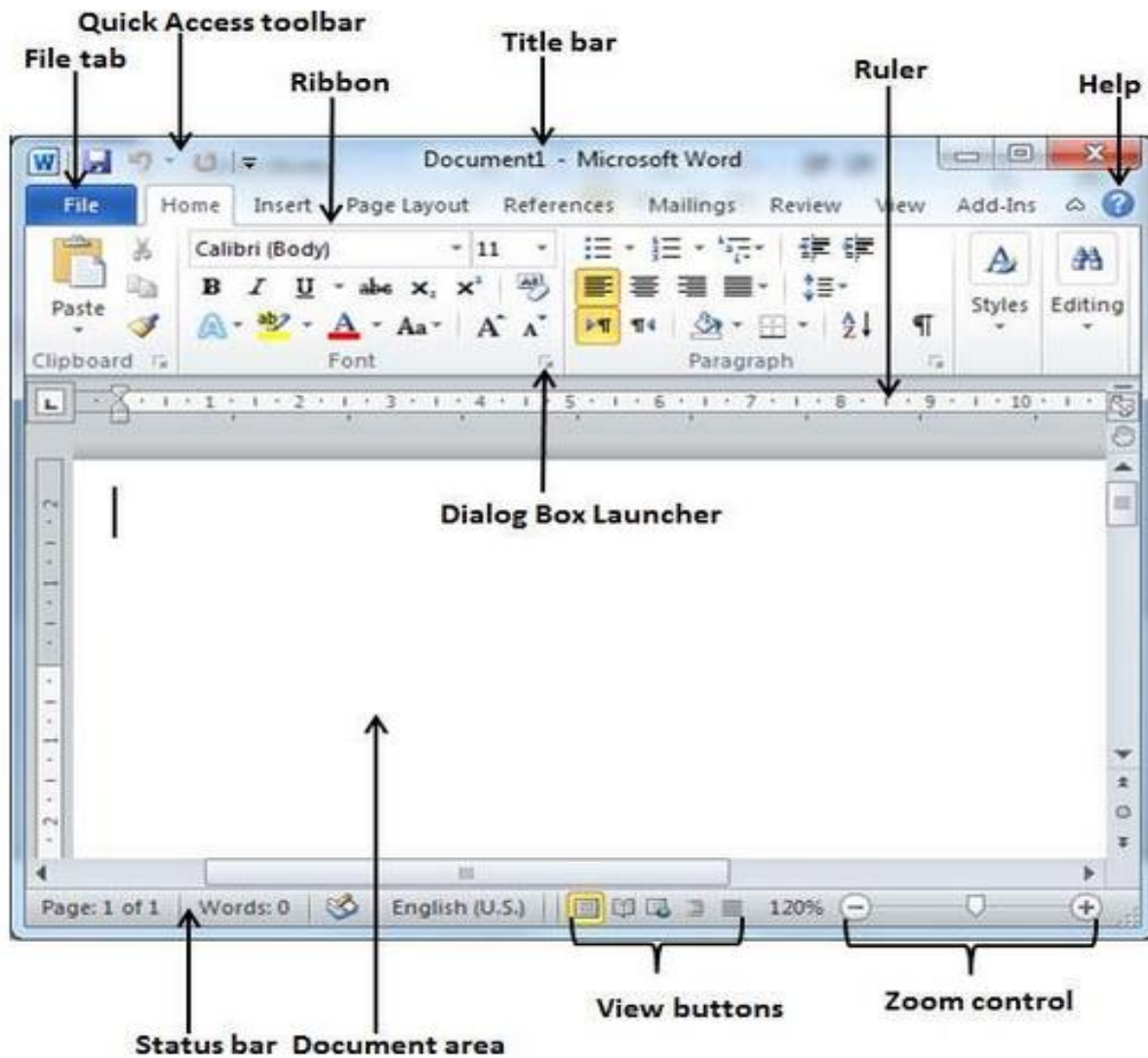


Figure 44: Parts of Microsoft office word 2010

File tab and Backstage View: The File tab replaces the Office button from Word 2007. When you click the File tab, you see the new **backstage view**. This view shows all the information about a document in one location. This is where you come when you need to open or save files, create new documents, print a document, and do other file-related operations.

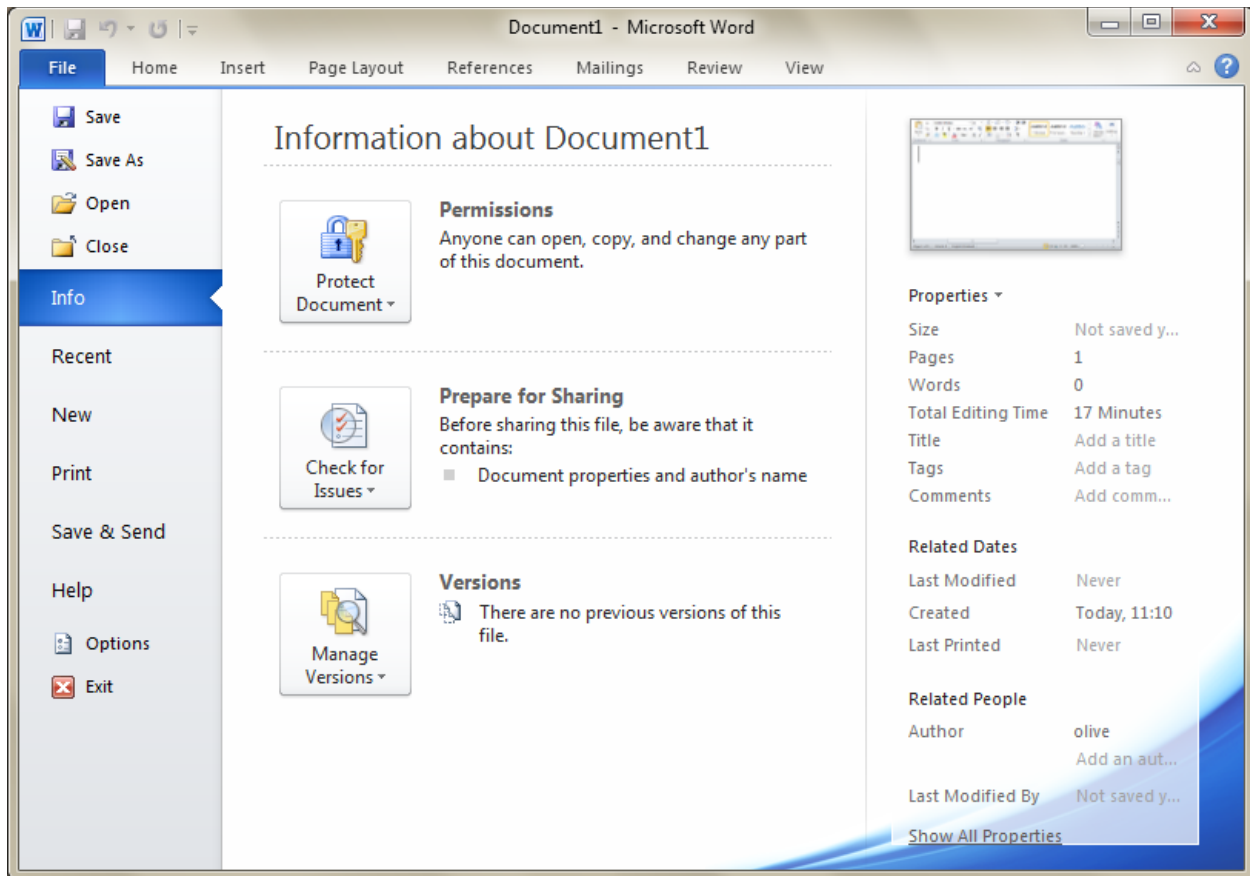


Figure 45: File tab and Backstage View

The following are the icons available in the backstage view and their uses ;

- **Save As** - allows file name, file type, and location to be specified and is used to save a newly created document, or to save another copy of a previously saved document.
- **Save** - allows you to save/update changes to a document.
- **Open** - allows you to open an existing document.
- **Close** - allows you to close the document.
- **Info** - displays different commands and properties associated with the document and where it is stored.
- **Close**-This option is used to close an open document.
- **Recent** -This option lists down all the recently opened documents
- **New** -This option is used to open a new document
- **Print** -This option is used to print an open document.
- **Save & Send** -This option will save an open document and will display options to send the document using email, etc.
- **Exit** -Use this option to close the document and exit.

Quick Access Toolbar: This is a customizable toolbar placed by default above the Ribbon - you can add icons for frequently used commands to this toolbar. It can also be placed below the Ribbon.

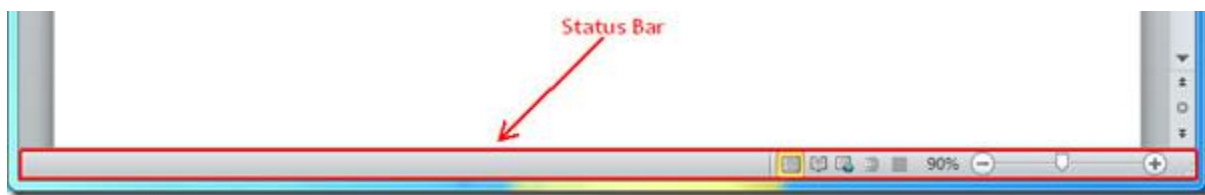


Ribbon: The Ribbon displays commands used to work with your document.

Ribbon contains commands organized in three components;

- **Tabs** – These appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are examples of ribbon tabs.
- **Groups** – They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment, etc.
- **Commands** – Commands appear within each group as mentioned above.

Status Bar: Located at the bottom of the screen, this provides information about the total number of pages, total number of words, and different layouts, including zoom options.



Title bar

This lies in the middle and at the top of the window. Title bar shows the program and document titles.

Rulers

Word has two rulers - a horizontal ruler and a vertical ruler. The horizontal ruler appears just beneath the Ribbon and is used to set margins and tab stops. The vertical ruler appears on the left edge of the Word window and is used to gauge the vertical position of elements on the page.

Help

The **Help Icon** can be used to get word related help anytime you like. This provides nice tutorial on various subjects related to word.

Zoom Control

Zoom control lets you zoom in for a closer look at your text. The zoom control consists of a slider that you can slide left or right to zoom in or out; you can click the + buttons to increase or decrease the zoom factor.

View Buttons

The group of five buttons located to the left of the Zoom control, near the bottom of the screen, lets you switch through the Word's various document views.

- **Print Layout view** – This displays pages exactly as they will appear when printed.
- **Full Screen Reading view** – This gives a full screen view of the document.
- **Web Layout view** – This shows how a document appears when viewed by a Web browser, such as Internet Explorer.
- **Outline view** – This lets you work with outlines established using Word's standard heading styles.
- **Draft view** – This formats text as it appears on the printed page with a few exceptions. For example, headers and footers aren't shown. Most people prefer this mode.

Document Area

This is the area where you type. The flashing vertical bar is called the insertion point and it represents the location where text will appear when you type.

Status Bar

This displays the document information as well as the insertion point location. From left to right, this bar contains the total number of pages and words in the document, language, etc.

You can configure the status bar by right-clicking anywhere on it and by selecting or deselecting options from the provided list.

Dialog Box Launcher

This appears as very small arrow in the lower-right corner of many groups on the Ribbon. Clicking this button opens a dialog box or task pane that provides more options about the group.

Creating A New Blank Document

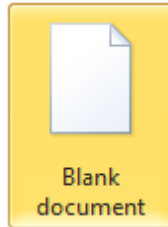
A Document Whatever you create with an application, including information you type, edit, view or save.

When Word starts up, the program will display a new blank document - that is, a completely blank piece of paper which you can begin to write on. Start typing your text at the insertion pointer on the plain document view.

Creating a document means typing text in a new document screen.

To create blank new document, follow the follow the following steps;

1. Select the File tab. The Backstage View appears. Click 
2. Select the New command The New Document pane displays with Blank Document selected.
Click 
3. Double click the Blank document button from the available templates. A new blank document is created.



Creating a new document using templates

Microsoft Word allows you to create professional-looking documents using existing templates. A template is a predesigned document.

Starting a New Document from a Template

1. Click on the Office Button in the upper left corner of the screen.
2. Click on New.
3. In the left side, select Installed Templates.
4. Select the Template of your choice.
5. Double-click on the template or Click on the Create button.

Creating simple Microsoft word document

To begin with, let us create some sample text. To create a sample text, there is a short cut available. Open a new document and type **=rand()** and press Enter. Word will create the following content for you.

Saving new document

It is important to regularly save the file you are working on to ensure that you do not lose data. You may also want to save different versions of your file under different names.

Following are the steps to save an edited Word document;

1. Click the **File tab** and select the **Save As** option.

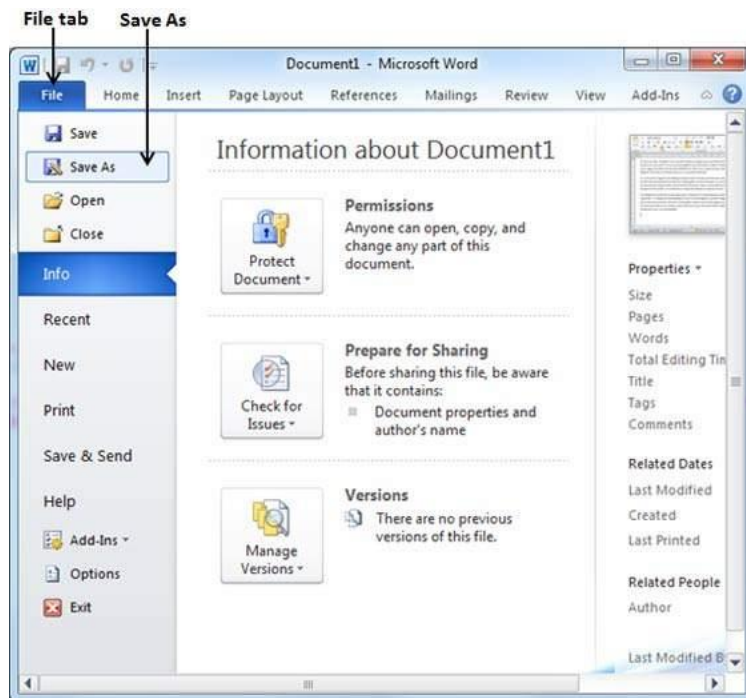


Figure 46 Saving new document

2. Select a folder where you will like to save the document, Enter the file name which you want to give to your document and Select the **Save As** option, by default it is the **.docx** format.
3. Finally, click on the **Save** button and your document will be saved with the entered name in the selected folder.

Saving New Changes

There may be an instance when you open an existing document and edit it partially or completely or an instance where you may like to save the changes in between editing of the document. If you want to save this document with the same name, then you can use either of the following simple options

1. Just press the **Ctrl + S** keys to save the changes.
2. Optionally you can click on the floppy icon available at the top left corner and just above the **File tab**. This option will also help you save the changes.
3. You can also use the third method to save the changes, which is the **Save** option available just above the **Save As** option.

Opening Existing Document

There may be a situation when you open an existing document and edit it partially or completely. Follow the steps given below to open an existing document –

1. Click the **File tab** and select the **Open** option.
2. This will display the following file **Open dialog box**. This lets you navigate through different folders and files, and also lets you select a file which you want to open.

3. Finally, locate and select a file which you want to open and click the small triangle available on the **Open** button to open the file. You will have different options to open the file, but simply use the **Open** option.

Editing word documents

This refers to making necessary changes to an existing document. Microsoft word offers user with several inbuilt tools such as spelling and grammar checker, redo and undo find and replace etc.

i. Highlighting block of text

This enables user to manipulate the selected text. Selecting a text is one of the most important skills required while editing a word document. You can perform various operations on a selected text; you can delete the selected text, copy it, move it, apply formatting to it, change its capitalization, etc.

To select text using multiple methods:

a) Using the Mouse

- **Selecting text between two points:** Click at the start of the block of text, hold down Shift, and click at the end of the block.
- **Selecting a single word:** Double-click anywhere on the word you want to select.
- **Selecting a paragraph:** Triple-click anywhere on the paragraph you want to select.
- **Selecting a sentence:** hold down the Ctrl key and click anywhere in the sentence you want to select.
- **Selecting a column of text:** Hold down Alt, click and hold the mouse button, and drag over the column you want to select.

b) Using the Keyboard

Keyboard provides very good support when you want to select various components of the document as described below

- **Ctrl + A:** Press Ctrl + A keys to select the entire document.
- **Shift:** Keep pressing the Shift key and use any of the arrow keys to select the portion of text.
- **F8:** Press F8 and then use any of the arrows keys to select the portion of text.
- **Ctrl + Shift + F8:** Press Ctrl + Shift + F8 and then use any of the arrows keys to select column of the text.

ii. How to delete text

You can easily delete the text in Word including characters, paragraphs or all of the content of your document. Word offers you different methods to delete the text; some of the commonly used methods are given below;

- Place the cursor right to the text then press Backspace key
- Place the cursor to the left of the text then press Delete key
- Select the text and press the Backspace or Delete key
- Select the text and type over it the new text.

iii. Copy/cut and paste text

Copying text means to create a duplicate of the original text in a different location. Moving text means changing the location of the text without leaving a copy of the original location.

Word offers different methods to copy/cut and paste text. Some of the popular methods are given below;

Method 1;

1. Select the text you want to copy/cut
2. Select the Home tab and click the Copy/cut command
3. Place the cursor where you want to paste the text
4. Click the Paste command in Home tab

Method 2;

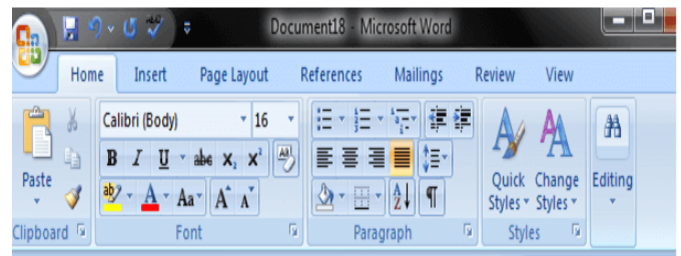
1. Select the text
2. Place the cursor over the text and right click the mouse
3. A menu will appear; with a left click select the "Copy/cut" option
4. Now, move the cursor to a desired location and right click the mouse
5. A menu will appear; with a left click select the "Paste" option.

iv. How to correct errors

When you type text in a document, by default the Word informs you if there is any contextual, spelling or grammatical error. Word informs you in different ways for different errors;

- If there is any **contextual error** in the document, it will underline the text with **blue line**.
- If there is any **spelling error** in the document, it will underline the text with **red line**.
- If there is any **grammar error** in the document, it will underline the text with **green line**.

Steps to correct errors:



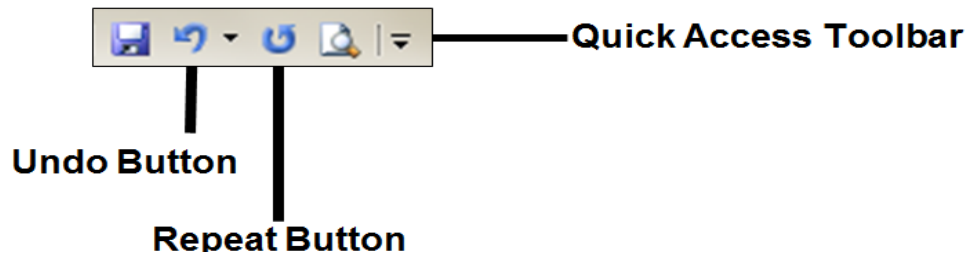
Contextual Spelling Error
Deer Sir

Grammatical Error
The market is divided into different segments of buyers on the basis of geography. There is mainly three geographical variables for geographical segmentation. The first variable is region or location that includes village, town, city and country. The second is population density that helps focus on densely populated regions. The third one is climate that helps to focus on regions with similar climatic conditions.

Spelling Error

- Place the cursor over the text that you want to correct
- Right click the mouse
- A list of suggestions appears
- Choose the correct word with a left click

v. **Using undo, redo and repeat**



Microsoft Word has two essential commands: Undo, which is utilised to undo a previous activity, and Repeat/Redo, which is utilised to repeat a previous activity.

For instance, in the event that you erroneously delete text, you can utilise the Undo command to restore it; if erase a character and you want to erase more characters then you can utilise the Repeat/Redo command.

To use the Undo and Repeat features.

- a) Click to undo  the last deletion
- b) Click the  to repeat the last deletion

Tip: The keyboard shortcuts Ctrl+Z [**Undo an action**] and Ctrl+Y [**Redo an action**] can also be used.

vi. **Find & replace operation**

Following are the simple steps –

1. Click the **Replace option** in the **Editing group** on the Home tab or press **Ctrl + H** to launch the **Find and Replace** dialog box.
2. Type a word which you want to search. You can also replace the word using the **Find and Replace** dialog box as in the following screenshot.

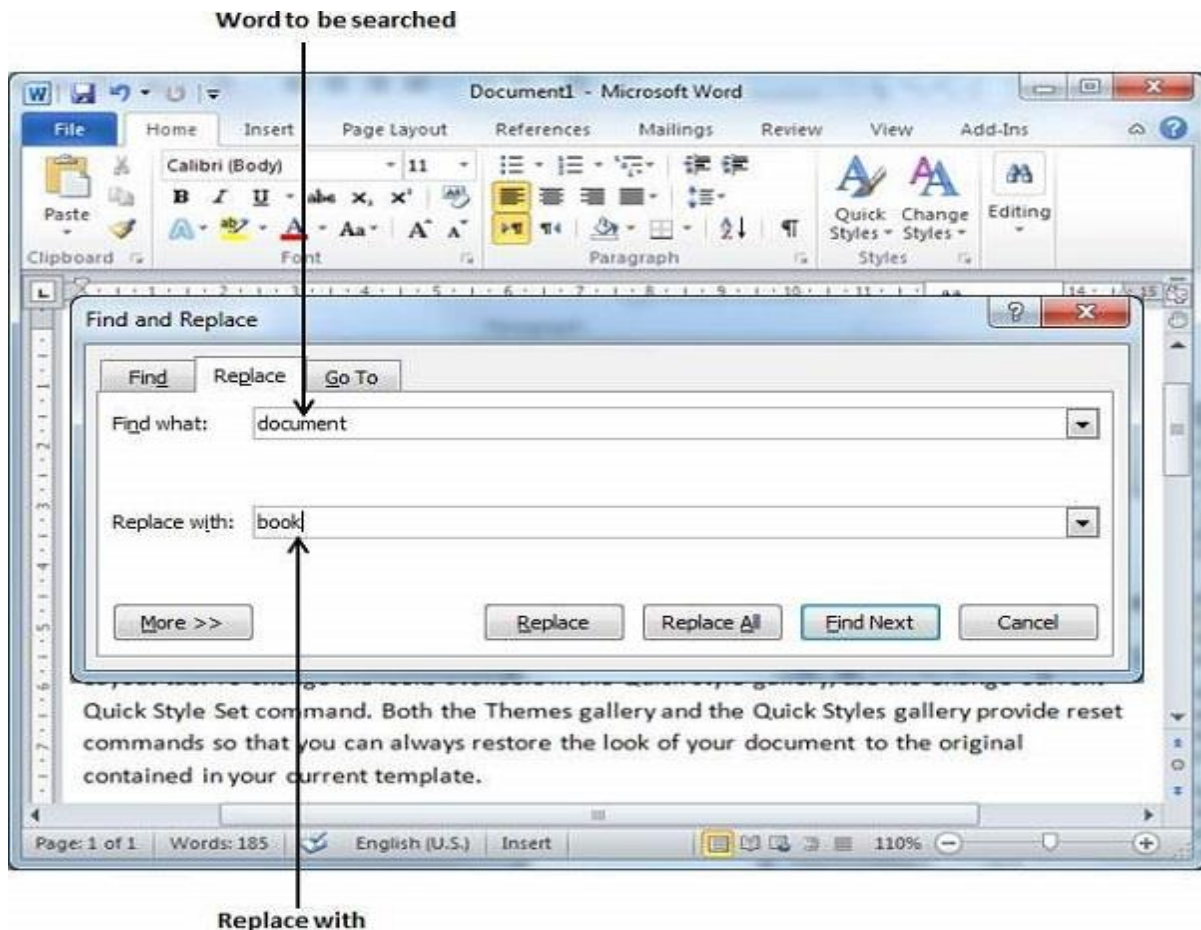


Figure 47 Find and Replace Dialog Box

3. Click the **Replace** button available on the **Find and Replace** dialog box and you will see the first occurrence of the searched word would be replaced with the replace with word. Clicking again on **Replace** button would replace next occurrence of the searched word. If you will click **Replace All** button then it would replace all the found words in one go. You can also use **Find Next** button just to search the next occurrence and later you can use **Replace** button to replace the found word.
4. You can use **More >>** button available on the dialog box to use more options and to make your search more specific like case sensitive search or searching for whole word only etc.
5. Finally, if you are done with the Find and Replace operation, you can click the **Close (X)** or **Cancel** button of the dialog box to close the box.

Document Views

This feature allows you easily switch between different document views, changing the way your document appears in the Word window. The figure bellow illustrates different views group.

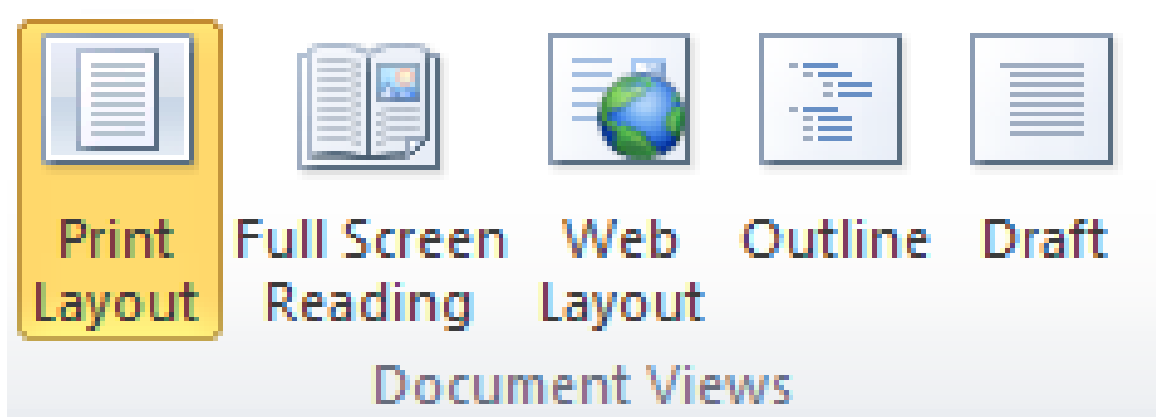


Figure 48 Document Views

Print Layout The document appears on the screen as it would appear in a printed document. The layout is complete and more accurate than in the other layout options.

Full Screen Reading This displays the document as a digital magazine. It removes all the features from the interface.

Web Layout The document appears as a web page, with the text wrapping as it would in a web browser. Backgrounds and formatting will appear as they would in a web browser.

Outline This layout shows the headings and subheadings in your document. It allows you to reorganize portions of your document and delete them if necessary.

Draft The document appears with a dotted line separating the pages and showing document sections.

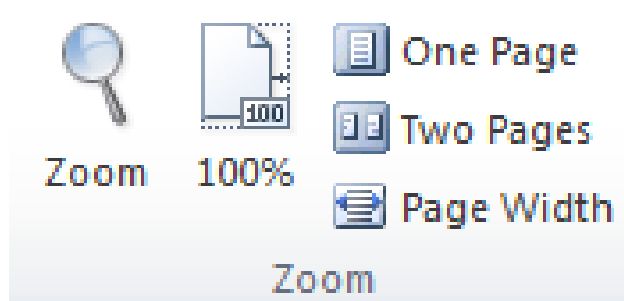
To view the document in different views:

Open an existing document from a specific drive and folder location.

- a) Click the **View** tab. The **View** tab appears.
- b) Click the Full Screen Reading command. The document is displayed in **Full Screen Reading view**.
- c) Click the Web Layout command. The document is displayed in **Web Layout view**.
- d) Click the **Outline** command. The document is displayed in **Outline view**

Zooming in/out

The zoom level in Word 2010 can be changed in different ways. You can use the **View** tab and select the **Zoom** icon to display the **Zoom** window. Select the preferred zoom level and click **OK** to confirm the changes.



Formatting:

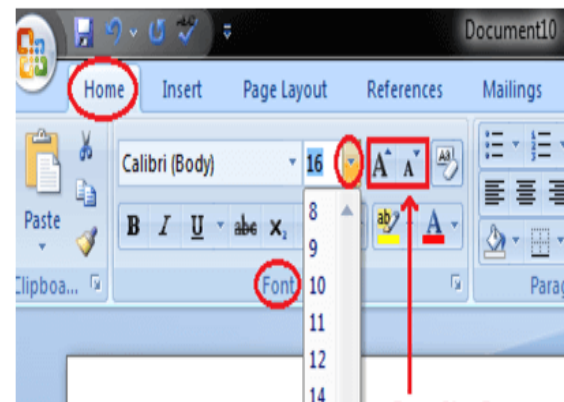
- a) Formatting refers to applying various styles or features to enhance the appearance of a document.
- b) It can also mean making a document attractive or enhancing the appearance of a document by bolding, italicizing, bordering, coloring, etc.

a) Formatting text

Change the Font & Size

You can easily change the font size of your text in the document. The basic steps to change the Font size are listed below;

1. Select the text that you want to modify
2. In Home tab locate the Font group
3. In Font group click the drop-down arrow next to font size box
4. Font size menu appears
5. Select the desired font size with a left click
6. Select the text and click the increase or decrease font size buttons



Change Font Style

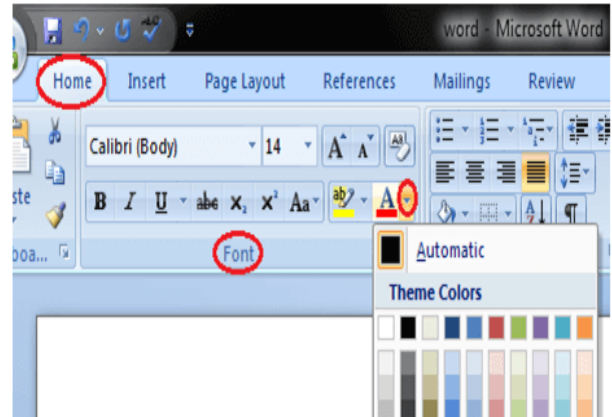
1. Select the text you want to modify
2. Select the Home tab and locate the Font group
3. Click the drop-down arrow next to font style box
4. Font style menu appears
5. With a left click select the desired font style
6. If you want to change the font to bold or italic, click the 'B' or 'I' icons on the format bar.

Format Font Color

Microsoft Word allows you to change the Font color of your text. If you want to emphasize a particular word or phrase, you can change its font color. The basic steps to change the Font color are given below;

Select the text you want to modify

1. In Home tab locate the Font group
2. Click the drop-down arrow next to Font color button
3. Font color menu appears
4. Select the desired font color with a left click
5. Word will change the Font color of the selected text.



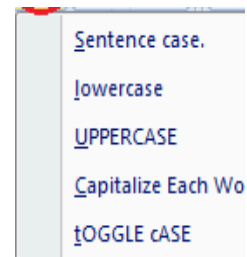
Change Text Case

The case menu offers four options;

- **Sentence case:** It capitalizes the first letter of each sentence.
- **Lowercase:** It changes the text from uppercase to lowercase.
- **Uppercase:** It capitalizes all the all letters of your text.
- **Capitalize Each Word:** It capitalizes the first letter of each word.
- **Toggle Case:** It allows you to shift between two case views, e.g. to shift between Capitalize Each Word and cAPITALIZE eACH wORD.

Select the text you want to change

1. In Home tab locate the Font group
2. Click the drop-down arrow in 'Change Case' button
3. It displays text case menu
4. Select the desired case with a left click

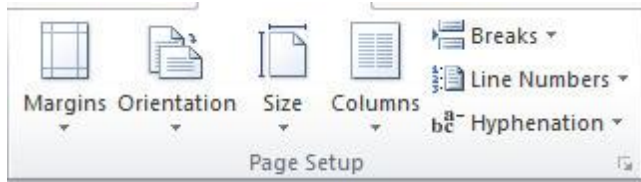


Apply automatic hyphenation.

The hyphen - is a punctuation mark used to join words and to separate syllables of a single word. The use of hyphens is called hyphenation. Non-hyphenated is an example of a hyphenated word.

Ensure that no text is selected.

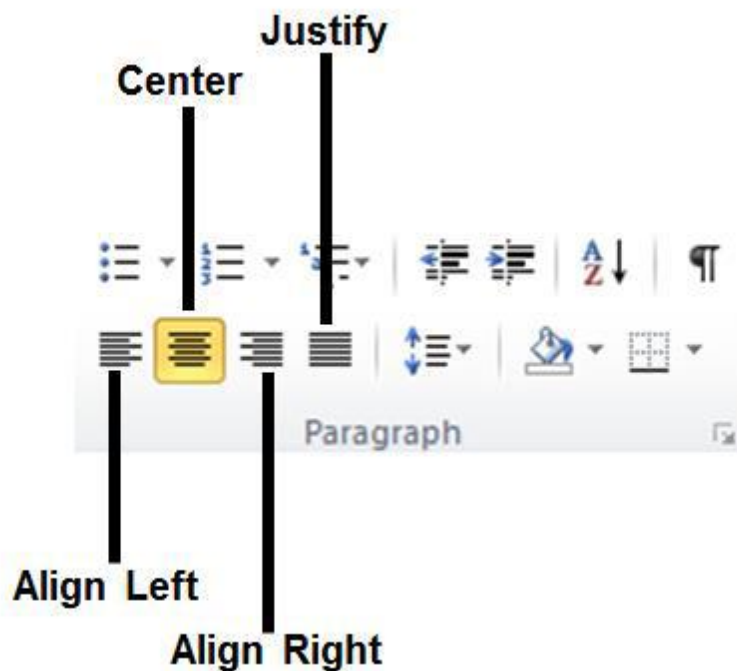
1. On the Page Layout tab, in the Page Setup group, click the Hyphenation button.
2. Click Automatic.



Change Text Alignment

You can change the text alignment in your document to make it more presentable and readable. The basic steps to change the text alignment are given below;

1. Select the content you want to modify
2. In Home tab locate the Paragraph group



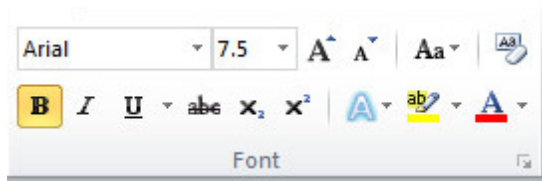
3. It has four alignment options;
 - **Align Text Left:** Aligns the text towards left margin
 - **Center:** Brings the text at center
 - **Align Text Right:** Aligns the text towards right margin
 - **Justify:** Aligns the text to both left and right margins
4. Select the desired alignment option with a left click

Bold, Italic, Underline Commands in MS Word

These commands are given in the Font group in the Home tab. Their functions are given below;

- **Bold:** It allows you to Bold the text of your document
- **Italic:** It allows you to Italicize the text of your document
- **Underline:** It allows you to underline the text of your document

- **Strikethrough:** Strikethrough portion of text will look as if a line has been drawn through the middle of it.



- 1) Select the text to format.
- 2) On the Home tab, in the Font group, click the Font Size arrow.
- 3) Select a size from the list or enter a size into the Font Size box.
- 4) Click **Strikethrough [abc]**

To change a selected portion of text into a strikethrough portion of text, follow two simple steps:
Select the portion of text that you want to change to a bold font.

1. Click **Font Strikethrough [abc]** button in the **Home tab** Font group to put a line in the middle of the text which is called strikethrough the text.

Highlight Text with Colors

You can highlight a selected portion of text using any color and it will look like it was marked with a highlighter pen. Usually we highlight a text using yellow color. It is very simple to highlight a portion of text with a color by following two simple steps

1. Select the portion of text that needs to be highlighted with color.
2. Click the **Text Highlight Color** button triangle to display a list of colors.

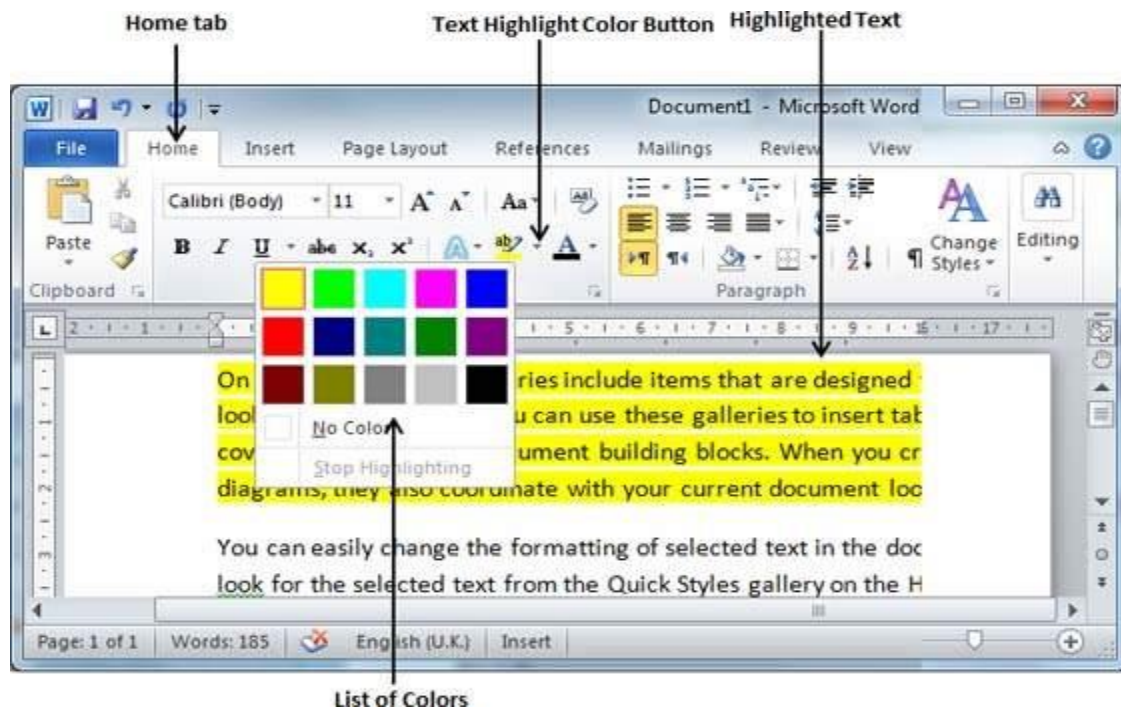


Figure 49 Highlight Text with Colors

Apply Text Effects

Microsoft word provides a list of text effect which add to the beauty of your document, especially to the cover page or the headings of the document. This is very simple to apply various text effects by following two simple steps –

1. The portion of text that you want to change to a bold font.
2. Click the **Text Effect** button to display a list of effects including shadow, outline, glow, reflection etc.

Indentation

Left indentation means to move the left edge of the paragraph inward towards the center of the paragraph. Let us use the following steps to create left indentation.

1. Click anywhere on the paragraph you want to indent left and click the **Increase Indent** button available on the **Home tab** or simply press the **Ctrl + M** keys. You can click multiple times to create deeper indentation.



Figure 50 Increasing Indent

2. You can remove left indentation by clicking the **Decrease Indent** button available on **Home tab** or simply press **Ctrl + Shift+ M** keys. You can click multiple times to remove deeper indentation.

Create a List from Existing Text

This is very simple to convert a list of lines into a bulleted or numbered list. Following are the simple steps to create either bulleted list or numbered list.

1. Select a list of text to which you want to assign bullets or numbers. You can use any of the text selection method to select the portion of text.
2. Click the **Bullet Button** triangle to display a list of bullets you want to assign to the list. You can select any of the bullet style available by simply clicking over it.

You can remove left indentation by clicking the **Decrease Indent** button available on **Home tab** or simply press **Ctrl + Shift+ M** keys. You can click multiple times to remove deeper indentation.

3. If you are willing to create a list with numbers, then click the **Numbering Button** triangle instead of the bullet button to display a list of numbers you want to assign to the list. You can select any of the numbering style available by simply clicking over it.

Spacing between Lines

Following are the simple steps to adjust spacing between two lines of the document.

1. Select the paragraph or paragraphs for which you want to define spacing.
2. Click the **Line and Paragraph Spacing Button** triangle to display a list of options to adjust space between the lines. You can select any of the option available by simply clicking over it.

Spacing between Paragraphs

You can also set distance between two paragraphs. Following are the simple steps to set this distance.

1. Select the paragraph or paragraphs for which you want to define spacing and click the **Paragraph Dialog Box** launcher available on the **Home tab**.

2. Click the **Before** spinner to increase or decrease the space before the selected paragraph. Similar way, click the **After** spinner to increase or decrease the space after the selected paragraph. Finally, click the **OK** button to apply the changes.

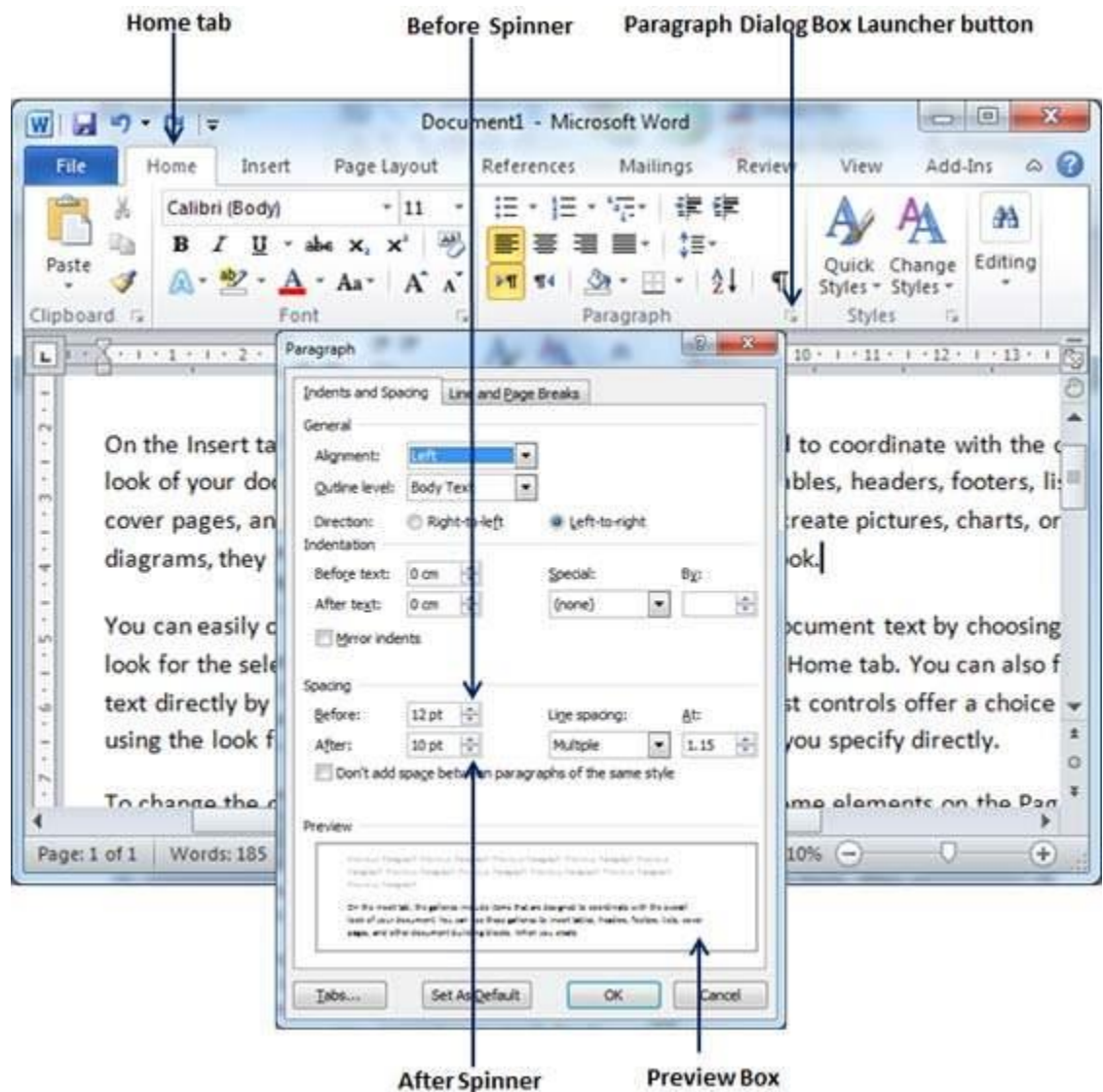


Figure 51 Spacing between Paragraphs

NOTE: You can use the **Line Spacing** option available at the dialog box to set line spacing as we have seen in previous example. You can try it yourself.

Add Borders to Text

Following are the simple steps to add border to any text or paragraph.

1. Select the portion of text or paragraph to which you want to add border. You can use any of the text selection method to select the paragraph(s).

2. Click the **Border Button** to display a list of options to put a border around the selected text or paragraph. You can select any of the option available by simply clicking over it.
3. Try to add different borders like left, right top or bottom by selecting different options from the border options.
4. To delete the existing border, simply select the No Border option from the border options.

Note – You can add a horizontal line by selecting the **Horizontal Line** option from the border options. Otherwise type --- (three hyphens) and press **ENTER**. A single, light horizontal line will be created between the left and the right margins.

Add Borders to Page

You can add borders of your choice to word pages by following the steps given below.

1. Click the **Border Button** to display a list of options to put a border. Select the **Border and Shading** option available at the bottom of the list of options as shown in the above screenshot. This will display a **Border and Shading** dialog box. This dialog box can be used to set borders and shading around a selected text or page borders.
2. Click the **Page Border** tab which will display a list of border settings, styles and options whether this border should be applied to the whole document or just one page or the first page.
3. You can use the **Preview** section to disable or enable left, right, top or bottom borders of the page. Follow the instruction given in the preview section itself.
4. You can customize your border by setting its color, width by using different art available under the style section.

Add Shades to Text

The following steps will help you understand how to add shades on a selected portion of text or a paragraph(s).

1. Click the **Border Button** to display a list of options to put a border. Select the **Border and Shading** option available at the bottom of the list of options as shown in the above screenshot. This will display a **Border and Shading** dialog box. This dialog box can be used to set borders and shading around a selected portion of text or page borders.

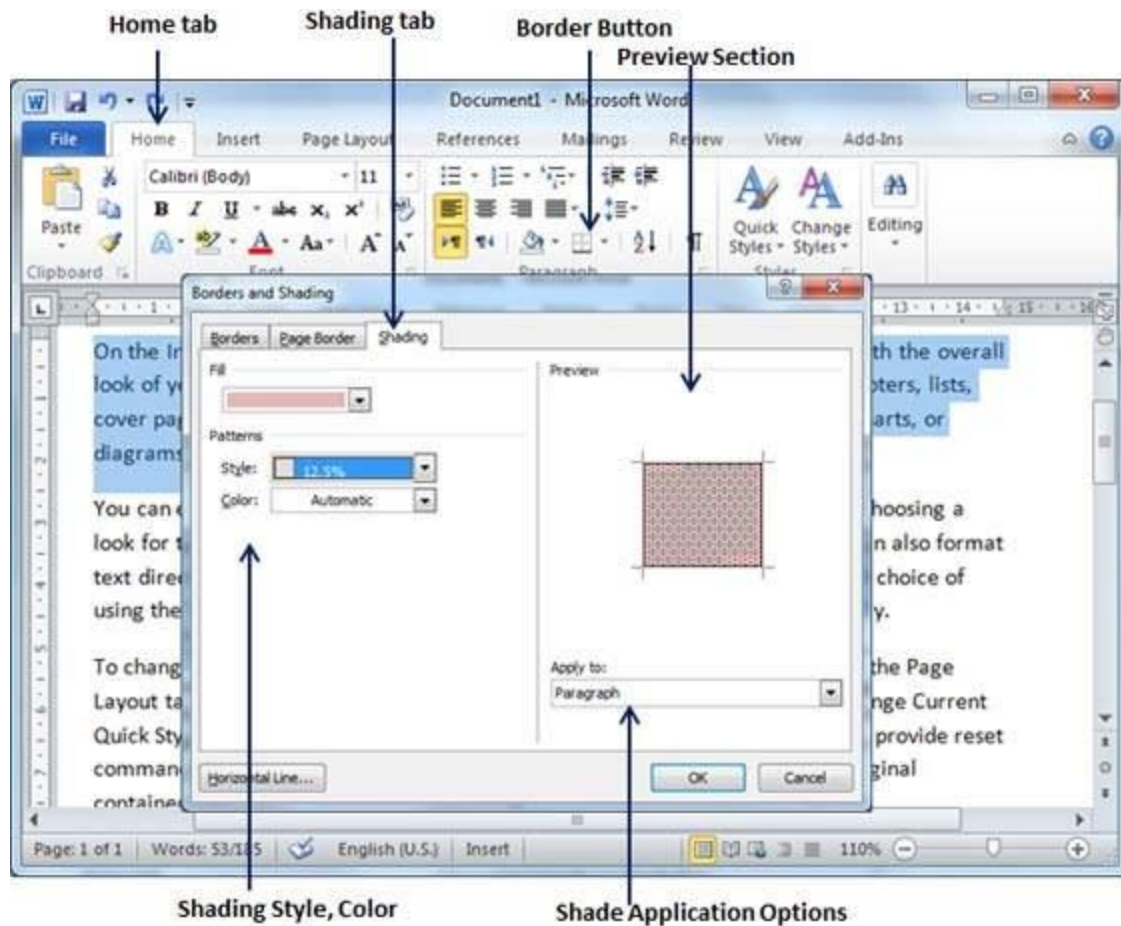


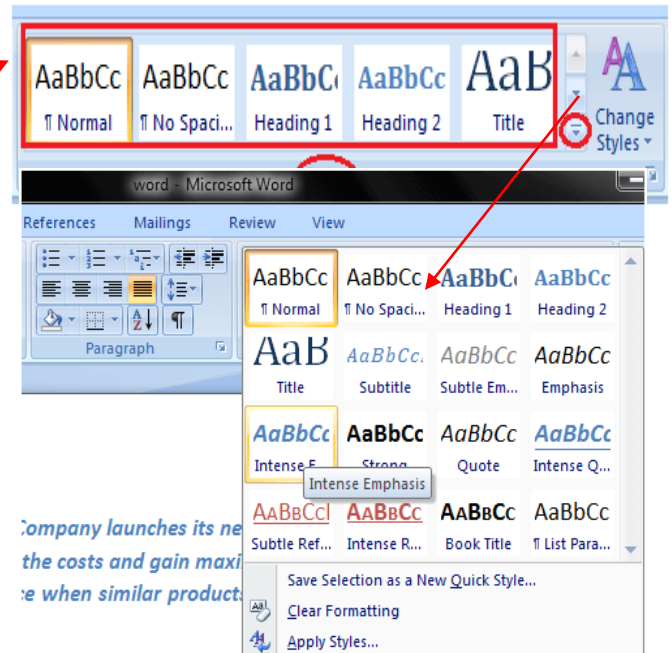
Figure 52 Borders and shading

2. Click the **Shading** tab; this tab will display the options to select **fill**, **color** and **style** and whether this border should be applied to a paragraph or a portion of text.
3. You can use the **Preview** section to have an idea about the expected result. Once you are done, click the **OK** button to apply the result.

How to Apply Style

You can create professional and presentable documents in Microsoft Word by applying different styles. The basic steps to apply a style in a document are listed below;

- Select the text to which you want to apply the style
- Select the Home tab
- In Styles group you will see different styles;
- To view more styles, click the drop-down arrow
- It displays style menu
- Select the desired style with a left-click



Copy and Apply Text Formatting

The following steps will help you understand how to copy and apply text formatting from one portion of text in your document to another portion of text in your document. The following are the steps followed in applying text formatting.

- Select the portion of text containing the formatting that you want to copy. The text which has bold and underlined font is selected as shown below.
- Click the **Home tab** and click the **Format Painter** button to copy the format of the selected text. As soon as you click the format painter button, the mouse pointer changes to a paint brush when you move the mouse over your document.
- Now you are ready to apply the copied text format to any of the selected text. So, select a text using mouse where you want to apply the copied text format. While selecting a portion of text, you have to make sure that your mouse pointer is still in paint brush shape. After selecting the text, just release the right-click button of the mouse and you will see that newly selected text is changed to the format used for the original selection. You can click anywhere outside the selection to continue working on your document for further editing.

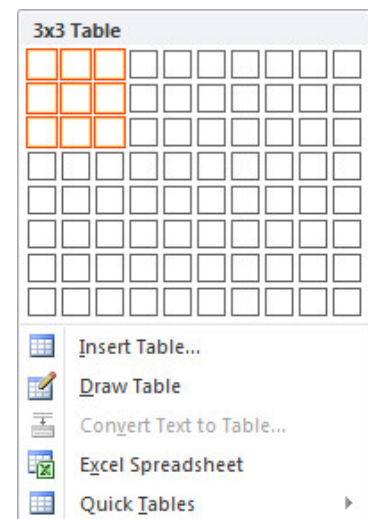


How to Insert Table

Table is a tool that allows you to organize your information in rows and columns. The steps to insert table are given below;

Place the cursor where you want to insert the table

1. Select the Insert tab
2. In Tables group click the Table command
3. It displays different options to insert the table
4. Select the desired option to insert the table



Select rows, columns, cells, entire table.

1. Click any cell in the table.
2. On the Layout tab, in the Table group, click the Select arrow.
3. Click Select Cell, Select Column, Select Row, or Select Table as required.

Insert rows.

1. Click any cell in the table.
2. On the Layout tab, in the Rows & Columns group, click the Insert Above or Insert Below button.

Insert columns.

1. Click any cell in the table.
2. On the Layout tab, in the Rows & Columns group, click the Insert Left or Insert Right button.

Delete rows and columns.

The table command also allows you to delete a column or row in your table.

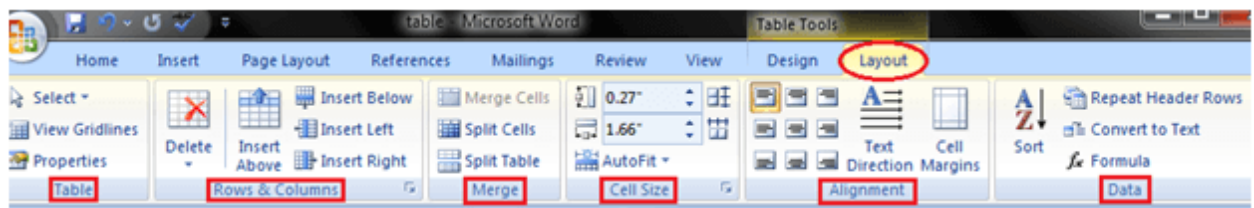
1. Select the row or column to delete
2. On the Layout tab, in the Rows & Columns group, click the Delete button
3. group, click the Delete button
4. Click Delete Rows or Delete Columns.

Modify Table

Word allows you to customize tables as per your requirement. You can modify your table in different ways, i.e. you can choose a table style, table design, draw borders. The steps to modify a table are given below;

1. Select the table
2. Two new tabs Design and Layout appear on the Ribbon
3. On Design tab you will see three groups of commands to modify table; Table Style Options, Table Styles and Draw Borders;

Layout tab has six groups of commands to format table;

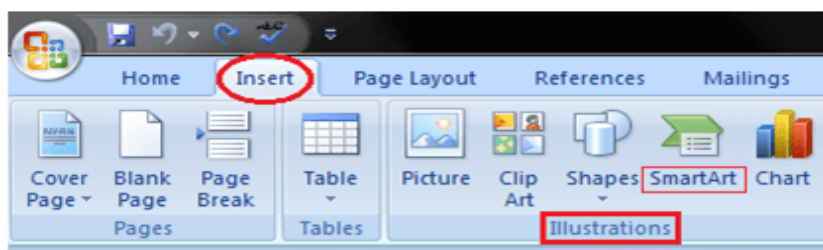


Insert an object (picture, image, chart, drawn object) to a specified location in a document.

These are the basic types of graphics that you can use to enhance your Word documents: drawing objects, SmartArt, charts, pictures, and clip art. Drawings refer to a drawing object shapes such as lines, stars, squares, polygons, and even banners. These documents are referred to as auto shapes.

The steps to insert smart art graphics are given below;

1. Click the location to insert image.
2. On the Insert tab, in the Illustrations group, click the Picture, Shapes or Chart button.



3. Navigate to the object, select the object and click Insert if required.

To draw an auto shape

1. Click insert tab
2. Click the Shapes button in the Illustrations group.
3. Select a shape.
4. Click where you want the shape to appear in the document and then drag until the shape is the size you want.



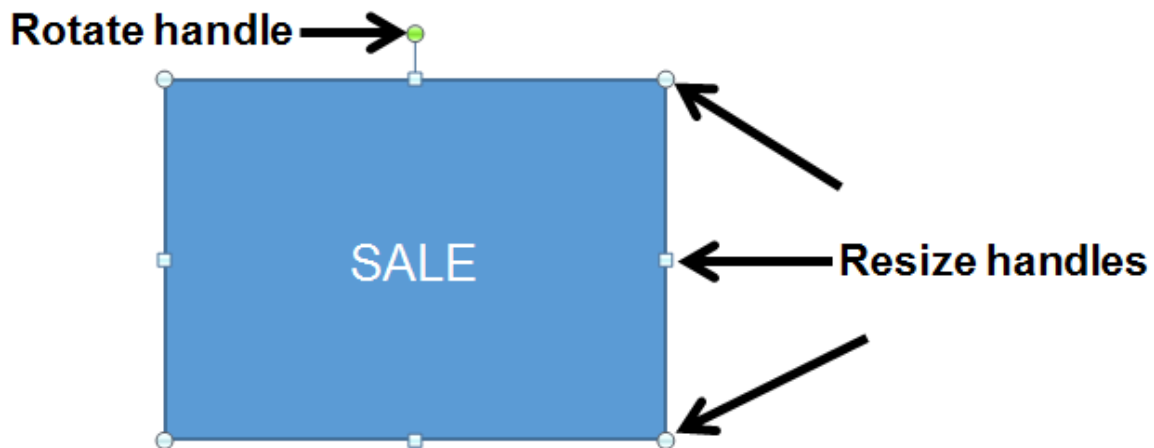
Select an object.

To select object, Click the picture, image, chart or drawn object.

Resize an object.

To resize an object, follow the following steps

1. Select the object.
2. Drag the object's sizing handles to the required size.



Selected Shape with Resize Handles on the Corners and Sides

Delete an object.

To delete object

1. Select the object.
2. Press the Delete key.

Copy an object within a document, between open documents.

1. Select the object.
2. On the Home tab, in the Clipboard group, click the Copy button.
3. Click a new location within the document or within another open document.
4. On the Home tab, in the Clipboard group, click the Paste button.

Insert Smart Art Graphics

You can insert Smart Art Graphics in your document to effectively communicate your message. You can insert a process flow, a relationship or an organization hierarchy. Place the cursor in the document where you want to insert graphics

1. Select the Insert tab
2. In Illustrations group select the 'Smart Art' command;

How to Add Text in Smart Art Graphics

Word also allows you to add text in Smart Art Graphics; you can add facts, figures and any other information. The steps to add smart art graphics are given below;

1. Select the graphic
2. Task pane appears on the left side if it is not visible then click the arrow on left side of graphic
3. Type the text in task pane fields it will appear in the graphic
4. You can also directly type the text in the graphic in text area
5. Close the task pane after entering the text and click outside the graphic

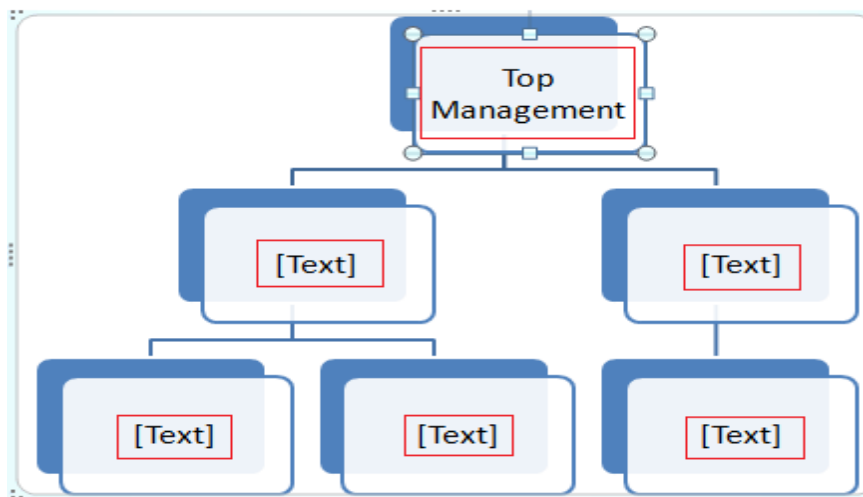


Figure 53 SmartArt Graphics
Insert Picture in Document

Pictures make our text more attractive and readable. You can insert relevant pictures in your text by following these steps;

1. Place the cursor where you want to insert the picture
2. Select the Insert tab on Ribbon
3. In Illustrations group click the Picture command;
4. It displays 'Insert Picture' dialog box
5. Select the desired image
6. Click Insert to insert the picture

Insert Clip Art

Clip art refers to a graphic or a picture that you can insert in your document. It comes in different formats and styles. It is used to enhance the appearance of a document. The steps to insert a clip art are given below;

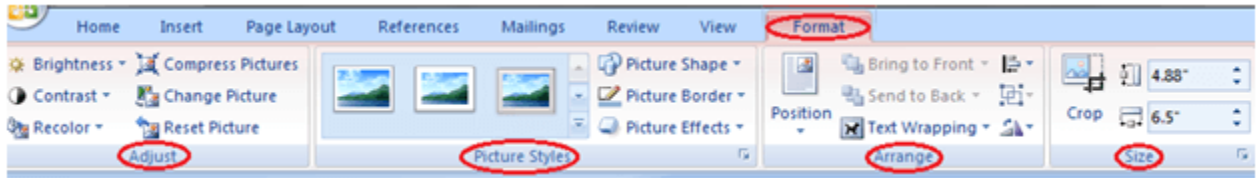
1. Place the cursor where you want to insert the clip art
2. Select the Insert tab
3. In Illustrations group click the Clip Art command;
4. A task pane appears on the right side of document
5. Enter the keyword in 'Search for' field and select the suitable option in 'Search in' and 'Results should be' fields
6. Click Go, clip art menu will appear
7. Select the desired clip art with a left click

Format Picture /Clip Art/Object

You can change the appearance of your picture or clip art to enhance its visual impact. The format tab offers you various options for formatting pictures like contrast, changing color, line style, cropping, etc. The steps to format picture or clip art are given below;

1. Select the picture or clip art or object that you want to format
2. Format tab appears in the Ribbon
3. Click the Format tab

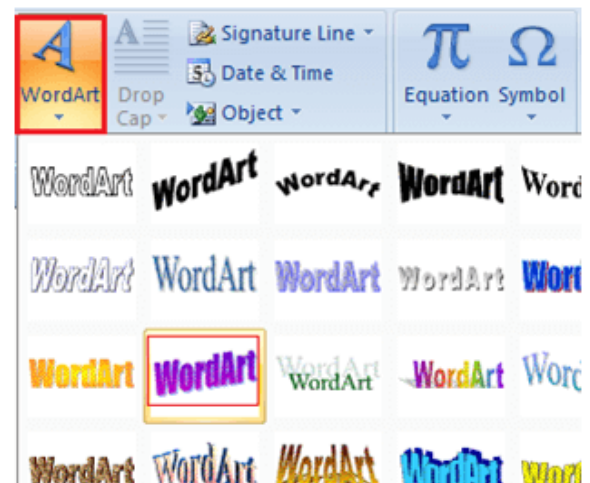
4. It displays four groups of related commands to modify or format picture or clip art



Insert WordArt

Word Art is designed to allow you make your text more attractive; you can format your text to make it look like a picture and enhance its appearance in different ways. The steps to insert WordArt are given below;

1. Place the cursor where you want to insert WordArt
2. Select the Insert tab
3. In Text group click the 'WordArt' button
4. WordArt menu appears;
5. Select the desired WordArt style
6. 'Edit WordArt Text' dialog box appears
7. Type the text in text area and click OK



Format WordArt

Word also allows you to customize WordArt. You can change WordArt shapes, font face and size, and colors as per your requirement. The steps to format WordArt are given below;

1. Select the WordArt in the document
2. Format tab appears in the Ribbon
3. It offers five groups of related commands
4. Click the suitable command to make desired changes in WordArt

Mail merging

Mail merge allows you to create multiple letters or labels using information that is stored in a list, database, or spreadsheet. The recipient's name, address, and other information can be personalized.

The basic steps in performing a mail merge are:

1. Set up the main document

Select the type of document (for example, letters, e-mails, envelopes, labels, or directories) you want to create with the mail merge. The main document should contain the components that are the same in all of the merged documents.

2. Select or create a data source

The data source contains the personalized information you want to display in the main document. You can create a new data source or use an existing data source. Examples of types of files that can be linked as data source are a Word table, an Excel file, or an Access database.

3. Insert fields

Specify where you want to insert the information from the data source into the main document.

4. Preview the merge

Preview how your document will appear when the information from the data source has been merged.

5. Complete the merge

Merge the data from the data source into the merge fields in the main document, creating a unique document for each record in the data source.

Preparation

1. On the Mailings tab, in the Start Mail Merge group, click the Start Mail Merge button.

2. Click Step by Step Mail Merge Wizard.

Ensure Letters is selected.

3. Click Next: Starting document.

Ensure Use the current document is selected. Click Next: Select recipients.

Ensure Use an existing list is selected.

4. Click Browse.

Navigate to the file required.

5. Click Open.

All records contained in the data source are displayed. Click OK.

6. Click Next: Write your letter.

7. Click Address block.

8. Click OK to accept the default settings.

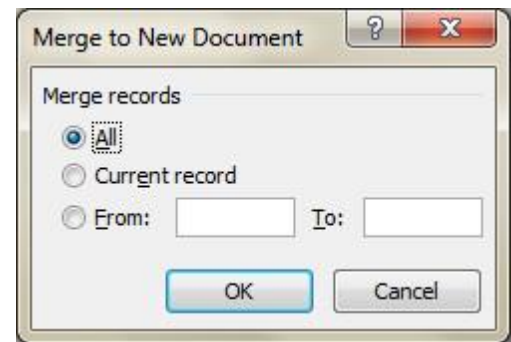
9. Click Next: Preview your letters.

10. Under Preview your letters, click the arrows next to the Recipient button to preview the letters.

11. Click Next: Complete the merge.

12. Click Edit individual letters.

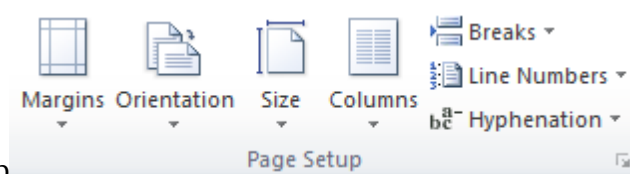
13. Select All in the Merge to New Document dialog box.



Change Page Orientation

Page Orientation refers to the direction in which a document is displayed. It is of two types; portrait (vertical) and landscape (horizontal). The default orientation is portrait; it can be changed to landscape by following these steps;

1. Select the Page Layout tab



2. Locate the Page Setup group
3. In Page Setup group click the Orientation command
4. It displays two options, Portrait and Landscape
5. Select the desired page orientation

Change Page Size

The default paper size in Word is 8.5 x 11 inches which easily fits in printers. This size is not fixed; you can change it if you want a document with different paper size. The steps to change the paper size are given below;

1. Click the Page Layout tab
2. In Page Setup group click the Size command
3. Paper size menu will appear

4. With a left click select the desired paper size
5. To customize page size click the 'More Paper Sizes' option

Change Page Margins

Margins are the space between the edge of the document and the document's text.

In the screenshot given, top, left and right margins are shown, if you will type the complete page, word will leave 1-inch bottom margin as well. Change margins of entire document: top, bottom, left, right.



On the Page Layout tab, in the Page Setup group, click the Margins button.

Click Custom Margins.

On the Margins tab, enter the required numbers in the Top, Bottom, Left and Right boxes.

Click OK.

Header and Footer

A **header** is text that appears at the top of every page, whereas a **footer** is text that appears at the bottom of every page.

To add text in headers/ Footers.

1. On the Insert tab, in the Header & Footer group, click the Header button to add headers or footer button to add footers.
2. Click a header design.

3. Enter text in the header or footer as required.

Edit text in headers.

Double-click the header area and edit text as required.

Add fields in headers, footers: date.

1. Click the header or footer.
2. On the Design tab, in the Insert group, click the Date & Time button.
3. Click a format from the Available formats list.
4. Click OK.

Page Numbers

Page numbering is the process of applying a sequence of numbers (or letters, or Roman numerals) to the pages of a book or other document.

Following are the simple steps to add page numbers in a Word document.

1. Click the **Insert tab**, and click the **Page Number** button available in the header and footer section. This will display a list of options to display the page number at the top, bottom, current position etc.
2. When you move your mouse pointer over the available options, it displays further styles of page numbers to be displayed. For example, when you take the mouse pointer at the **Bottom of Page** option it displays the following list of styles.
3. Finally, select any one of the page number styles. You will be directed to the Page Footer modification mode. Click the **Close Header and Footer** button to come out of the Footer Edit mode.

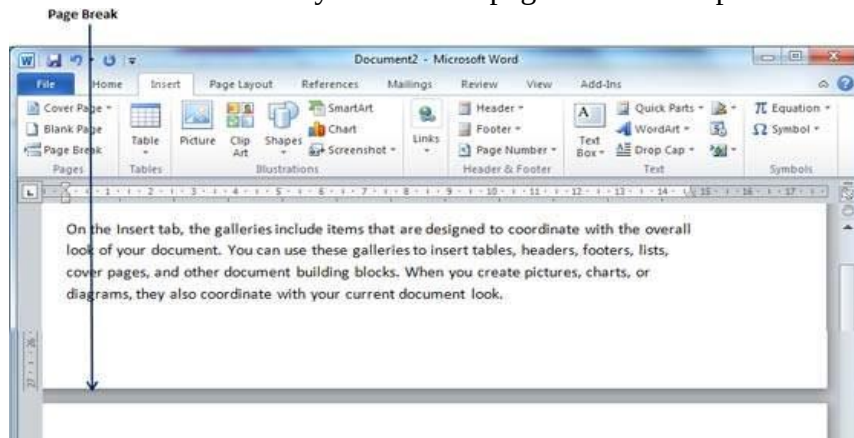
NB: You can format your page numbers using the **Format Page Numbers** option available under the listed options.

Remove Page Numbers

The following steps will help you remove page numbering from a Word document.

1. Click the **Insert tab**, and click the **Page Number** button available in the header and footer section. This will display a list of options to display page number at the top, bottom, current position, etc. At the bottom, you will have the **Remove Page Numbers** option. Just click this option and it will delete all the page numbers set in your document.

Word inserts a page break and moves all text after the page break onto a new page. You can also use the **Ctrl + Enter** keys to create a page break at the pointed location.



Print Previewing

Before printing, you can preview a document to see how the content appears on each page. The **Print Preview** feature displays the pages as they will appear when printed. If you use the **Print Preview** feature, you can avoid wasting time and paper by printing unfinished versions of a document.

To print preview a document.

1. On the File tab, click Print.
2. The document is displayed in the Preview pane.

Printing documents

The following steps will help you print your Microsoft Word document.

1. Open the document for which you want to see the preview.
2. Next click the **File** tab followed by the **Print** option which will display a preview of the document in the right column. You can scroll up or scroll down your document to walk through the document using given **Scrollbar**. The middle column gives various options to be set before you send your document to the printer.

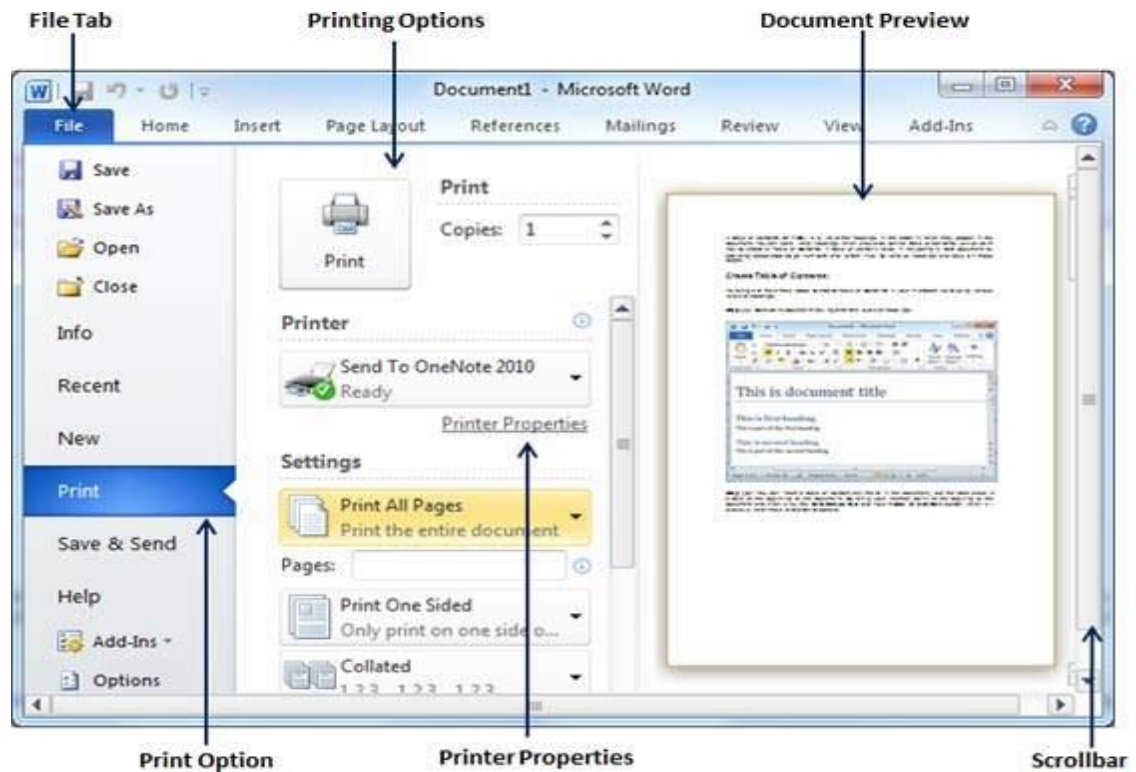


Figure 55 Print Dialogue Box

3. You can set various other printing options available. Select from among the following options, depending on your preferences.

Option and Description

- **Copies:** - Set the number of copies to be printed; by default, you will have one copy of the document.
- **Print Custom Range:** - This option will be used to print a particular page of the document. Type the number in Pages option, if you want to print all the pages from 7 till 10 then you would have to specify this option as 7-10 and Word will print only 7th, 8th, 9th and 10th pages.
- **Print One Sided:** - By default, you print one side of the page. There is one more option where you will turn up your page manually in case you want to print your page on both sides of the page.
- **Collated:** - By default, multiple copies will print Collated; if you are printing multiple copies and you want the copies uncollated, select the Uncollated option.
- **Orientation:** - By default, page orientation is set to Portrait; if you are printing your document in landscape mode then select the Landscape mode.

- **A4:** - By default, the page size is A4, but you can select other page sizes available in the dropdown list.
- **Custom Margin:** - Click the Custom Margins dropdown list to choose the document margins you want to use. For instance, if you want to print fewer pages, you can create narrower margins; to print with more white space, create wider margins.
- **Page Per Sheet:** - By default, the number of pages per sheet is 1 but you can print multiple pages on a single sheet. Select any option you like from the given dropdown list by clicking over the 1 Page Per Sheet option.

Once you are done with your setting, click on the **Print** button which will send your document to the printer for final printing.

4.2.1.4 Learning Activities

Learning Activities	Special Instruction
Visit a computer lab in your institution and carry out the following activities. <u>Activity 1</u> Using computer running Windows 10 and word processing software: • Create a new black document. • Type the name of your county in upper case • Press enter and type the list of sub counties in your county • Select the sub counties and apply bullets. • Type =rand(5) and press enter. • Select the third paragraph beginning with Themes and styles..... • Cut the paragraph selected • Paste the selected paragraph after the last subcounty. • Select the second paragraph and apply heading 1, font univers, font size 17, and highlight it. • Save the document on the desktop as Your Full Name and college number. • View the document in Full Screen Reading, Web Layout, Outline, and Draft view. • Display the Ruler. • Close the document	Avoid overcrowding to avoid accidents and damages. Do not tamper with computers and their accessories. Cover the computers after use
<u>Activity 2</u>	

- Open the saved document in **activity 1**
- Select the sub counties and apply bulleted list
- Select the second first paragraph beginning with Themes and styles... and apply the following features on the paragraphs
 - i. Bold, underline it and choose font size 15 with font verdana
 - ii. Apply first line indent on the selected paragraph
 - iii. Highlight the text to yellow
- Insert a table after the last paragraph with three rows and four columns as shown below

Month	Amount			age	County
Jan	500.00			13	Machakos
Feb	32				
March	13	13	12	43	
May					

- Insert headers containing your name and footer with centers page numbers of type page x of y.
- Print preview and save the changes.

Activity 3

1. Locate Microsoft Word and open a new document.
2. Type the following text:

He was an old man who fished alone in a skiff in the Gulf Stream and he had gone eighty-four days now without taking a fish.
Ernest Hemingway: The Old Man and the Sea (1952)

3. Italicize the text.
4. Underline the title of the story.
5. Bold the author's name.
6. Increase the font size to 17.
7. Change the font style to symbol
8. Adjust the line spacing to 2.0.
9. Spellcheck your work.
10. Use Save As to save your document on the desktop. The Old Man and the Sea.
11. Insert a picture onto your document (find an image from the internet, save it to the M drive).
12. Add a numbered list with your top three favorite authors (or movie stars, etc.).
13. Save your work.

4.2.1.5 Self-Assessment

This assessment requires you to demonstrate competence required to: Demonstrated ability to create, format, save and print documents using MS Word.

In this assessment you will be required to answer written questions:

- 1) Computer word processing includes process of?
 - a) Entering text
 - b) Editing text
 - c) Formatting document
 - d) All of the above
- 2) When starting word, default document window name is
 - a) Document 1
 - b) File 1
 - c) Word 1
 - d) Wpd 1
- 3) The following are computer application software's. Choose the old one out.
 - a) Microsoft word
 - b) Apple works
 - c) Microsoft PowerPoint
 - d) Corel word perfect
- 4) What do you understand by the following terms as used in word processing?
 - a) Editing a document
 - b) Blocking text
 - c) Printing
 - d) Saving
 - e) Italicizing text
 - f) Header
 - g) Footer
 - h) Formatting
 - i) Print previewing
- 5) The State two examples of word processors
- 6) Draw the screen layout of Microsoft office 2010 and name any 5 parts
- 7) Outline any five features of word processors
- 8) A Word processor is a tool that can be used to prepare & produce documents. Name any five documents that can be prepared.
- 9) Give any five document formatting features of a word processor.

10) What are the two reasons why it is necessary to specify the correct paper size before printing a document?

Match the shortcut or keystroke combination with the correct selection result.

Key stroke combination	Selection
1. Shift right arrow	1) Selects the current word
2. Double-click in the middle of a word	2) Selects the current sentence
3. Ctrl+Shift+right arrow	3) Selects the next character
4. Shift+left arrow	4) Selects the previous character
5. Ctrl+Shift+left arrow	5) Selects from the insertion point to the end of the current word
6. CTRL Click	6) Selects from the insertion point to the beginning of the current word

Table 2 Key Stroke Combination

4.2.1.6 Tools, Equipment, Supplies and Materials

- Software (Windows, MS Office, Antivirus, Games)
- Computer
- Printer
- Digital instructional material including DVDs and CDs;
- Storage Devices (Flash Disks, CDs, DVDs, Memory cards)
- Stationery
- internet

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Sample answers to the self- assessment

- 1) Computer word processing includes process of?
 - a) Entering text
 - b) Editing text
 - c) Formatting document
 - d) All of the above**

- 2) When starting word, default document window name is
 - a) Document 1**
 - b) File 1
 - c) Word 1
 - d) Wpd 1

- 3) The following are computer application software's. Choose the odd one out.
 - e) Microsoft word
 - f) Apple works
 - g) Microsoft PowerPoint**
 - h) Corel word perfect

- 4) What do you understand by the following terms as used in word processing?
 - a) **Editing a document** - Making changes to an already typed/existing document.
 - b) **Blocking text** - Selecting a group of text in order to work with it as a whole, e.g. a word sentence or paragraph.
 - c) **Printing**– having your work copied on a piece of paper as output
 - d) **Saving** - Storing a file/document permanently in the computer's secondary memory (e.g., hard disk) so as to be used in the future.
 - e) **Italicizing text**- making the text slant forward
 - f) **Header**- It is a standard text or information such as page numbers, chapter titles, etc. that appears above the top margin of every page in a document or in a section
 - g) **Footer**-It is a standard text or information that appears below the bottom margin of every page in a document.
 - h) **Formatting** – refers to changing the appearance of document to look attractive

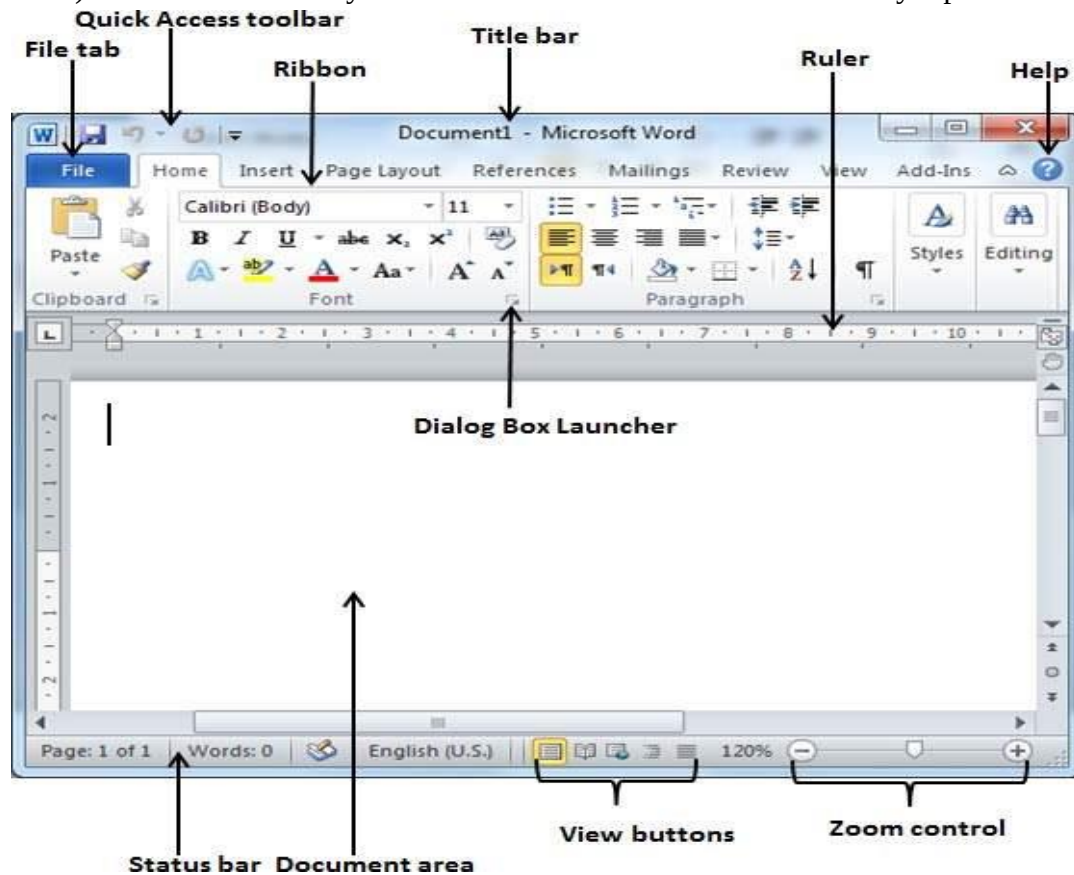
i) **Print previewing**- These refers to the act of checking how the document will appear when printed.

5) The State two examples of word processors

Microsoft word

Corel word perfect

6) Draw the screen layout of Microsoft office 2010 and name any 5 parts



7) Outline any five features of word processors

- **Print**
- **Print preview**
- **Save**
- **Create**
- **Format**
- **Edit**
- **Table**

8) A Word processor is a tool that can be used to prepare & produce documents. Name any five documents that can be prepared.

- **Writing Letters (i.e., Business & general mail).**
- **Writing Memos.**
- **Writing Books.**
- **Writing Articles, Research letters such as Reports/thesis and Term papers.**
- **Writing Essays and Projects.**
- **Writing Curriculum vitae and Resumes.**
- **Writing weekly Newsletters on sports, entertainment, etc.**
- **Writing Lease agreements and other legal documents.**

9) Give any five document formatting features of a word processor.

- **Changing font**
- **Font size**
- **Line spacing**
- **Bullets and numbering**
- **Indenting**

10) What are the two reasons why it is necessary to specify the correct paper size before printing a document?

Match the shortcut or keystroke combination with the correct selection result.

Key stroke combination	Selection
1. Shift right arrow	Selects the next character
2. Double-click in the middle of a word	Selects the current word
3. Ctrl+Shift+right arrow	Selects from the insertion point to the beginning of the current word
4. Shift+left arrow	Selects the previous character
5. Ctrl+Shift+left arrow	Selects from the insertion point to the end of the current word
6. CTRL Click	Selects current sentence

4.2.12 4.2.2 Learning Outcome 2: Apply worksheets using Microsoft Excel

4.2.2.1 Introduction to applying worksheets using Microsoft Excel

Businesses, institutions and organizations usually handle large volumes of numeric data such as sales, financial statements stock movement, student scoresheets and mathematical manipulations of all kinds. For many years' businesses have used manual spreadsheets; that is a large sheet of squared paper divided into rows and columns to analyze various types of information. Formerly accountants used the sheets of paper spread-out on their desk hence the name spreadsheet.

4.2.2.2 Performance Standard

- 4.2.2.2.1 Features of a spreadsheet are outlined
- 4.2.2.2.2 Features of Ms Excel interface are identified
- 4.2.2.2.3 Creation of a workbook and worksheet is done
- 4.2.2.2.4 Editing and formatting of a worksheet is done in accordance to the workplace procedures.
- 4.2.2.2.5 Printing of a worksheet is done

4.2.2.3 Information Sheet

Spreadsheet is a software that assists users in processing and analyzing tabular data. It is made of rows and columns that help sort, organize, and arrange data efficiently, and calculate numerical data.

Microsoft Excel is a computer application program written by Microsoft. It mainly comprises tabs, groups of commands and worksheet. It is mainly used to store tabular data and to perform calculations and analysis of data.

Data is always entered in a **cell** (intersection of a **row** and a **column**) and formulas and functions to process a group of cells is easily available.

Some of the popular spreadsheet software include Microsoft Excel, iWork Numbers, Google Sheets, etc.

Features of spreadsheet

Here is a list of activities that can be done within a spreadsheet software –

1. Data entry- This feature allows you Enter data into cells; use good practice in creating lists.
2. The software has built-in options, such as the Help function within the application to enhance productivity.
3. It allows you to Select, sort and copy, move and delete data. Sorting is arranging data in certain order while sorting is selecting data that meets a particular criterion

4. It allows you to create mathematical and logical formulas using standard spreadsheet functions; use good practice in formula creation; recognize error values in formulas.
5. Format numbers and text content in a spreadsheet.
6. It allows you to Choose, create, and format charts to communicate information meaningfully.
7. Adjust spreadsheet page settings and check and correct spreadsheet content before finally printing spreadsheets.
8. Page orientation refers to how output is printed on the page. If you change the orientation, the onscreen page breaks adjust automatically to accommodate the new paper orientation.
9. Freezing panes- If you set up a worksheet with row or column headings, these headings will not be visible when you scroll down or to the right. MS Excel provides a handy solution to this problem with freezing panes. Freezing panes keeps the headings visible while you're scrolling through the worksheet.
10. Data validation - MS Excel data validation feature allows you to set up certain rules that dictate what can be entered into a cell.
11. A header is the information that appears at the top of each printed page and a footer is the information that appears at the bottom of each printed page
12. What-If Analysis is the process of changing the values in cells to see how those changes will affect the outcome of formulas on the worksheet. Three kinds of What-If Analysis tools come with Excel: Scenarios, Goal Seek, and Data Tables.
13. Database – this is the collection of data that has been entered in a worksheet its easily related, well organized and can be easily be manipulated mathematically.
14. Printing – This is the process of converting the soft copy to hardcopy using printer.
15. Print preview – This refers to viewing how the printed sheet will appear before printing.
16. Check and correct spreadsheet content before finally printing spreadsheets.
17. Charts- A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets.

Starting Microsoft excel

To start Microsoft excel follow the following steps as indicated below:



1. Click on the **Start** button.

2. Click on **All Programs** option from the menu. 
3. Search for **Microsoft Office** from the sub menu and click it.  Microsoft Office
4. Search for **Microsoft Excel** from the submenu and click it. This will launch the Microsoft Excel application  Microsoft Excel 2010

Microsoft excel window

The following basic window appears when you start the excel application. Let us now understand the various important parts of this window.

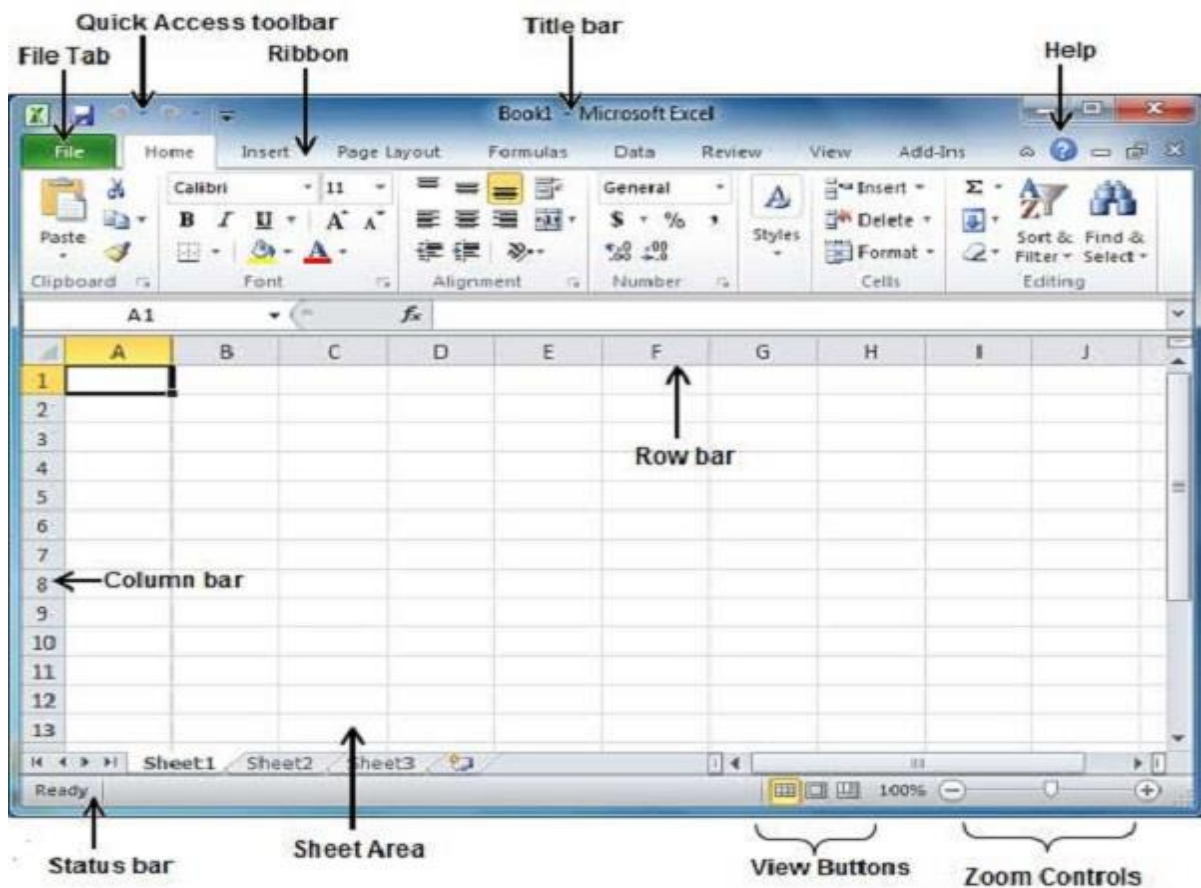


Figure 56 Ms Excel worksheet

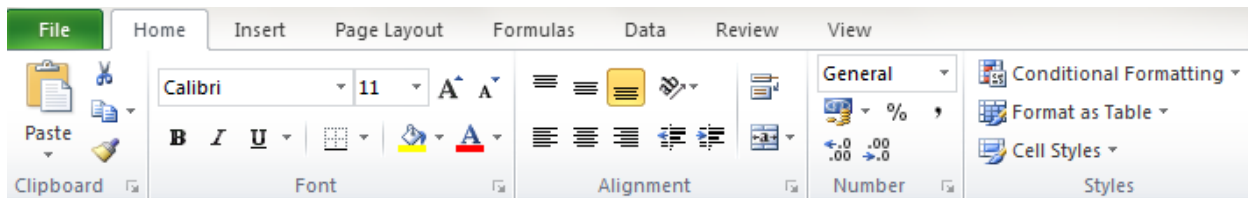
i) File Tab

The File tab replaces the Office button from Excel 2007. You can click it to check the **Backstage view**, where you come when you need to open or save files, create new sheets, print a sheet, and do other file-related operations.

ii) Quick Access Toolbar

You will find this toolbar just above the **File tab** and its purpose is to provide a convenient resting place for the Excel's most frequently used commands. You can customize this toolbar based on your comfort.

iii) Ribbon



Ribbon contains commands organized in three components:

- **Tabs** – They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are the examples of ribbon tabs.
- **Groups** – They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment etc.
- **Commands** – Commands appear within each group as mentioned above.

iv) **Title Bar:** This lies in the middle and at the top of the window. Title bar shows the program and the sheet titles.

v) **Help:** The **Help Icon** can be used to get excel related help anytime you like. This provides nice tutorial on various subjects related to excel.

vi) **Zoom Control:** Zoom control lets you zoom in for a closer look at your text. The zoom control consists of a slider that you can slide left or right to zoom in or out. The + buttons can be clicked to increase or decrease the zoom factor.

vii) **View Buttons:** The group of three buttons located to the left of the Zoom control, near the bottom of the screen, lets you switch among Microsoft excels various sheet views.

- **Normal Layout view** – This displays the page in normal view.
- **Page Layout view** – This displays pages exactly as they will appear when printed. This gives a full screen look of the document.
- **Page Break view** – This shows a preview of where pages will break when printed.

viii) **Sheet Area:** The area where you enter data. The flashing vertical bar is called the insertion point and it represents the location where text will appear when you type.

ix) **Sheet Tabs**

By default, there is one worksheet in an Excel file. The tab at the bottom of a worksheet tells you the name of the worksheet - such as Sheet1, Sheet2 etc.

- x) **Row Bar:** Rows are numbered from 1 onwards and keeps on increasing as you keep entering data. Maximum limit is 1,048,576 rows.
- xi) **Column Bar:** Columns are numbered from A onwards and keeps on increasing as you keep entering data. After Z, it will start the series of AA, AB and so on. Maximum limit is 16,384 columns.
- xii) **Status Bar:** This displays the current status of the active cell in the worksheet. A cell can be in either of the four states
 - a) **Ready** mode which indicates that the worksheet is ready to accept user input
 - b) **Edit** mode indicates that cell is editing mode, if it is not activated the you can activate editing mode by double-clicking on a cell
 - c) A cell enters into **Enter** mode when a user types data into a cell
 - d) **Point** mode triggers when a formula is being entered using a cell reference by mouse pointing or the arrow keys on the keyboard.
- xiii) **Dialog Box Launcher:** This appears as a very small arrow in the lower-right corner of many groups on the Ribbon. Clicking this button opens a dialog box or task pane that provides more options about the group.

Creating A Workbook

A Microsoft Office Excel workbook is a file that contains one or more worksheets that you can use to organize various kinds of related information. You can create a new workbook by simply opening a blank one. You can also use templates on which to base the new workbook, such as the default template provided with Microsoft Excel or templates you have created.

Create a new blank workbook

1. On the File tab, click New.
2. A blank workbook is selected, click Create.

Open an existing workbook

In addition to creating new workbooks, we'll often need to open a workbook that was previously stored.

This enables us to continue on it or edit it. Follow the following steps

1. On the File tab, click Open.
2. Select the spreadsheet(s) to open and click Open

Save a spreadsheet to a location on a drive.

You save a spreadsheet in order to use it later time. It is also done periodically, say after 10 minutes to prevent data loss in case of power failure. To save follow the following steps.

1. On the File tab, click Save.
2. Create a file name and navigate to the location required.
3. Click Save.

Save a spreadsheet as another file type like: template, text file, software specific file extension, version number.

1. On the File tab, Click Save As.
2. Click on the Save as type drop-down list and click a file type
3. Click Save.

Saving New Changes

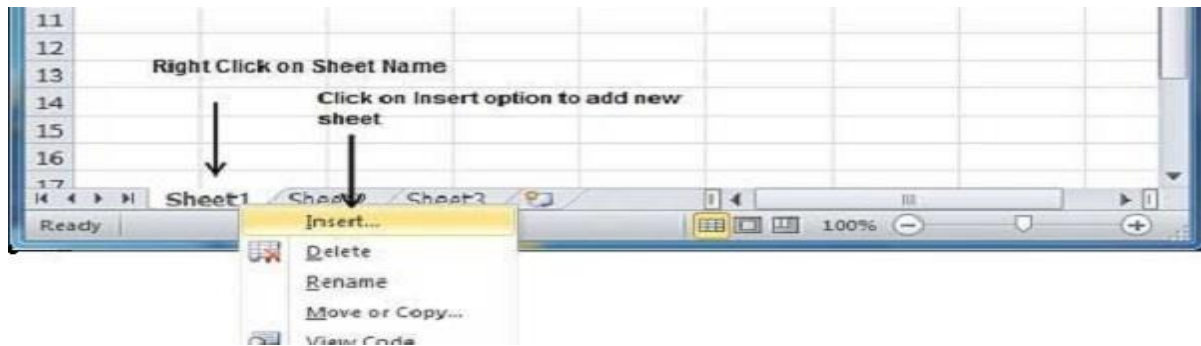
There may be a situation when you open an existing sheet and edit it partially or completely, or even you would like to save the changes in between editing of the sheet. If you want to save this sheet with the same name, then you can use either of the following simple options:

- Just press **Ctrl + S** keys to save the changes.
- Optionally, you can click on the floppy icon available at the top left corner and just above the **File tab**. This option will also save the changes.
- You can also use third method to save the changes, which is the **Save** option available just above the **Save As** option as shown in the above screen capture.

Creating new worksheet

Three new blank sheets always open when you start Microsoft Excel. Below steps explain you how to create a new worksheet if you want to start another new worksheet while you are working on a worksheet, or you closed an already opened worksheet and want to start a new worksheet.

1. Right Click the **Sheet Name** and select **Insert** option.



To rename a worksheet

Whenever we create a new Excel workbook, it will include **one worksheet** named **Sheet1**. We can rename a worksheet to reflect its content better. In this example, we will develop a training log organized by month.

1. Right-click the worksheet we wish to rename, then select Rename from the worksheet menu.
2. Type the **desired name** for the worksheet.
3. Click anywhere outside of the worksheets, or press the **Enter** on our keyboard. The worksheet will be **renamed**.

Worksheet, rows, columns and cells in excel Worksheet

Worksheet is also called spreadsheet.

Rows: Rows run horizontally across the worksheet and ranges from 1 to 1048576. A row is identified by the number that is on left side of the row, from where the row originates.

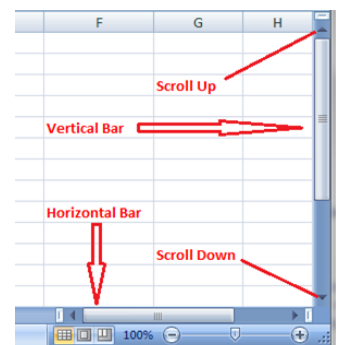
Columns: Columns run vertically downward across the worksheet and ranges from A to XFD - 1 to 16384. A column is identified by a column header that is on the top of the column, from where the column originates.

Cells: Cells are small boxes in the worksheet where we enter data. A cell is the intersection of a row and column. It is identified by row number and column header such as A1, A2.

Moving across the worksheet in Excel

There are multiple options to move across the worksheet using mouse and keyboard.

You can scroll the work sheet up or down by rolling mouse wheel or using vertical scroll bar. In a similar way, you can use horizontal scroll bar to move the work sheet horizontally towards left or right side.



How to enter data in Excel

1. Select a cell with a single click where you want to enter data; cell B3 is selected in the image given below.

2. Then double click in the cell to enter data. You can enter text, numbers and formulas in the cell.
3. After entering data, you can press Tab key to move to next column and can press Enter key to move to next row. You can press arrow keys for more options to move to other cells.

Select a cell.

- Click the cell.

Select a range of adjacent cells.

A range is a rectangular block of cells. Ranges are defined using rows and columns

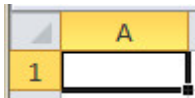
- Click the first cell and drag to the last cell in the range.

Select a range of adjacent cells.

- Click the first cell and drag to the last cell in the range.

Select an entire worksheet.

- Click the Select All button found above Row 1 and to the left of Column A.

**Select a row.**

Click the row heading.

Select a range of adjacent rows.

1. Click the first-row heading.
2. Drag to highlight through to the last row heading.

Select a range of non-adjacent rows.

1. Click the first row heading or range of rows.
2. Hold the Ctrl key down and continue highlighting additional row headings.

Select a column.

1. Click the column heading.

Select a range of adjacent columns.

1. Click the first column heading
2. Drag to highlight through to the last column heading.

Select a range of non-adjacent columns.

1. Click the first column heading or range of columns.

2. Hold the Ctrl key down and continue highlighting additional column headings.

Insert rows.

1. Click the row heading(s) above which the new row will appear.
2. On the Home tab, in the Cells group, click the Insert button.

Insert columns.

1. Click the column heading(s) immediately to the right of where the new column will appear.
2. On the Home tab, in the Cells group, click the Insert button.

Delete rows.

1. Click the row heading(s) of the rows to delete.
2. On the Home tab, in the Cells group, click the Delete button.

Delete columns.

1. Click the column heading(s) of the columns to delete.
2. On the Home tab, in the Cells group, click the Delete button.

Modify column widths to a specified value, to optimal width.

1. Click the column heading(s) of the columns to modify.
2. On the Home tab, in the Cells group, click the Format button.
3. To modify the column width to a specified value, click Column Width and enter a width.
4. Click OK.

Freeze row titles and column titles.

The Excel Freeze Panes tool allows you to lock your column and/or row headings so that, when you scroll down or over to view the rest of your sheet, the first column and/or top row remain on the screen.

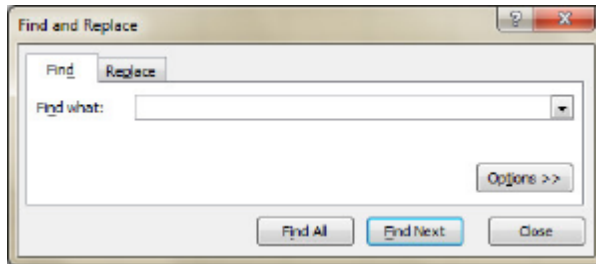
1. Select the row/ column immediately below/to right of the row/column to freeze.
2. On the View tab, in the Window group, click the Freeze Panes button.
3. Click Freeze Panes.

Unfreeze row and/or column titles.

1. On the View tab, in the Window group, click the Freeze Panes button.
2. Click Unfreeze Panes.

Use the search command for specific content in a worksheet.

1. On the Home tab, in the Editing group, click the Find & Select button.
2. Click Find.
3. Enter the word or phrase to find in the Find what box.
4. Click Find Next to select the first occurrence of the word or phrase or click Find All.
5. Click Close.



Sorting

Sort a cell range by one criterion in ascending, descending numeric order, ascending, descending alphabetic order.

1. Select the cell range to sort.
2. On the Data tab, in the Sort & Filter group, click the Sort A to Z button to sort in ascending order or click the Sort Z to A button to sort in descending order.



Auto fill

Use the autofill tool/copy handle tool to copy, automatically increment data entries. If you are entering a predictable series (e.g. 1, 2, 3...; days of the week; hours of the day) you can use the AutoFill command to automatically extend the sequence

Select the cell or cell range to copy.

1. Move the mouse pointer over the lower right-hand corner of the selected cell or cell range.
2. Use the fill handle to drag through the range required.

Formatting cell

Formatting refers to enhancing the appearance of the worksheet to make it attractive and appealing to the reader.

MS Excel Cell can hold different types of data like Numbers, Currency, Dates, etc. You can set the cell type in various ways as shown below –

- Right Click on the cell » Format cells » Number.
- Click on the Ribbon from the ribbon.

Various Cell Formats

Below are the various cell formats.

- **General** – This is the default cell format of Cell.
- **Number** – This displays cell as number with separator.
- **Currency** – This displays cell as currency i.e. with currency sign.
- **Accounting** – Similar to Currency, used for accounting purpose.
- **Date** – Various date formats are available under this like 17-09-2013, 17th-Sep-2013, etc.
- **Time** – Various Time formats are available under this, like 1.30PM, 13.30, etc.
- **Percentage** – This displays cell as percentage with decimal places like 50.00%.
- **Fraction** – This displays cell as fraction like 1/4, 1/2 etc.
- **Scientific** – This displays cell as exponential like 5.6E+01.
- **Text** – These displays cell as normal text.
- **Special** – Special formats of cell like Zip code, Phone Number.
- **Custom** – You can use custom format by using this.

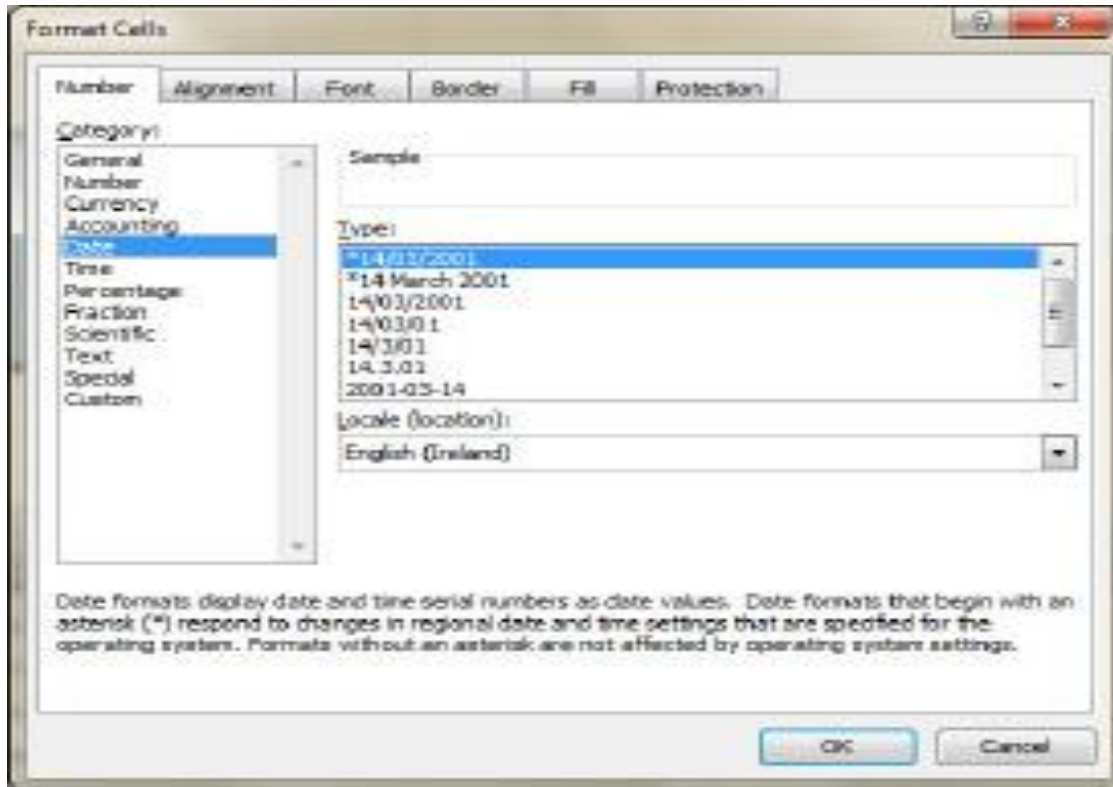


Figure 57 Format Cells

Format cells to date, currency, accounting formats

Select the cell or cell range.

1. On the Home tab, in the Cells group, click the Format button.
2. Click Format Cells.
3. On the Number tab, click the appropriate category (Date or currency or accounting category).
4. Click a date type from the Type box.
5. Click OK.

Change cell content appearance: font sizes and font type

1. Select the cell or cell range.
2. On the Home tab, in the Font group, click the Font Size arrow or font row for you to choose font.
3. Click a size from the list or enter a size into the Font Size box to choose font size or click the font into the font box.



Apply formatting to cell contents: bold, italic, underline, double underline.

Select the text to format.

1. To embolden the text, on the Home tab, in the Font group, click the Bold button.
2. To italicize the text, on the Home tab, in the Font group, click the Italic button.
3. To underline the text, on the Home tab, in the Font group, click the Underline button.
4. To double underline the text, on the Home tab, in the Font group, click the Underline arrow and click the Double Underline button.

Apply different colours to cell content, cell background.

1. Select the cell or cell range to colour.
2. On the Home tab, in the Font group, click the Fill Color arrow.
3. Click a colour.

Copy the formatting from a cell, cell range to another cell, cell range.

1. Select the cell or cell range to copy from.
2. On the Home tab, in the Clipboard group, click the Format Painter button.
3. Click the cell or cell range to apply the format.

Apply text wrapping to contents within a cell, cell range.

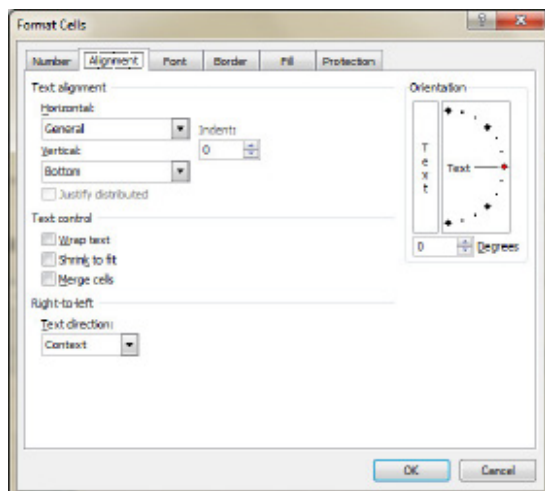
1. Select the cell or cell range.
2. On the Home tab, in the Alignment group, click the Wrap Text button.

Alignment, Border Effects

Align cell contents: horizontally, vertically

To align text

1. Select the cell or cell range.
2. On the Home tab, in the Alignment group, click the Alignment group arrow.



3. On the Alignment tab, click the alignment options required in the Horizontal and Vertical boxes.
4. Click OK.

Merge cells and center a title in a merged cell.

1. Select the cell range.
2. On the Home tab, in the Alignment group, click the Merge & Center arrow.
3. Click the merge option required.

Add border effects to a cell, cell range: lines, colours.

1. Select the cell range.
2. On the Home tab, in the Font group, click the Border arrow.
3. Click the line and colour options required.

Wrap Text and Shrink to Fit

If the text is too wide to fit the column width but don't want that text to spill over into adjacent cells, you can use either the Wrap Text option or the Shrink to Fit option to accommodate that text.

Apply text wrapping to contents within a cell, cell range.

1. Select the cell or cell range.
2. On the Home tab, in the Alignment group, click the Wrap Text button.

Formulas In Microsoft Excel

A formula consists of special code, which is entered into a cell. It performs some calculations and returns a result, which is displayed in the cell.

Create formulas using cell references and arithmetic operators (addition, subtraction, multiplication, division)

1. Click the cell to enter the formula into.
2. Enter the = (equals) sign.
3. Enter a formula using cell references and operators, for example =B3+B4.

Understand relative, absolute cell referencing in formulas.

A formula that contains **relative cell** reference will change when it is copied to other cells.

e.g = C4+C5

By default, once copied, formula cell references will become relative and change as per the cells selected.

A formula that contains **an absolute cell reference** always refers to a cell in a specific location and never changes when copied to other cells.

=**\$C\$13** The value does not change. Its usually preceded by dollar sign before the column and row.

To create an absolute cell reference press F4 after selecting the cell and the formula will fix to this cell

Functions

These are inbuilt formulas. There is a long list of Excel's built-in formulas that make it easy to perform complex mathematical operations. These formulas are organized into categories which you can view. You can use the Insert Function button to insert the basic functions.

They include; sum, average, minimum, maximum, count, counta, round functions.

To use this function, follow the following procedure

1. Click the cell to enter the formula into.
2. On the Formulas tab, in the Function Library group, click the Insert Function button.
3. Enter the function name in the highlighted Search for a function box.
4. Click Go.
5. Ensure the function is highlighted in the Select a function box.
6. Click OK.
7. Enter the arguments for the function.
8. Click OK.

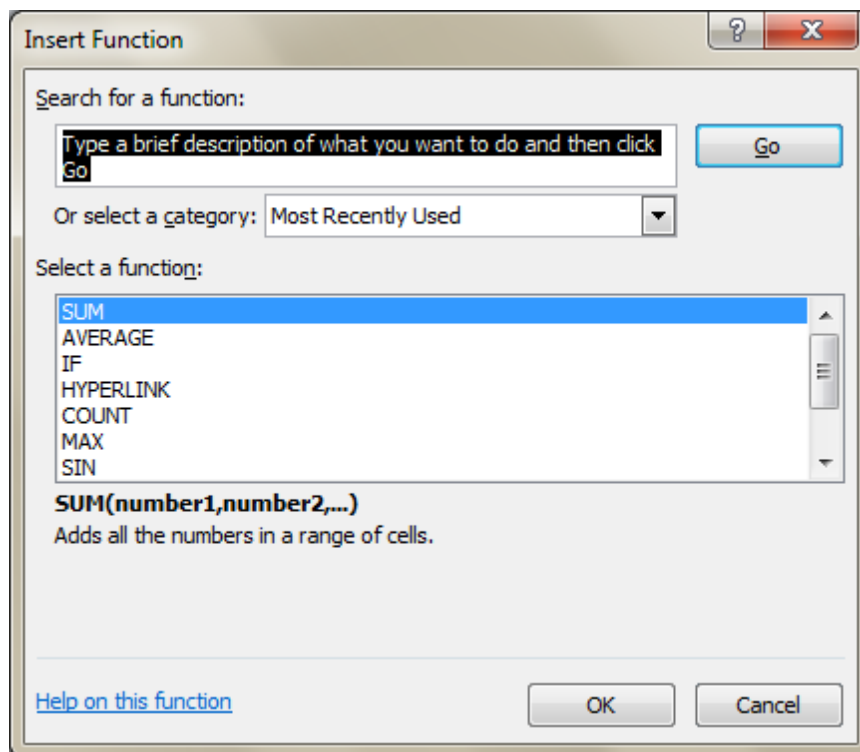


Figure 58 Insert Function

The basic functions used are:

Function	Name	Description
Sum	SUM	The sum of the values
Average	AVERAGE	The average of the values
Minimum	MIN	The smallest value
Maximum	MAX	The largest value
Count	COUNT	The number of data values
Counta	COUNTA	The number of data values in non-blank cells
Round	Round	Numbers rounded to whole numbers

Table 1: Basic Functions

Logical functions

Use the logical function if (yielding one of two specific values) with comparison operator: =, >, <.

The if function returns one value if a condition specified evaluates to TRUE and another value if it evaluates to FALSE.

1. Click the cell to enter the formula into.
2. On the Formulas tab, in the Function Library group, click the Insert Function button.
3. Enter IF in the highlighted Search for a function box.
4. Click Go.
5. Enter the arguments for the function.
6. Click OK.

Charts

A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets. Displaying data in a well-conceived chart can make your numbers more understandable. Because a chart presents a picture, charts are particularly useful for summarizing a series of numbers and their interrelationships.

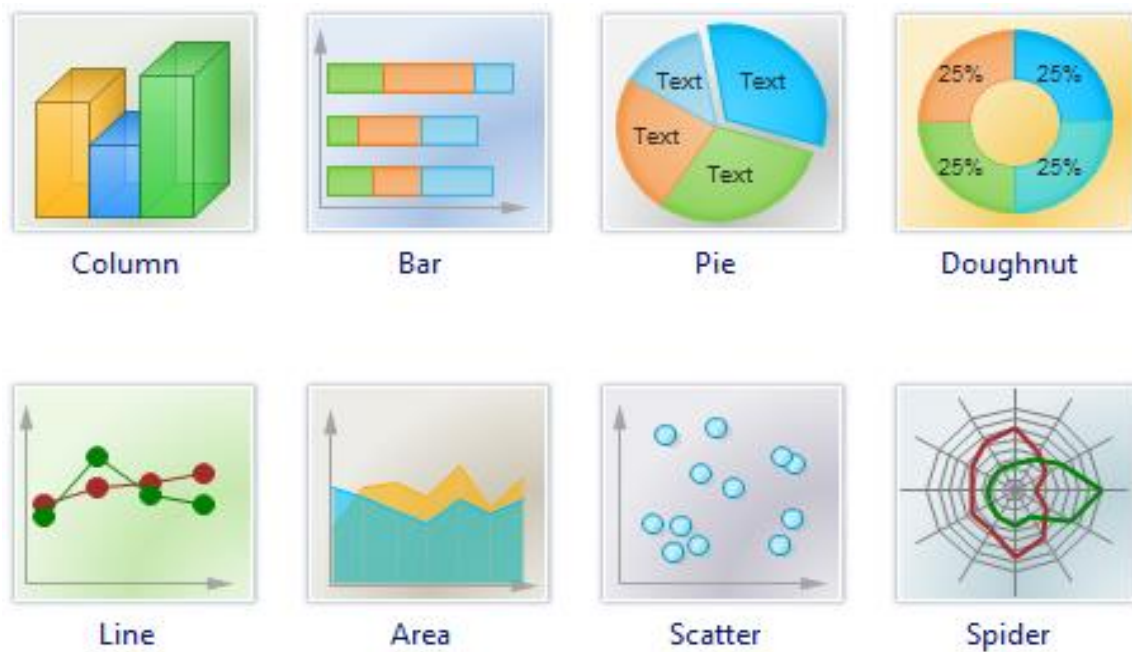


Figure 59: Types of charts

Types of Chart

- Column** – Column chart shows data changes over a period of time or illustrates comparisons among items.
- Bar** – A bar chart illustrates comparisons among individual items.
- Pie** – A pie chart shows the size of items that make up a data series, proportional to the sum of the items. It always shows only one data series and is useful when you want to emphasize a significant element in the data.
- Line** – A line chart shows trends in data at equal intervals.
- Area** – An area chart emphasizes the magnitude of change over time.
- X Y Scatter** – An xy (scatter) chart shows the relationships among the numeric values in several data series, or plots two groups of numbers as one series of xy coordinates.
- Stock** – This chart type is most often used for stock price data, but can also be used for scientific data (for example, to indicate temperature changes).
- Surface** – A surface chart is useful when you want to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.

- i) **Doughnut** – Like a pie chart, a doughnut chart shows the relationship of parts to a whole; however, it can contain more than one data series.
- j) **Bubble** – Data that is arranged in columns on a worksheet, so that x values are listed in the first column and corresponding y values and bubble size values are listed in adjacent columns, can be plotted in a bubble chart.
- k) **Radar** – A radar chart compares the aggregate values of a number of data series.

Creating Chart

To create charts for the data by below mentioned steps:

1. Select the data for which you want to create the chart.
2. Choose **Insert Tab » Select the chart or click on the Chart group** to see various chart types.
3. Select the chart of your choice and click OK to generate the chart.

Editing Chart

You can edit the chart at any time after you have created it.

- You can select the different data for chart input with **Right click on chart » Select data**. Selecting new data will generate the chart as per the new data, as shown in the below screen-shot.
- You can change the X axis of the chart by giving different inputs to X-axis of chart.
- You can change the Y axis of chart by giving different inputs to Y-axis of chart.

Edit a chart title.

- Select the chart title and edit as required.

Add data labels to a chart: values/numbers, percentages.

- Select the chart.
- On the Layout tab, in the Labels group, click the Data Labels button.
- Click the location required for the data labels.

Change chart area background colour, legend fill colour.

- Select the chart background or the legend to change.
- On the Format tab, in the Shape Styles group, click the Shape Fill button.
- Click the colour required.

Change the column, bar, line, pie slice colours in the chart.

- Click the column, bar, line or pie slice of the chart to change.

- On the Format tab, in the Shape Styles group, click the Shape Fill button.
- Click the colour required.

Printing worksheets

Before printing you must prepare the document to ensure the printed copy . This includes performing page setup.

a) Change worksheet margins: top, bottom, left, right.

- On the Page Layout tab, in the Page Setup group, click the Margins button.
- Click Custom Margins.
- On the Margins tab, enter values in the Top, Bottom, Left and Right boxes.
- Click OK.

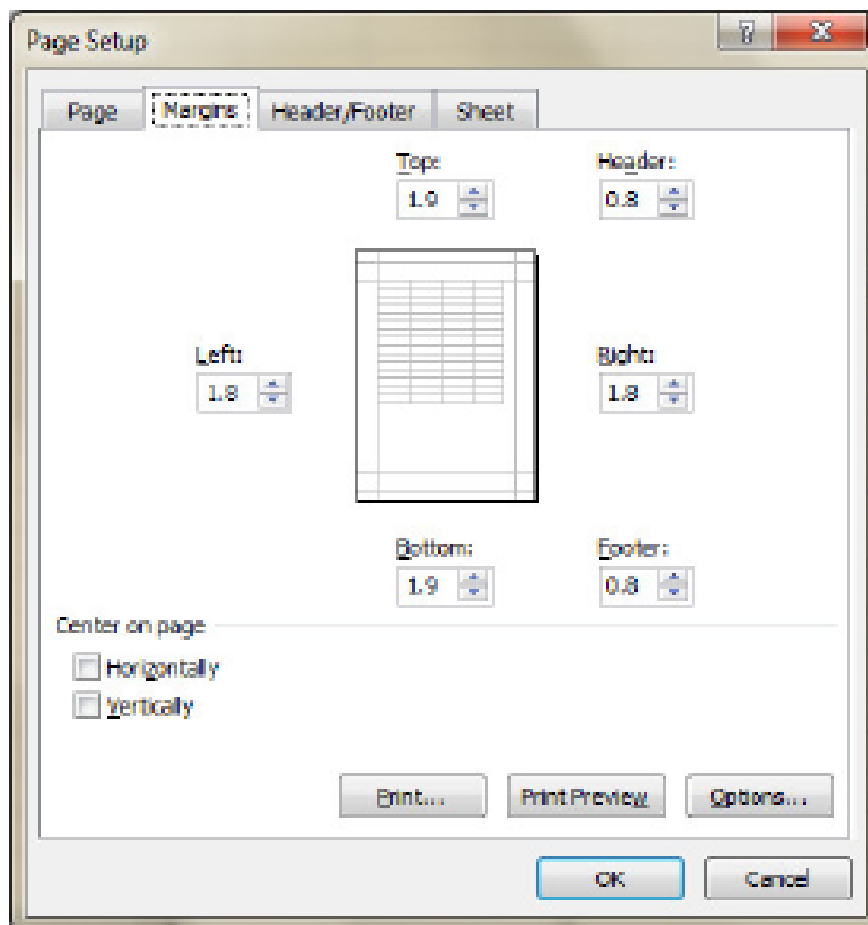
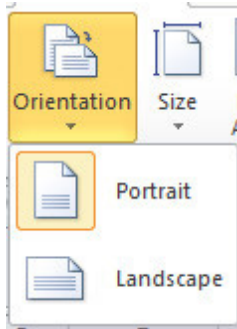


Figure 60 Page setup

b) Change worksheet orientation: portrait, landscape.

- On the Page Layout tab, in the Page Setup group, click the Orientation button.
- Click Portrait or Landscape.



Change paper size.

- On the Page Layout tab, in the Page Setup group, click the Size button.
- Click the paper size required.

Adjust page setup to fit worksheet contents on a specified number of pages.

- On the Page Layout tab, in the Scale to Fit group, click the number of pages required in the Width and Height boxes.

Add text in headers, footers in a worksheet.

- On the Insert tab, in the Text group, click the Header & Footer button.
- By default, the header section opens; to go to the footer, on the Design tab, in the Navigation group, click the Go to Footer button.
- Enter the text required in the required header and footer boxes.

Edit, delete text in headers, footers in a worksheet.

- On the Insert tab, in the Text group, click the Header & Footer button.
- By default, the header section opens; to go to the footer, on the Design tab, in the Navigation group, click the Go to Footer button.
- Edit or delete the text as required.

Apply automatic title row(s) printing on every page of a printed worksheet.

- On the Page Layout tab, in the Page Setup group, click the Print Titles button.
- Click the Rows to repeat at top box and click the row on the spreadsheet.
- Click OK.

Quick Print

If you want to print a copy of a worksheet with no layout adjustment, use the Quick Print option. There are two ways in which we can use this option.

- Choose File » Print (which displays the Print pane), and then click the Print button.
- Press Ctrl+P and then click the Print button (or press Enter).

Choosing Your Printer

To switch to a different printer, choose **File » Print** and use the drop-down control in the Printer section to select any other installed printer.

Specifying What You Want to Print

Sometimes you may want to print only a part of the worksheet rather than the entire active area. Choose **File » Print** and use the controls in the Settings section to specify what to print.

- **Active Sheets** – Prints the active sheet or sheets that you selected.
- **Entire Workbook** – Prints the entire workbook, including chart sheets.
- **Selection** – Prints only the range that you selected before choosing **File » Print**.

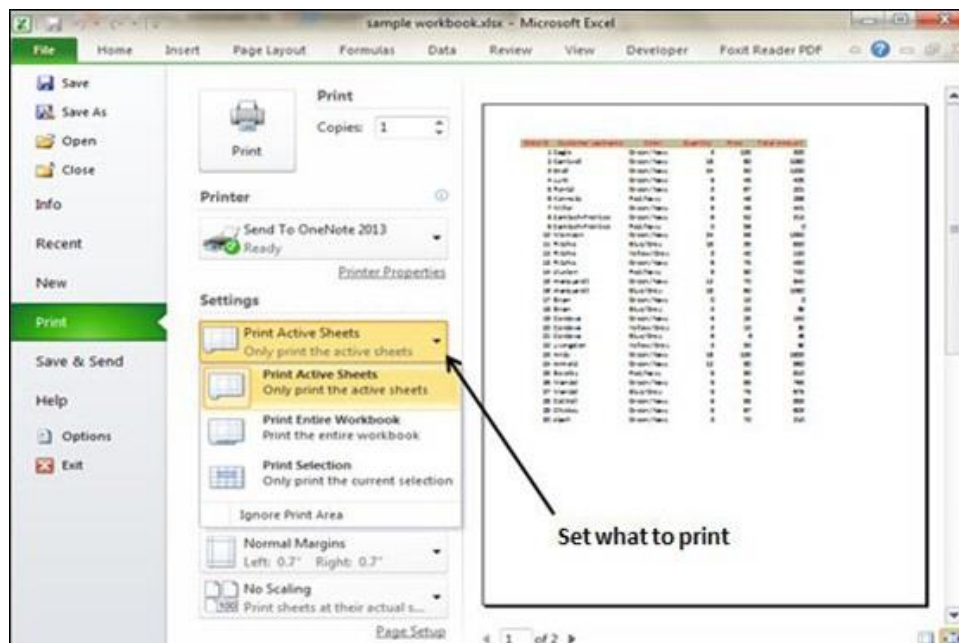


Figure 61 Quick Print

4.2.2.4 Learning activities

Learning Activities					Special Instruction																																																																										
Visit a computer lab in your institution and carry out the following activities. <u>Activity 1</u> Use the following figure to perform the tasks <table border="1"> <tr> <td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td></tr> <tr> <td>1</td><td colspan="7">Payroll</td></tr> <tr> <td>2</td><td>Date:</td><td>1/1/2011</td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>3</td><td>EMPL Number</td><td>EMPL Name</td><td>Hourly Rate</td><td>Hours Worked</td><td>Gross Pay</td><td>S.S Tax</td><td>Net Pay</td></tr> <tr> <td>4</td><td>E00001</td><td>Ford</td><td>7.5</td><td>35</td><td>?</td><td>?</td><td>?</td></tr> <tr> <td>5</td><td>E00002</td><td>Mino</td><td>8</td><td>30</td><td>?</td><td>?</td><td>?</td></tr> <tr> <td>6</td><td>?</td><td>Bell</td><td>6.5</td><td>25</td><td>?</td><td>?</td><td>?</td></tr> <tr> <td>7</td><td>?</td><td>Davis</td><td>9</td><td>40</td><td>?</td><td>?</td><td>?</td></tr> <tr> <td>8</td><td>?</td><td>Turro</td><td>10</td><td>39</td><td>?</td><td>?</td><td>?</td></tr> </table> 1. Open a new workbook and save the file with the name “Payroll”. 2. Enter the labels and values in the exact cells locations as desired. 3. Use AutoFill to put the Employee Numbers into cells A6:A8. 4. Set the columns width and rows height appropriately. 5. Set labels alignment appropriately. 6. Use warp text and merge cells as desired. 7. Apply borders, gridlines and shading to the table as desired. 8. Format cell B2 to Short Date format. 9. Format cells E4:G8 to include dollar sign with two decimal places. 10. Calculate the Gross Pay for employee; enter a formula in cell E4 to multiply Hourly Rate by Hours Worked. 11. Calculate the Social Security Tax (S.S Tax), which is 6% of the Gross Pay; enter a formula in cell F4 to multiply Gross Pay by 6%. 12. Calculate the Net Pay; enter a formula in cell G4 to subtract Social Security Tax from Gross Pay. 13. Set the work sheet vertically and horizontally on the page. 14. Save your work.						A	B	C	D	E	F	G	1	Payroll							2	Date:	1/1/2011						3	EMPL Number	EMPL Name	Hourly Rate	Hours Worked	Gross Pay	S.S Tax	Net Pay	4	E00001	Ford	7.5	35	?	?	?	5	E00002	Mino	8	30	?	?	?	6	?	Bell	6.5	25	?	?	?	7	?	Davis	9	40	?	?	?	8	?	Turro	10	39	?	?	?	Avoid overcrowding to avoid accidents and damages. Do not tamper with computers and their accessories. Cover the computers after use		
	A	B	C	D	E	F	G																																																																								
1	Payroll																																																																														
2	Date:	1/1/2011																																																																													
3	EMPL Number	EMPL Name	Hourly Rate	Hours Worked	Gross Pay	S.S Tax	Net Pay																																																																								
4	E00001	Ford	7.5	35	?	?	?																																																																								
5	E00002	Mino	8	30	?	?	?																																																																								
6	?	Bell	6.5	25	?	?	?																																																																								
7	?	Davis	9	40	?	?	?																																																																								
8	?	Turro	10	39	?	?	?																																																																								

Activity 2

Use the following figure to perform the tasks

	A	B	C	D	E
1	<u>London Team Call Statistics</u>				
2					
3	Name	No. calls	Hours worked	Calls per Hour	Bonus
4	Adam	42	5	?	?
5	Jhon	6	4	↓	↓
6	Jamse	39	6	↓	↓
7	Alex	15	6	↓	↓
8	Emma	2	7	↓	↓
9					
10	TOTAL	?	?	?	?
11					
12	Bonus Rate	25%			

1. Open a new workbook and save the file with the name “Call Statistics”.
2. Delete Sheet 2 & 3, and rename Sheet 1 to (Call Statistics).
3. Enter the labels and values in the exact cells locations as desired.
4. Set the row height of rows 1 & 3 to size 30; and rows 4 until 10 to size 20.
5. Set labels alignment appropriately.
6. Use Warp Text, Orientation and merge cells as desired.
7. Apply border, gridlines and shading to the table as desired.
8. Format column E to include euro (€) sign with two decimal places.
9. Format cell B12 to include % sign with 0 Decimal places.
10. Calculate the Calls per Hour, enter a formula in cell D4 to divide numbers of calls by Hours worked. Using AutoFill, copy the formula to the remaining cells.
11. Calculate the Bonus. Enter a formula in cell E4 to multiply ‘Calls per Hours’ by the fixed Bonus Rate in cell B12. Using AutoFill, copy the formula to the remaining

cells.

12. Calculate the 'TOTAL'.

13. Set the worksheet vertically and horizontally on the page.

14. Create a header that includes your name in the left section, and your ID number in the right section. Create the footer that includes the current Date in the center.

Activity 3

Use the following figure to perform the tasks

	A	B	C	D	E	F
1	Panda EST					
2	Monthly Sales Report - July					
3						
4	Emp. No.	Name	Salary	Sales Amount	Comission	Total Salary
5	S101	Ahmed	1600	2500	?	?
6	S105	Hassan	1800	3000		
7	S112	Ali	1500	2200		
8	S107	Waleed	2000	4500		
9	S110	Mohammed	1700	3500		
10	S103	Samir	1600	2500		
11						
12		Totals	?	?	?	?
13		Average	?	?	?	?
14		Highest	?	?	?	?
15		Lowest	?	?	?	?
16		Count	?			

1. Create the worksheet shown above.

2. Set the column widths as follows: Column A: 8, Column B: 14, Columns C & D: 15, Columns E & F: 14.

3. Enter the formula to find COMMISSION for the first employee.

The commission rate is 2% of sales, $\text{COMMISSION} = \text{SALES} * 2\%$

Copy the formula to the remaining employees.

4. Enter the formula to find TOTAL SALARY for the first employee where:

$\text{TOTAL SALARY} = \text{SALARY} + \text{COMMISSION}$

Copy the formula to the remaining employees.

5. Enter formula to find TOTALS, AVERAGE, HIGHEST, LOWEST, and COUNT values.

Copy the formula to each column.

6. Format numeric data to include commas and two decimal places.
7. Align all column title labels horizontally and vertically at the center.
8. Create a Header that includes your name in the left section, page number in the center section, and your ID number in the right section.
9. Create footer with DATE in the left section and TIME in the right section.
10. Save the file with name Exercise 3.

4.2.2.5 Self-Assessment

1) What is Microsoft Excel?

2) Explain Spreadsheet and its Basics.

3) Which data formats are available in Excel? Name some of them.

4) How can you sum up the Rows and Column number quickly in the Excel sheet?

5) What do you understand by the following terms as used in a worksheet?

6. a) A formula to add the contents of B5 and C4 was entered in Cell F5. what will it become when it is copied to Cell H8?

b) What is the reason for your answer.

7. Study the worksheet below and answer the questions that follow:

	A	B	C	D	E	F
1						
2	MAWINGU AGENCIES					
3	PRODUCT	REGION 1	REGION 2	REGION 3	REGION 4	TOTAL Sale
4	Rexona	3400	3,700	4000	4100	
5	Lifebuoy	2500	2600	2100	2500	
6	Omo	6000	6100	6300	1600	
7	Ushindi	1200	1500	1400	6400	
8	Carmel	7000	6900	7200	8000	
9	Total					
10	Maximum					
11	Average					

i) Write functions that can be entered to get total, maximum, and average of each region.

- ii) Write down the function that returns the number of sales in the four regions whose value is greater than or equal to 2000.
- iii) The function = sum (B4:E4) is entered at F5 and then copied to F8. Write down the function as it appears in the destination cell.

4.2.2.5 Tools, equipment, materials and supplies

- Software (Windows, MS Office, Antivirus, Games)
- Computer
- Printer
- Digital instructional material including DVDs and CDs;
- Storage Devices (Flash Disks, CDs, DVDs, Memory cards)
- Stationery
- internet

4.2.2.6 References

<https://www.javatpoint.com/what-is-workbook-window>

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S. Mburu, G chemwa, Longhorn secondary computer studies form 2, 2013, Longhorn publishers

J. Makori . J Mwende , K Munene , Longhorn Information communication Technology , An introductory to Course For Tvet Students , 2018, Lognhorn Publishers .

D. Mulli , D Ochieng , J. Ndengwa , J. Kioko Logon Computer studies form two , 2013 , Kenya Literature Bureau.

Answers to self assessment

1) What is Microsoft Excel?

Microsoft Excel is an electronic spreadsheet application that enables users to store, organize, calculate and manipulate the data with formulas using a spreadsheet system broken up by rows and columns. It also provides the flexibility to use an external database to do analysis, make reports, etc. thus saving lots of time.

2) Explain Spreadsheet and its Basics.

Spreadsheet can be compared to a paper ledger sheet. It consists of rows and columns and their intersection called cells.

3) Which data formats are available in Excel? Name some of them.

- Number – Stores data as a number
- Currency – Stores data in the form of currency
- Date – Data is stored as dates
- Percentage – Stores numbers as a percentage
- Text Formats – Stores data as string of texts

4) What are charts in MS-Excel?

To enable graphical representation of the data in Excel, charts are provided. A user can use any chart type, including column, bar, line, pie, scatter, etc. by selecting an option from Insert tab's Chart group.

5) How can you sum up the Rows and Column number quickly in the Excel sheet?

By using SUM function, you can get the total sum of the rows and columns, in an Excel worksheet.

6) What do you understand by the following terms as used in a worksheet?

Columns: These are the fields that make up the worksheet of a spreadsheet, and are identified by letters. They run vertically from top downwards

Rows: These are the records that form a worksheet, and are identified by numbers. They run horizontally from left to right.

Cell: A box formed when a row & a column intersect in a worksheet where the data is entered

7. a) A formula to add the contents of B5 and C4 was entered in Cell F5. what will it become when it is copied to Cell H8?

$$= D8 + E7$$

b) What is the reason for your answer.

When we move to cell H8 from F5, the column changes by 2 while the row changes by 3. The formula = B5 + C4 is also updated likewise. This is because of relative referencing.

6. Study the worksheet below and answer the questions that follow:

	A	B	C	D	E	F

1						
2	MAWINGU AGENCIES					
3	PRODUCT	REGION 1	REGION 2	REGION 3	REGION 4	TOTAL Sale
4	Rexona	3400	3,700	4000	4100	
5	Lifebuoy	2500	2600	2100	2500	
6	Omo	6000	6100	6300	1600	
7	Ushindi	1200	1500	1400	6400	
8	Carmel	7000	6900	7200	8000	
9	Total					
10	Maximum					
11	Average					

iv) Write functions that can be entered to get total, maximum, and average of each region.

- **Total = Sum (B4:B8)**
- **Maximum: = Max (B4:B8)**
- **Average: = Average (B4: B8)**

v) Write down the function that returns the number of sales in the four regions whose value is greater than or equal to 2000.

= SUMIF (B4:E4, ">=2000")

vi) The function = sum (B4:E4) is entered at F5 and then copied to F8. Write down the function as it appears in the destination cell.

= sum (B7:E7)

4.2.13 4.2.3 Learning Outcome 3: Apply database management using Ms Access

4.2.3.1 Introduction applying database management using Microsoft Access

In our daily lives we are faced with the need to keep, search, update and store reports. That's why we use tools such as diaries, and files. Traditionally people used to manage data and information using simple devices which had a number of weaknesses. These tools represented manual databases.

However, with introduction of computers and their prices going down, most people prefer creating database using electronic databases.

A database is a collection of information related to a particular subject or purpose. A collection of related data or information grouped together under one logical structure.

Examples of electronic databases include MySQL, PostgreSQL, Microsoft Access, SQL Server, FileMaker, Oracle, RDBMS, dBASE, Clipper, and FoxPro.

4.2.3.2 Performance standards

- 4.2.3.2.1 Features of a database management system are outlined
- 4.2.3.2.2 Features of Ms Access interface are identified
- 4.2.3.2.3 Creation of a database as per the user requirements is done
- 4.2.3.2.4 Manipulation of database objects is done
- 4.2.3.2.5 Printing of reports is done

4.2.3.3 Information Sheet

Database Management System: The software which is used to manage database is called Database Management System (DBMS).

Databases are crucial tools for storing, managing, and manipulating data, sorting, updating, retrieving and modifying their records in a single database; for example, they can keep and update profiles in a client base.

Data is raw, unorganized facts and details. Examples of data that could be stored in a database are:

A student's test score, An employee's ID, A vendor's email address.

Information is the processed output of data. It provides context for data. Examples are:

Average test score per subject chart

Mailing list sorted alphabetically and organized by location.

Some of the common uses of large-scale databases are:

- Airline booking systems:

These systems maintain a database of all the seats on all the available flights, allowing passengers to be quickly booked onto flights to their destination.

- Government records:

Governments all over the world rely on multiple large databases in order to function. Tax records, criminal records and social security all require sophisticated database systems.

- Bank account records:

Banks require extremely reliable databases in order to keep track of all their customer account and log transactions.

- Hospital patient details:

Medical records are stored in a database system. This system should allow your medical history to be instantly available wherever you require treatment.

Features of a Database Management System

Data storage – A DBMS should be able to store the information in a secure location.

Reporting- This is a database feature that allows displaying the contents of the report in a summary form.

Data Structuring-all information in a digital repository is organized into a clear hierarchical structure with records, tables or objects. Every piece of information that you can add to your database will be organized in a kind of catalogue, so it will be easier for you to search and update your records later on.

Data Integrity-All information in a database is accessible by several or more users but only one user can change the same piece of data at a time. This capability lets prevent database corruptions and failure.

Security – Features like multiple views offer security to some extent where users are unable to access data of other users and departments. DBMS offers methods to impose constraints while entering data into the database and retrieving the same at a later stage.

Multiple views – DBMS offers multiple views for different users. A user who is in the Sales department will have a different view of database than a person working in the Production department.

Query – DBMS is equipped with query language, which makes it more efficient to retrieve and manipulate data. A user can apply as many and as different filtering options as required to retrieve a set of data.

Consistency – Consistency is a state where every relation in a database remains consistent.

Features of Ms Access interface

The Ribbon is the long strip comprised of tabs with buttons across the top of the main window within the Access interface.

The Ribbon is designed in a way that aids you in quickly finding commands that help complete a task, and contains almost all of the primary commands for working with access. You no longer have to search commands endlessly through many menus and sub-menus.

However, the File tab still exists, as does a single toolbar called the Quick Access Toolbar. All the other commands are now found in the various tabs of the Ribbon within the interface.

- **Tabs** – These appear across the top of the Ribbon and contain groups of related commands. Home, create, external data, Database tools.
- **Groups** – They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment, etc.
- **Commands** – Commands appear within each group as mentioned above.

Contextual tabs appear on the Ribbon when an object requiring additional functionality is selected. For example, selecting a table in Access will display Table Tools contextual tabs on the Ribbon.



Contextual tabs

Quick access toolbar

By default, the Save, Undo, and Repeat/Redo buttons appear on the Quick Access Toolbar. If you regularly use a few buttons that are scattered on various tabs of the Ribbon and you do not want to switch between tabs to access the buttons or crowd the Ribbon with a custom tab, you might want to add these frequently used buttons to the Quick Access Toolbar. They are then always visible in the upper-left corner of the program window.

Clicking the Customize Quick Access Toolbar button at the right end of the Quick Access Toolbar displays a menu that lists commonly used commands.

Clicking the Customize Quick Access Toolbar button at the right end of the Quick Access Toolbar displays a menu that lists commonly used commands.

Check marks appear to the left of commands currently available on the Quick Access Toolbar. You can click these commands to remove them, and click other commands to add them.

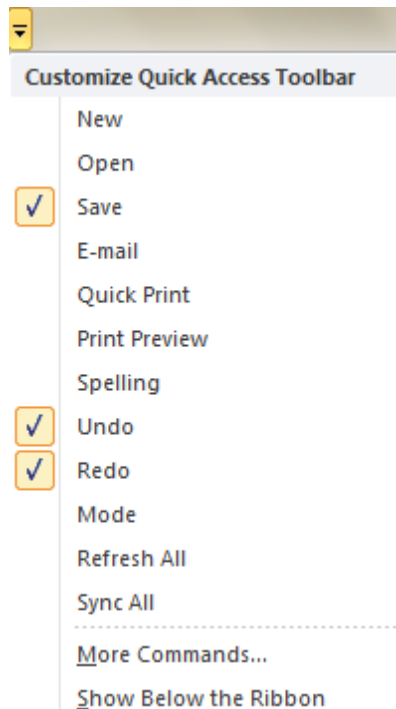


Figure 62 Customizing Quick Access Toolbar

Understanding database objects

An Access database can contain various types of database objects, including tables, queries, forms, reports, macros and modules. The following section briefly introduces the four main database objects. All database objects can be accessed from the Navigation Pane.

1. **Tables:** The basic building block of any database is a table. A database table is similar in appearance to a list or spreadsheet, in that the data is stored in rows and columns.

A database can have many tables. A table should only contain records related to a particular subject. When tables contain data related to a single subject type, it is easier to search for and locate data. For example, you may have a table called customers containing information about your customers with a separate table called orders. You can then link the tables by creating a relationship, connecting each customer with their associated orders.

2. **Queries:** Queries allow users to locate data from one or more tables according to specific search criteria. The data you want to retrieve may be stored in several tables, and a query allows you to view data from several tables in a single datasheet. In addition, because you generally do not want to see all the information at once, queries allow you select certain fields and add criteria to retrieve only specific records.

The result of a query is called a record set or result set. You can view the result set on the screen, print it, copy it to the clipboard, or use the output of the query as the record source for a form or report.

3. **Forms:** Forms are commonly used as data entry screens. They are user-friendly interfaces for working with data, and they often contain elements and command buttons that make entering data and performing various other tasks quick and easy.
4. **Reports:** You use reports to print and summaries data. Each report is formatted to present the information in the most readable way possible. You can format any report to fit your requirements and you can create custom reports as well.
5. **Macros** - This is a feature that will allow you to automate task , for example opening a particular file.

Database Organization

Understand that each **field** in a table should contain only one element of data. For example, first name in one field, surname in second field.

Records – is a collection of related fields that represent single entity. Example in a student database is student name.

Tables – This refers to a collection of related records. Example student file in a school database.

Database- this is the highest in data organization hierarchy . For example college database may contain student file and trainers file.

Starting access

To start **Microsoft Access 2010**:

1. Click the Start button.
2. Select All Programs.
3. Click Microsoft Access 2010.

Open a database.

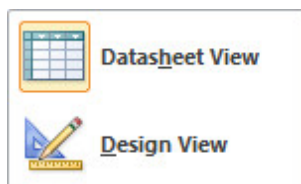
Databases residing in your computer or on a shared network drive can be opened by starting Microsoft Access and then selecting Open command from the File tab.

Create a new database and save to a location on a drive.

1. On the File tab, click New.
2. By default, a blank database is selected.
3. Beside the File Name box, click the Folder button.
4. Navigate to the location required.
5. Click OK.
6. Click Create.

In Design view, you first create the structure of the new table. Then, you can either switch to Datasheet view to enter data or you can also use a form to enter data.

Design view also allows you to specify the field name, data type and additional information for each field in the Description column.



Data types

Every field in a table has properties and these properties define the field's characteristics and behavior. The most important property for a field is its data type. A field's data type determines what kind of data it can store. MS Access supports different types of data, each with a specific purpose.

- The data type determines the kind of the values that users can store in any given field.
- Each field can store data consisting of only a single data type.

Here are some of the most common data types you will find used in a typical Microsoft Access database.

• Text	Text numbers or both up to 255 characters
• Memo	Text numbers or both up to 63999characters
• Number	Numbers used in calculations
• Date/Time	Date times or both up to 8 bytes
• Currency	values prevents rounding
• AutoNumber	Unique sequential numbers automatically added to field
• Yes/No	True/False On/Off
• OLE	Object Documents created in other File programs
• Hyperlink	Hyperlink to a UNC path or URL up to 2048 characters

- **Lookup Wizard** Create a field that allows the choice of a value from another table or list

Description of field properties

Field Properties - A set of characteristics that control how the field is stored, entered, or displayed

Understand what a primary key is.

- It uniquely identifies each record in a table to avoid data duplication and to allow faster data access. Examples include Order ID, Product ID, Customer ID

tblInventory			
	Field Name	Data Type	Description (Optional)
🔑	ID	AutoNumber	InventoryID gets generated automatically
	Item	Short Text	Enter Item Name
	Description	Long Text	Enter Item Description
	Category	Short Text	Enter Item Category
	Location	Short Text	Enter Location
	Supplier	Number	Enter Supplier Number
	Manufacturer	Short Text	Enter Manufacturer Name
	Model	Short Text	Enter Model Number
	Reorder Level	Number	Enter Reorder Level
	Target Stock Level	Number	Enter Target Stock Level

Field Properties

General	Lookup
Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	0
Validation Rule	
Validation Text	
Required	No
Indexed	No
Text Align	General

Figure 63 Field Properties

The different field properties include:

- Field Size.**
The Field Size property defines/ controls the maximum no. of characters that can be entered/ stored in a Text or Number field.

- (ii). Understand what an **index** is. Understand how it allows for faster data access. It helps find and sort records faster.
- (iii). Format. -The Format property specifies how (the way) data is displayed in a field & printed. Number & Currency fields provide predefined display formats. They include Currency, Fixed, General, Percent, Scientific, General data, Medium date, Medium time.
- (iv). Decimal places.
It is used to define the no. of decimal places in values.
- (v). Default value.
It allows you to define a value that will automatically be inserted into the field as you add new records. It is used in Text and Memo fields.
- (vi). Validation Rule.
It allows you to create an expression or a formula that will test data when being entered into the field.

It automatically rejects faulty/flawed entries, e.g., entering very large or very small figures in the Age or Salary fields.

Validation Rule	Description
Between 18 and 55	Limits an age field from 18 to 55.
<10000	Allows any value less than 10000

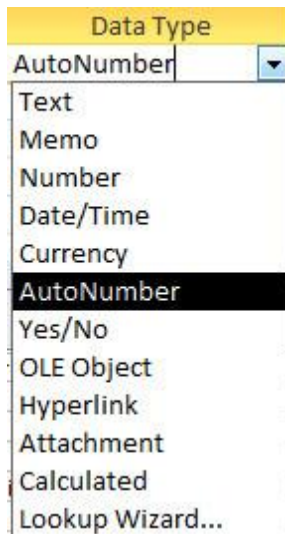
- (vii). Validation Text.
Defines an error message that will be displayed when the validation rule is violated/broken.
- (viii). Required. - It controls the entry of important fields.
When this option is set to YES, an entry must be made within that field, i.e., it ensures that the field is not left blank.
- (ix). Input Mask.- Lets you define a pre-formatted pattern for the entry of data into a Date or a Text field. The data in that field must conform to a pattern.
- (x). Caption.-This is an alternative name used (other than the fieldname) in order to appear in the fieldname header button in Table datasheet view and as a label in Forms.

Design a table

1. Create and name a table.
2. On the Create tab, in the Tables group, click the Table button.
3. On the Fields tab, in the Views group, click the View button.
4. Click Design View.
5. When prompted, enter a name for the table and click OK.

Specify fields with their data types like: text, number, date/time, yes/no.

1. In Design View, click the Data Type column for the field.
2. Click the drop-down menu and click a Data Type.



Apply field property settings: field size, default value.

1. In Design View, click a field row.
2. On the General tab at the bottom of the window, click the Field Size or Default Value box.
3. Enter or modify values as required.

Apply field property settings: number format, date/time format.

1. In Design View, click a field.
2. On the General tab at the bottom of the window, click the Format box.
3. Click the drop-down arrow and select a Format.

Create a validation rule for number, date/time, currency.

1. In Design View, click a field.
2. On the General tab at the bottom of the window, click the Validation Rule field.
3. Enter the validation rule required.

Set a field as a primary key.

1. In Design View, click the field to select as the primary key.
2. On the Design tab, in the Tools group, click the Primary Key button.

Index a field (with, without duplicates allowed).

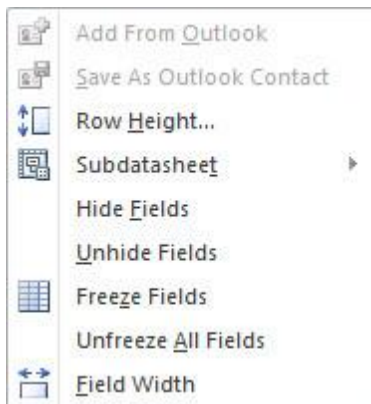
1. In Design View, click the field row.
2. On the General tab at the bottom of the window, click the field property Indexed.
3. Click the drop-down list and click Yes (No Duplicates).

Add a field to an existing table.

1. In Design View, click an empty field row.
2. Enter a new field name.
3. Click a Data Type from the drop-down list.

Change width of columns in a table.

1. In Datasheet View, select the column heading.
2. On the Home tab, in the Records group, click the More button.
3. Click Field Width.
4. Enter a width in the Column Width box.
5. Click OK.

**Using Related Tables**

A relationship helps you combine data from two or more different tables. Each relationship consists of fields in two tables, with data that corresponds.

Tables can be joined, or related, in order to access and coordinate information in all the fields of the related tables. Joining tables is a useful way to avoid entering duplicate information in various, related tables

A relationship is built by matching a unique field within one table with a field within another table. The fields must have the same data types and field size.

Access has three forms of relationships

1. One-to-many
2. One-to-one
3. Many-to-many.

A one-to-many relationship occurs when one record from the primary table matches many records from the related table (e.g., one customer record matches many order records).

A one-to-one relationship occurs when one record from the primary table matches one record from the related table. Access determines the relationship type automatically when you create the relationship.

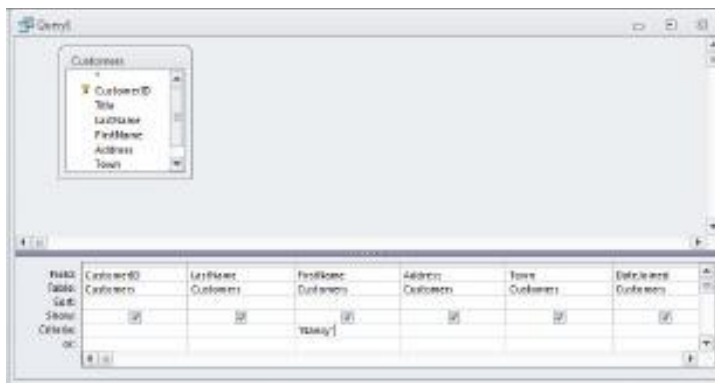
A many-to-many relationship occurs when a number of records from the primary table match a number of records in the related table (e.g. when dealing with Products and Orders, each record in t

Queries

Queries allow users to locate data according to specific search criteria.

Create a named single table query using specific search criteria.

1. On the Create tab, in the Queries group, click the Query Design button.
2. Select the table to add from the Show Table window.
3. Click Add and then click Close.
4. Click and drag the fields required into the Field row in the window below.
5. Click the Criteria box of the field to query.
6. Enter the query criteria.
7. Close the query and click Yes to confirm save.
8. Enter the name required in the Query Name box.
9. Click OK.



Create a named two-table query using specific search criteria.

1. On the Create tab, in the Queries group, click the Query Design button.
2. Select the two tables to add from the Show Table window.
3. Click Add and click Close.
4. Click and drag the fields required into the Field row in the window below.
5. Click the Criteria box of the field to query.
6. Enter the query criteria.
7. Close the query and click Yes to confirm save.

8. Enter the name required in the Query Name box.
9. Click OK.

Adding Criteria in a query

Add criteria to a query using one or more of the following operators: = (Equal), <> (Not equal to), < (Less than), <= (Less than or equal to), > (Greater than), >= (Greater than or equal to).

1. In Design View, click into the Criteria box of the field to be queried.
2. Enter the criteria using an arithmetic operator.

Using wildcards

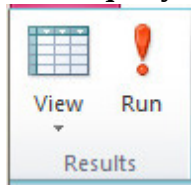
Use a wildcard in a query, * or %, ? or _.

1. In Design View, click into the Criteria box of the field to be queried.
2. Enter the criteria using a wildcard.

Edit a query: add, modify, remove criteria.

1. In Design View, click into the Criteria box of the field to be queried.
2. Add, modify, or remove criteria as required.

Run a query.



1. On the Design tab, in the Results group, click the Run button.

Forms / Input screens

Forms are used to display and maintain records.

Forms allow users to navigate through records and add, delete, or modify records as needed.

Create and name a form.

1. Select a table or query.
2. On the Create tab, in the Forms group, click the Form button.
3. Close the form and when prompted, click Yes to save.
4. Enter the name required in the Form Name box.
5. Click OK.

Use a form to delete records, modify or add .

1. Ensure the form is open.
2. Select the record to delete.
3. On the Home tab, in the Records group, click the appropriate button.
4. Click on Record.
5. Click Yes to confirm.

Reports

Reports allow users to create a printed copy of all or selected data for greater ease of reference and understanding. Although you can print records from a table or form, a report provides more precise control over the final output. Reports can include page headers and footers, calculated totals and subtotals, and even graphics. In addition, reports can be used for invoices, orders, presentations, and mailing labels.

Create and name a report based on a table, query.

1. Select a table or query.
2. On the Create tab, in the Reports group, click the Report button.
3. Close the report and, when prompted, click Yes to save and then confirm the name of report and click OK.

Add text in headers, footers in a report.

1. In Design View, on the Design tab, in the Controls group, click the Label button.
2. Click and drag to place in the header or footer of the report.
3. Add the text required.

The screenshot shows the Microsoft Access interface. The 'All Access Objects' task pane on the left lists various queries, with 'qryLateProjects' highlighted. The main window displays a report titled 'All Access Objects' with the following data:

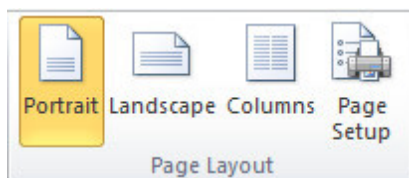
Project Name	Task Title	Due Date	Percent Complete
Azure Waves	Create Story Board	6/26/2013	0%
Azure Waves	Create Character Postcards	7/1/2013	0%
Cash in King: How to Cut Your Spending by Carrying Cas	Create Outline	6/14/2013	25%
Cash in King: How to Cut Your Spending by Carrying Cas	Hire Technical Reviewer	6/14/2013	0%
The Potion, the Scroll, and the Cauldron	Edit Chapter 16	6/21/2013	0%
The Potion, the Scroll, and the Cauldron	Write Chapter 17	6/21/2013	0%
The Potion, the Scroll, and the Cauldron	Edit Chapter 17	6/28/2013	0%
The Potion, the Scroll, and the Cauldron	Write Chapter 18	6/28/2013	0%
The Potion, the Scroll, and the Cauldron	Edit Chapter 18	7/5/2013	0%
The Potion, the Scroll, and the Cauldron	Write Chapter 19	7/5/2013	0%
The Potion, the Scroll, and the Cauldron	Edit Chapter 19	7/12/2013	0%
The Potion, the Scroll, and the Cauldron	Write Chapter 20	7/12/2013	0%
The Potion, the Scroll, and the Cauldron	Edit Chapter 20	7/19/2013	0%
The Potion, the Scroll, and the Cauldron	Complete Final Revisions	8/2/2013	0%
The Potion, the Scroll, and the Cauldron	Copry Edit Chapters 1-5	8/9/2013	0%
The Potion, the Scroll, and the Cauldron	Layout Chapters 1-5	8/16/2013	0%
The Potion, the Scroll, and the Cauldron	Copry Edit Chapters 6-10	8/16/2013	0%
The Potion, the Scroll, and the Cauldron	Layout Chapters 6-10	8/23/2013	0%
The Potion, the Scroll, and the Cauldron	Copry Edit Chapters 11-15	8/23/2013	0%
The Potion, the Scroll, and the Cauldron	Layout Chapters 11-15	8/30/2013	0%
The Potion, the Scroll, and the Cauldron	Copry Edit Chapters 16-20	8/30/2013	0%
The Potion, the Scroll, and the Cauldron	Layout Chapters 16-20	9/6/2013	0%

Figure 64 Sample of a report

Printing

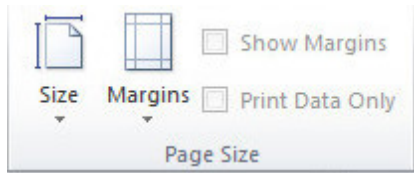
Change the orientation (portrait, landscape) of a table, form, query output, report.

1. Open the table, form, query output or report.
2. On the File tab, click Print.
3. Click Print Preview.
4. On the Print Preview tab, in the Page Layout group, click the Portrait or Landscape buttons.



Change paper size.

1. On the File tab, click Print.
2. Click Print Preview.
3. On the Print Preview tab, in the Page Size group, click the Size button.
4. Click the size required.

**Print a page.**

1. On the File tab, click Print.
2. Click Print.
3. Click OK.

Print selected record(s).

1. Select the records to print.
2. On the File tab, click Print.
3. Click Print.
4. Check the Selected Record(s) checkbox.
5. Click OK.

Print specific page(s) in a report, print complete report.

1. On the File tab, click Print.
2. Click Print.
3. To print all pages, ensure the All checkbox is checked.
4. To print specific pages, check the Pages checkbox and enter the required number references in the From and To boxes.
5. Click OK.

4.2.3.4 Learning Activity

Learning Activities	Special Instruction																																
Visit a computer lab in your institution and carry out the following activities. <u>Activity 1</u> Open Microsoft access and Create a Table: A. Create a table called Publisher having the following structure: <table><tr><th>Field Name</th><th>Data Type</th></tr><tr><td>PubID</td><td>Short Text</td></tr><tr><td>PubName</td><td>Short Text</td></tr><tr><td>URL</td><td>Hyperlink</td></tr></table> • Set the field PubID as the primary key. • Set the Field Size field property of the field PubID to 5. • Set the Field Size field property of the field PubName to 50. • Set the caption property of the PubID field to Publisher ID. • Set the caption property of the PubName field to Publisher’s Name. B. Enter the following data for the Publisher table: <table><tr><th>PubID</th><th>PubName</th><th>URL</th></tr><tr><td>MH</td><td>McGraw-Hill</td><td>http://www.mhhe.com</td></tr><tr><td>PH</td><td>Prentice Hall</td><td>http://www.prenhall.com</td></tr><tr><td>WI</td><td>Wiley</td><td>http://www.wiley.com</td></tr><tr><td>EL</td><td>Elsevier</td><td>http://www.elsevierdirect.com</td></tr><tr><td>AW</td><td>Addison Wesley</td><td>http://www.aw.com</td></tr><tr><td>MP</td><td>MIT Press</td><td>http://mitpress.mit.edu</td></tr><tr><td>CL</td><td>Cengage Learning</td><td>http://cengage.com</td></tr></table>	Field Name	Data Type	PubID	Short Text	PubName	Short Text	URL	Hyperlink	PubID	PubName	URL	MH	McGraw-Hill	http://www.mhhe.com	PH	Prentice Hall	http://www.prenhall.com	WI	Wiley	http://www.wiley.com	EL	Elsevier	http://www.elsevierdirect.com	AW	Addison Wesley	http://www.aw.com	MP	MIT Press	http://mitpress.mit.edu	CL	Cengage Learning	http://cengage.com	Avoid overcrowding to avoid accidents and damages. Do not tamper with computers and their accessories. Cover the computers after use
Field Name	Data Type																																
PubID	Short Text																																
PubName	Short Text																																
URL	Hyperlink																																
PubID	PubName	URL																															
MH	McGraw-Hill	http://www.mhhe.com																															
PH	Prentice Hall	http://www.prenhall.com																															
WI	Wiley	http://www.wiley.com																															
EL	Elsevier	http://www.elsevierdirect.com																															
AW	Addison Wesley	http://www.aw.com																															
MP	MIT Press	http://mitpress.mit.edu																															
CL	Cengage Learning	http://cengage.com																															

Activity 2

You have been appointed as a Database administrator at Moi Teaching and Referral Hospital. You are required to organize the Hospital database so as to reflect the current activities within the hospital. Design a database and create two tables.

EMPLOYEE TABLE

ID NUMBER	FIRST NAME	LAST NAME	DEPARTMENT
5000	JOHN	MUNGA	INFORMATION
5001	MARK	WANGAI	HOSPITALITY
5002	JOY	ROTICH	INFORMATION
5003	EDDIT	MAIYO	HUMAN RESOURCES
5004	MOLLY	KATHURE	HOSPITALITY
5005	EDWIN	KOIYA	INFORMATION

SALARY TABLE

ID NUMBER	DEPARTMENT	SALARY
5000	INFORMATION	15 000
5001	HOSPITALITY	20 000
5002	INFORMATION	14 000
5003	HUMAN RESOURCES	12 000
5004	HOSPITALITY	14 000
5005	INFORMATION	20 000

REQUIRED

- Design a query from employee table and set the criteria to display all the employees in the information department and save it employee query.
- Design a form employee query and save it employee form.
- Design a report from employee table and save it employee report.

4.2.3.5 Self-Assessment

1. What is primary key?
2. What is a field?
3. What is a record?
4. What are the differences between a form and a report?
5. What are the four major shortcomings of the conventional (paper) file structures that are being addressed by the database approach.

6. The following car details are to be entered in a database: Make, Date-of-manufacture, colour, and cost.
- a) Prepare a suitable database structure showing field names and their field data types
 - b) Explain how you index the data such that cars of the same make and colour are together.
 - c) Write a statement that can be used to select cars of colour green.
 - d) Give an instruction that would:
 - i) Select cars whose cost is between 500,000/= and 1,000,000/=
 - ii) Determine the average cost of all cars.
7. What are the ten field types in Access?

4.2.3.6 Tools, Equipment, Supplies and Materials

- Software (Windows, MS Office, Antivirus, Games)
- Computer
- Printer
- Digital instructional material including DVDs and CDs;
- Storage Devices (Flash Disks, CDs, DVDs, Memory cards)
- Stationery

4.2.3.7 References

https://www.tutorialspoint.com/ms_access/index.htm

<https://www.javatpoint.com/microsoft-access>

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J. Makori . J Mwende , K Munene , Longhorn Information communication Technology , An introductory to Course For Tvet Students , 2018, Lognhorn Publishers .

D. Mulli , D Ochieng , J. Ndengwa , J. Kioko Logon Computer studies form two , 2013 , Kenya Literature Bureau.

Sample answers to the self- assessment

1. What is primary key?

A primary key is a rule which ensures that unique data is entered for the field and the field is not left blank. This is the field that would identify a record uniquely in table

2. What is a field?

A field in a database is a piece of information about a subject. Each field is arranged as a column in table.

3. What is a record?

A record is complete information about a subject. A record is a collection of fields and presented as a row in a table of database.

4. What are the differences between a form and a report?

Forms are primarily used to edit overview data whereas reports are used primarily to print or view data. In a form you usually navigate from one record to another, whereas in reports summarized data are possible to present.

5. **What are the four major shortcomings of the conventional (paper) file structures that are being addressed by the database approach.**

- Unnecessary duplication of data
- Boredom & time wastage especially when searching for a particular item
- In order to carry out any file processing task(s), all the related files have to be processed
- Misleading reports due to poor data entry and organization
- Difficulty in sorting, retrieving & updating records
- Security: no protection of files against unauthorized access and corruption
- Sharing of files is difficult
- Some information resulting from several files may not be available.

6. **The following car details are to be entered in a database: Make, Date-of-manufacture, colour, and cost.**

a) Prepare a suitable database structure showing field names and their field data types

Field name Data type

ID (Primary key) Auto Number

Make text

Date of manufacture Date/time

Colour Text

Cost Currency

b) Explain how you index the data such that cars of the same make and colour are together.

Create a query to show same make and colour

c) Write a statement that can be used to select cars of colour green.

Create a query. In the colour field, and in the Criteria row, write "green"

d) Give an instruction that would:

i) Select cars whose cost is between 500,000/= and 1,000,000/=

Create a query. In the cost field, and in the criteria row, write ">500000 and <1000000"

ii) Determine the average cost of all cars.

Create a query. Choose average of costs “Avg” option in the total section.

7. What are the ten field types in Access?

The ten different field types in Access are:

- Text
- Memo
- Number
- Date/Time
- Currency
- Auto-Number
- Yes/No
- OLE Object
- Hyperlink
- Lookup Wizard

4.2.14 4.2.4 Learning Outcome 4: Apply graphic presentation using Ms PowerPoint

4.2.4.1 Introduction to Applying graphic presentation using Ms PowerPoint

The act of projecting images or content on large screens for telling stories. This story can be for various purposes, including educational, entertainment and even business. With the latest development in computer technology and advent of graphics presentation software such as Microsoft PowerPoint, presenters are now able to conveniently engage their audiences in various forums such as meetings and lectures.

The learner is required to demonstrate ability to Create, edit, format, save preview and print presentations using MS PowerPoint.

4.2.4.2 Performance Standard

- 4.3 Features of a presentation software are outlined
- 4.4 Features of PowerPoint interface are identified
- 4.5 Creation of presentations is done
- 4.6 Editing and formatting of the presentation is done
- 4.7 Previewing and printing of handouts is done.

4.2.4.3 Information Sheet

Presentation software is defined as computer programs designed to allow the user to present information in an engaging way such as with text, pictures, sound and video. It displays information in form of slides.

Some common presentation software include **Microsoft PowerPoint**, Windows **movie maker**, **Apple keynote**, **Haiku Deck**, **Open office**, **Prezi**, **Presenter** etc.

In this learner guide we are going to concentrate on PowerPoint presentations using Microsoft office PowerPoint 2010

Microsoft PowerPoint is a presentation tool that supports text, shapes, graphics, pictures and multimedia along with integration with other Microsoft Office products like Excel. By default, documents saved in PowerPoint 2010 are saved with the **.pptx** extension.

A **slide** is a single page of a presentation while a **presentation** is a collection of several slides saved with a unique name.

Purpose of Microsoft PowerPoint

PowerPoint can be used in:

- (i). Marketing or internal company presentations
- (ii). To deliver company results to shareholders meeting
- (iii). To report on sales figures
- (iv). To launch new product in the market
- (v). In the induction of new employees to a company
- (vi). In advertisements

With PowerPoint you can create overhead slides, speakers notes, audience handouts and an outline all in one presentation.

Advantages of MS PowerPoint

- Quick and easy: The basic features are easy to master and can make you appear to be organized, even if you are not.
- Simple bullet points: It can reduce complicated messages to simple bullet points. Bullet points are a good basis for a presentation and remind the speaker of main points and the organization of the message.
- Easy to create a colorful, attractive design: Using the standard templates and themes, you can create something visually appealing, even if you do not have much knowledge of basic graphic design principles.
- Easy to modify: When compared to other visual aids such as charts, posters, or objects, it is easy to modify.
- Easily re-order presentation: with a simple drag and drop or using key strokes, you can move slides to re-order the presentation.
- Finally, PowerPoint is integrated with other products that allow you to include parts of documents, spread sheets, and graphics.
- Audience size: PowerPoint slides are generally easier to see by a large audience when projected than other visual aids.
- Easy to present: You can easily advance the slides in the presentation one after another with a simple key stroke while still maintaining eye contact with the audience.
- No need for handouts: They look good visually and can be easily read if you have a projector and screen that is large enough for the entire room.

Disadvantages of PowerPoint

- Design power pointlessness: Gives the illusion of content and coherence, when in fact there is really not much substance or connection between the different points on the slides.

- PowerPoint excess: Some speakers create presentations so they have slides to present rather than outlining, organizing, and focusing on the message.
- Replaces planning and preparation: PowerPoint is a convenient prop for poor speakers, as it can reduce complicated messages to simple bullet points and elevates style over substance.
- Oversimplification of topic: The linear nature of PowerPoint forces the presenter to reduce complex subjects to a set of bullet items that are too weak to support decision-making or show the complexity of an issue.
- Feature abundance: While the basic features are easy to use and apply, a speaker can get carried away and try to use all the features at once rather than simply supporting a message. Too many flying letters, animations, and sound effects without seeing much original thought or analysis can be a real issue. In many cases, the medium shoves the message aside.
- Basic equipment required: You will need to have a computer and projection equipment in place to display the slides to the audience.
- Focus on medium, not message: Too many people forget that they are making a presentation first and that PowerPoint is just a tool.

Features of graphics presentation software

- Built-in layout that includes all of the content boxes that you need from the beginning. Try out a built-in layout that includes all of the content boxes that you need from the beginning.
- Use Slide Master View to Update Designs Consistently
- Use Someone Else's Presentation as a Starting Point
- **Rearrange** Slides for Effectiveness – Slide sort feature allows you to rearrange your slides easily.
- **Guides** that you'll see pop up as you drag and drop objects help ensure that your objects are nice and neat. The small red arrows and dotted lines show how objects relate to each other, and you'll see them when an object is equidistant between them.
- Set **Slide Sizes**- The key consideration when setting slide size is to consider the size of the screen you'll present on. Some different types of screen have slightly different aspect ratios.
- **Resize Multiple Objects**
As I mentioned earlier, I think consistency in slides is important for maintaining a clean look. If you've got multiple images that need to be the same size, there's an easy feature for doing just that.
- Data **tables** in PowerPoint are one of the most effective ways to present data. They're easy for your viewer to quickly glance at and understand numbers with an easy row-column view.
- Without a doubt, **SmartArt** is one of my favorite PowerPoint features. Think of this feature as the sweet spot between infographics and text-only diagrams.
- Themes allow a consistent look and feel to be applied to the presentation, applying a common background, font style and layout throughout the presentation with a single operation.

- Rehearsing Slide Transition Timings
- Creating Basic Charts
- Applying Special Effects
- Inserting a Photo Album
- PowerPoint allows users to zoom in and zoom out of the slides to help focus on specific sections or look at the entire slide as a whole.

Starting Microsoft presentation

In this, we will understand how to get started with PowerPoint 2010. We will understand how to start PowerPoint 2010 application in simple steps.

To start Microsoft PowerPoint, follow the following steps

1. Select the Start button on the taskbar. The Start menu appears.



Click

2. Point to All Programs. The All Programs menu appears.



Click

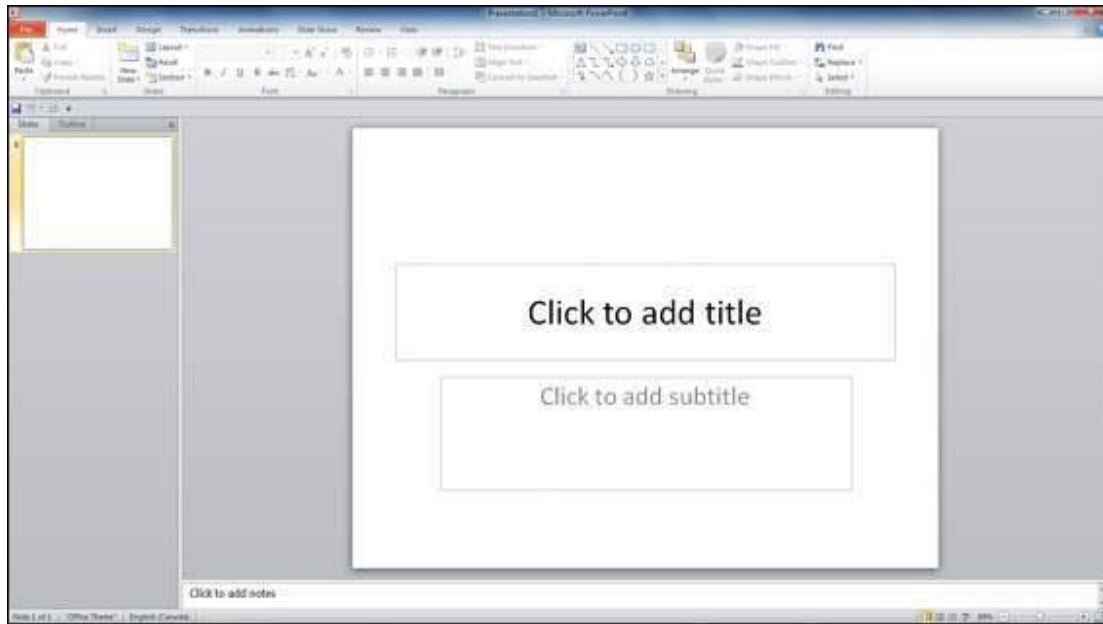
3. Select Microsoft Office 2010. The Microsoft Office 2010 submenu appears.

Click  Microsoft Office

4. Select Microsoft Word 2010. The Microsoft Powerpoint 2010 window opens.

Click  Microsoft PowerPoint 2010

This will launch the Microsoft PowerPoint 2010 application and you will see the following presentation window.



Microsoft PowerPoint screen

The following screenshot shows the various areas in a standard PowerPoint file. It is important to familiarize yourself with these areas as it makes learning and using PowerPoint easier.

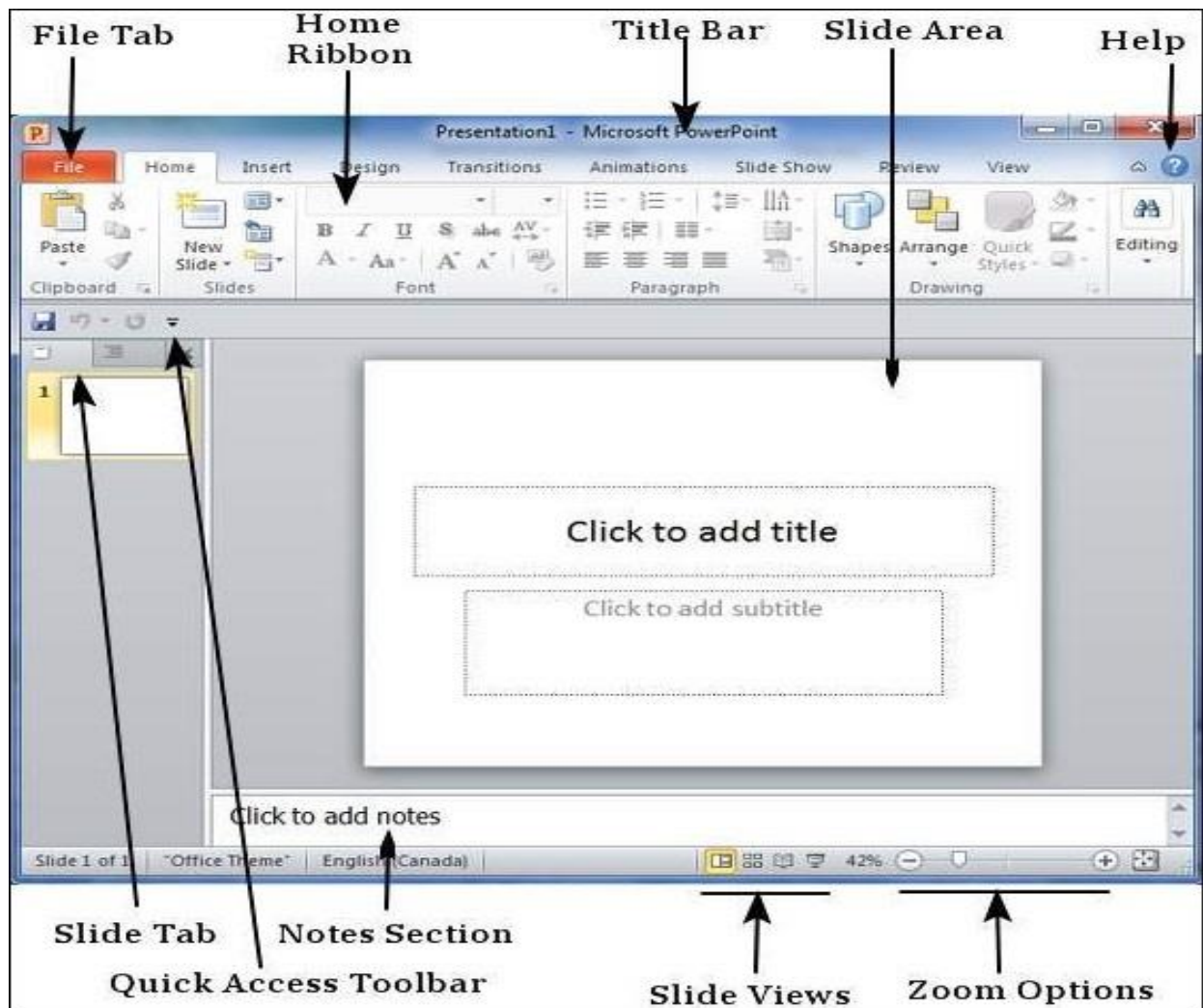
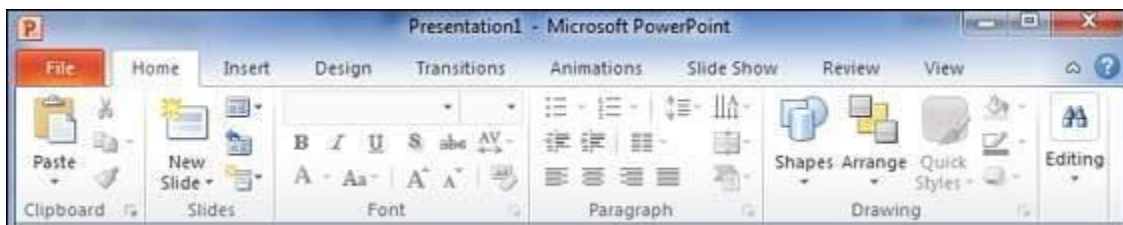


Figure 65 Microsoft PowerPoint Screen

File Tab- This tab opens the **Backstage** view which basically allows you to manage the file and settings in PowerPoint. You can save presentations, open existing ones and create new presentations based on blank or predefined templates. The other file related operations can also be executed from this view.

Ribbon



The ribbon contains three components –

- **Tabs** – They appear across the top of the Ribbon and contain groups of related commands. **Home, Insert, Design, Transitions**, animations are examples of ribbon tabs.
- **Groups** – They organize related commands; each group name appears below the group on the Ribbon. For example, a group of commands related to fonts or a group of commands related to alignment, etc.
- **Commands** – Commands appear within each group as mentioned above.

Title Bar

This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.

Slide Area

This is the area where the actual slide is created and edited. You can add, edit and delete text, images, shapes and multimedia in this section.

Help

The Help Icon can be used to get PowerPoint related help anytime you need. Clicking on the "?" opens the PowerPoint Help window where you have a list of common topics to browse from. You can also search for specific topics from the search bar at the top.

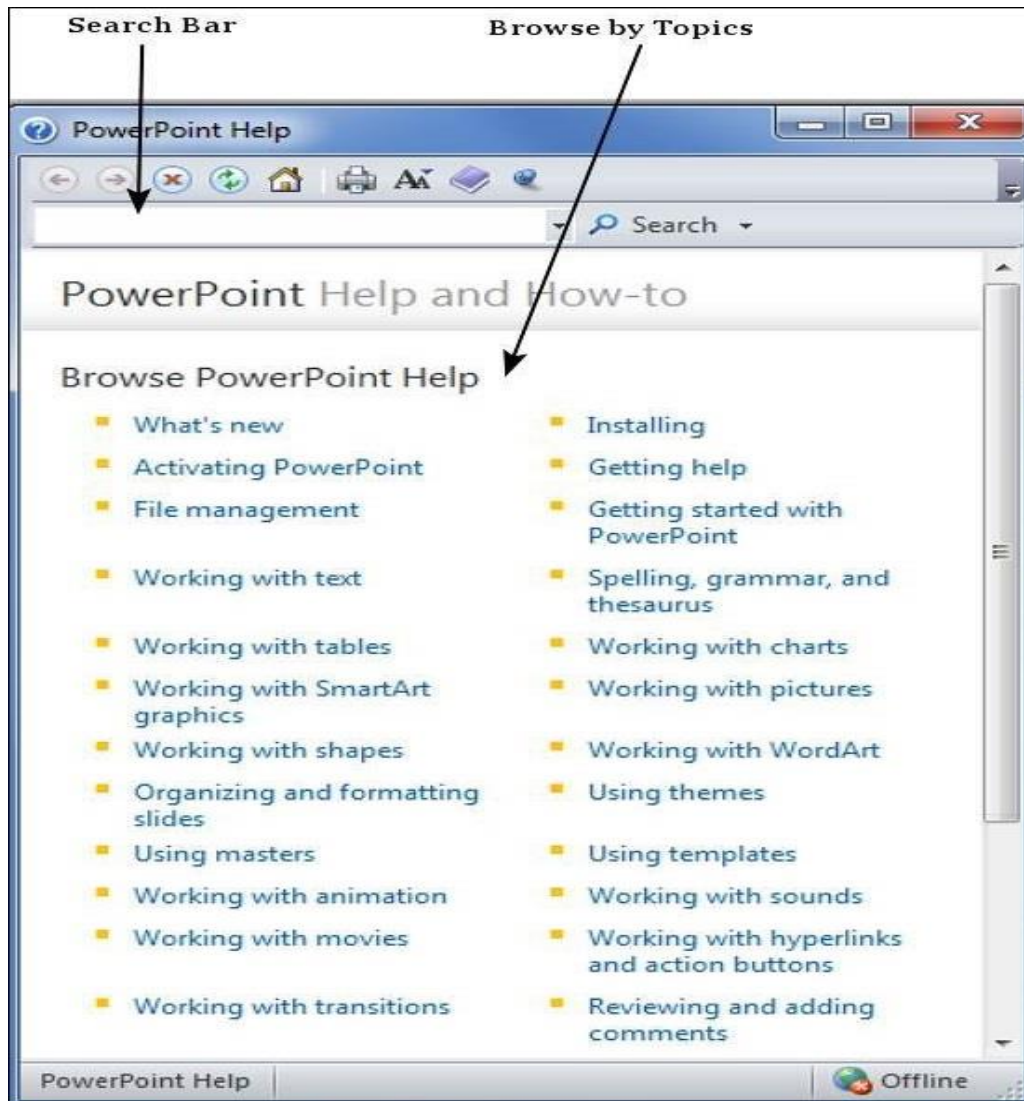


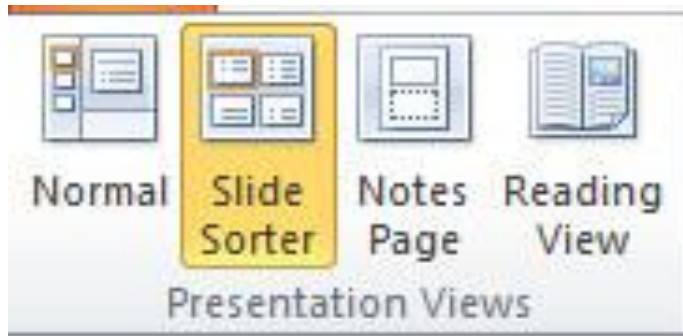
Figure 66 PowerPoint Help Dialog box

Zoom Options

The zoom control lets you zoom in for a closer look at your text. The zoom control consists of a slider that you can slide left or right to zoom in or out, you can click on the - and + buttons to increase or decrease the zoom factor. The maximum zoom supported by PowerPoint is 400% and the 100% is indicated by the mark in the middle.

Slide Views

The group of four buttons located to the left of the Zoom control, near the bottom of the screen, lets you switch between PowerPoint views.



- **Normal Layout view** – This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows you to edit individual slides and also rearrange them.
- **Slide Sorter view** – This displays all the slides as a matrix. This view only allows you to rearrange the slides but not edit the contents of each slide.
- **Reading View** – This view is like a slideshow with access to the Windows task bar in case you need to switch windows. However, like the slideshow you cannot edit anything in this view.

Notes Section

This section allows you to add notes for the presentation. These notes will not be displayed on the screen during the presentation; these are just quick reference for the presenter.

Quick Access Toolbar

The Quick Access Toolbar is located just under the ribbon. This toolbar offers a convenient place to group the most commonly used commands in PowerPoint. You can customize this toolbar to suit your needs.



Slide Tab

This section is available only in the Normal view. It displays all the slides in sequence. You can **add**, **delete** and **reorder** slides from this section.

Close a presentation application.

On the File tab, click Exit.

Open presentations.

On the File tab, click Open.

Select the presentation(s) to open and click Open.

Close presentations.

On the File tab, click Close.

Create a new presentation based on default template.

1. On the File tab, click New.
2. A blank presentation is selected, click Create.

Save a presentation to a location on a drive.

1. On the File tab, click Save.
2. Create a file name and navigate to the location required.
3. Click Save.

Save a presentation under another name.

1. On the File tab, click Save As.
2. Enter a new file name over the existing file name and navigate to the location required.
3. Click Save.

Save a presentation as another file type: Rich Text Format, template, show, image file format, version number.

1. On the File tab, click Save As.
2. Click on the Save as type drop-down list and click a file type.
3. Click Save.

Working with Presentations**1 Add a new slide with a specific slide layout.**

Add a new slide with a specific slide layout like: title slide, chart and text, bulleted list, table/spreadsheet.

1. On the Home tab, in the Slides group, click the New Slide arrow.
2. Click the slide layout required.

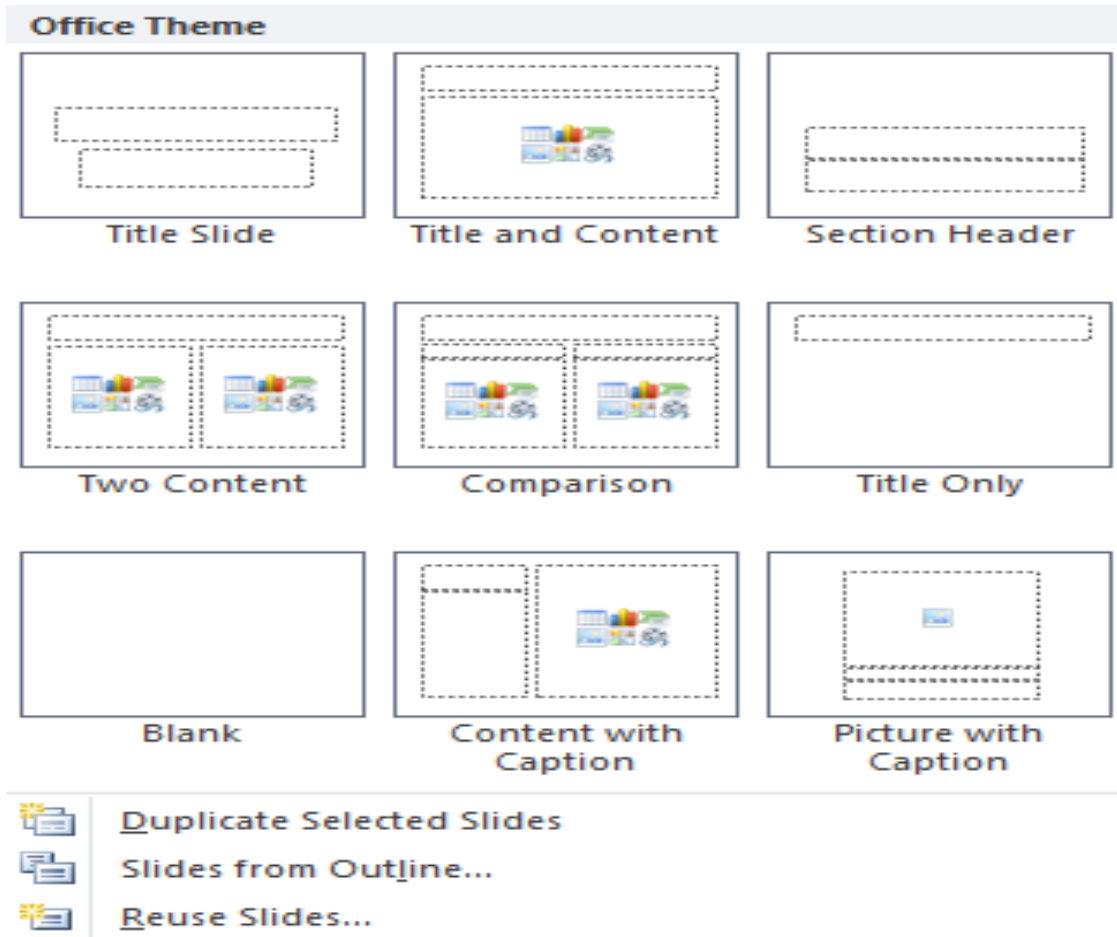


Figure 67 Slide layouts

2 Switch views

You can use the following views to edit, print, and deliver your presentation:

- Normal View is the main editing view to write and design a presentation.
- Slide Sorter View shows all slides in thumbnail form so they are easy to sort.
- Outline View displays all the text from the slides in a list for ease of reference and editing.
- Slide Show View uses the full computer screen and is used when presenting a slide show to an audience.

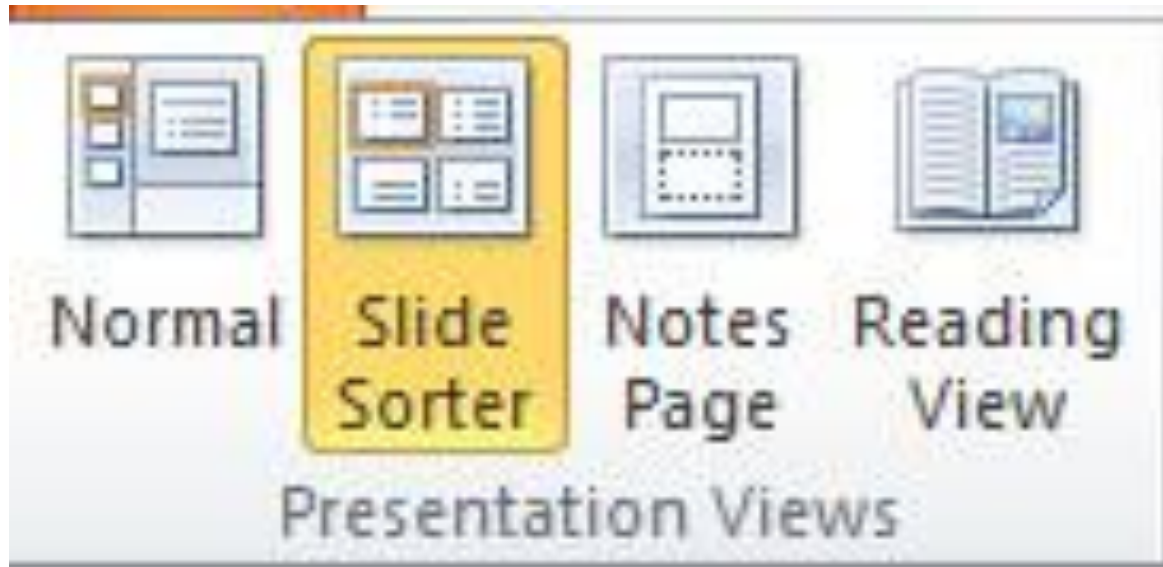


Figure 68 Powerpoint Views

3 Add speaker notes

Adding speaker notes to your PowerPoint presentation helps you smoothly deliver the presentation without worrying about forgetting anything.

To add notes to a slide in Normal and Notes Page views:

Add presenter notes to slides.

- Click the notes pane at the bottom of Normal view (Click to add notes should currently be visible).
- Enter the text required.

4 Insert/remove a graphical object into/from a master slide

A slide master is the primary slide in a structure of slides. It stores information about the slide layouts, theme, background colours, fonts, placeholder sizes etc. and allows you to make multiple changes across the presentation in one go. You can insert or remove a graphical object from a master slide.

- On the View tab, in the Master Views group, click the Slide Master button.
- On the Insert tab, in the Images group, click the Picture or Photo Album button.
- Navigate to the object to insert.
- Click Open or Insert.

5 Change magnification

The default zoom level set for PowerPoint slides in normal view is 62%, but you can change the zoom level using the option provided as part of the view menu or using the slider control in the status bar.

6 Change background colour on specific slide(s), all slides.

- On the Design tab, in the Background group, click the Background group arrow.
- On the Fill tab, ensure the Solid fill checkbox is checked.
- Click the Color button.
- Click the colour required.
- Click Close.
- To apply the colour to all slides, click Apply to All.
- Click Close.

7 Apply theme

PowerPoint includes a collection of compelling themes (including wide-screen themes) that you can choose from to create your presentation. Themes come with a set of variations, like different colour palettes, backgrounds, and font families, so you can change the look and feel of your presentation with a single tap or click.

To apply

- On the Design tab, in the Themes group, click the More Themes arrow.
- Click the theme required.

8 Enter text into footer of specific slides, all slides in a presentation.

- On the Insert tab, in the Text group, click the Header & Footer button.
- Check the Footer checkbox.
- Enter the text required in the Footer box.
- Click Apply or Apply to All.

9 Entering Text Into a place order

When entering text recognize the following good practice in creating slide content.

- Use short concise phrases
- Use bullet points
- Use numbered lists

Enter text into a placeholder in standard, outline view.

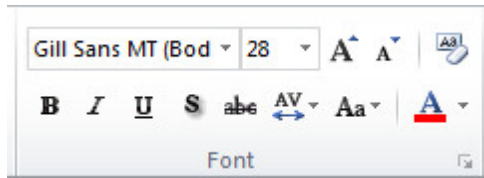
- In standard view, click the placeholder required on the slide and enter the text.
- In outline view, click next to the slide number and then click the placeholder required on the slide and enter the text.

To edit text in a presentation.

Select the text and edit as required.

Change text formatting: font sizes.

- Select the text to format.
- On the Home tab, in the Font group, click the Font Size arrow.



Click a size from the list or type the required size.

Indent bulleted text.

- Select the text to indent.
- On the Home tab, in the Paragraph group, click the Increase List Level button.

10 Using tables

To create a PowerPoint table

- Select the Insert Table icon in the content place holder.



- Specify the number of columns and rows.
- The number of columns and rows appears in the dialog box.
- Select OK.

Select rows, columns, entire table.

- Click any cell in the table.
- On the Layout tab, in the Table group, click the Select arrow.
- Click the Select Row, Select Column or Select Table button.

Insert rows.

- Select a row.
- On the Layout tab, in the Rows & Columns group, click the Insert Above or Insert Below button.

Insert columns.

- Select a column.
- On the Layout tab, in the Rows & Columns group, click the Insert Left or Insert Right button.

Delete rows and columns.

- Select the row or column to delete.
- On the Layout tab, in the Rows & Columns group, click the Delete button.

- Click the Delete Rows or Delete Columns button.

11 Charts

Inserting charts

- Inserting a chart is a primary feature of PowerPoint and its functionality as a presentation tool. It easily allows you to group data and map it in a variety of chart styles to give users numerous ways to create the most visually engaging and functional presentations.

Input data to create built-in charts in a presentation: column, bar, line, pie.

- On the Insert tab, in the Illustrations group, click the Chart button.
- Click a chart and click OK.
- Click into the individual cells in the spreadsheet that opens to enter data.
- Close the spreadsheet.

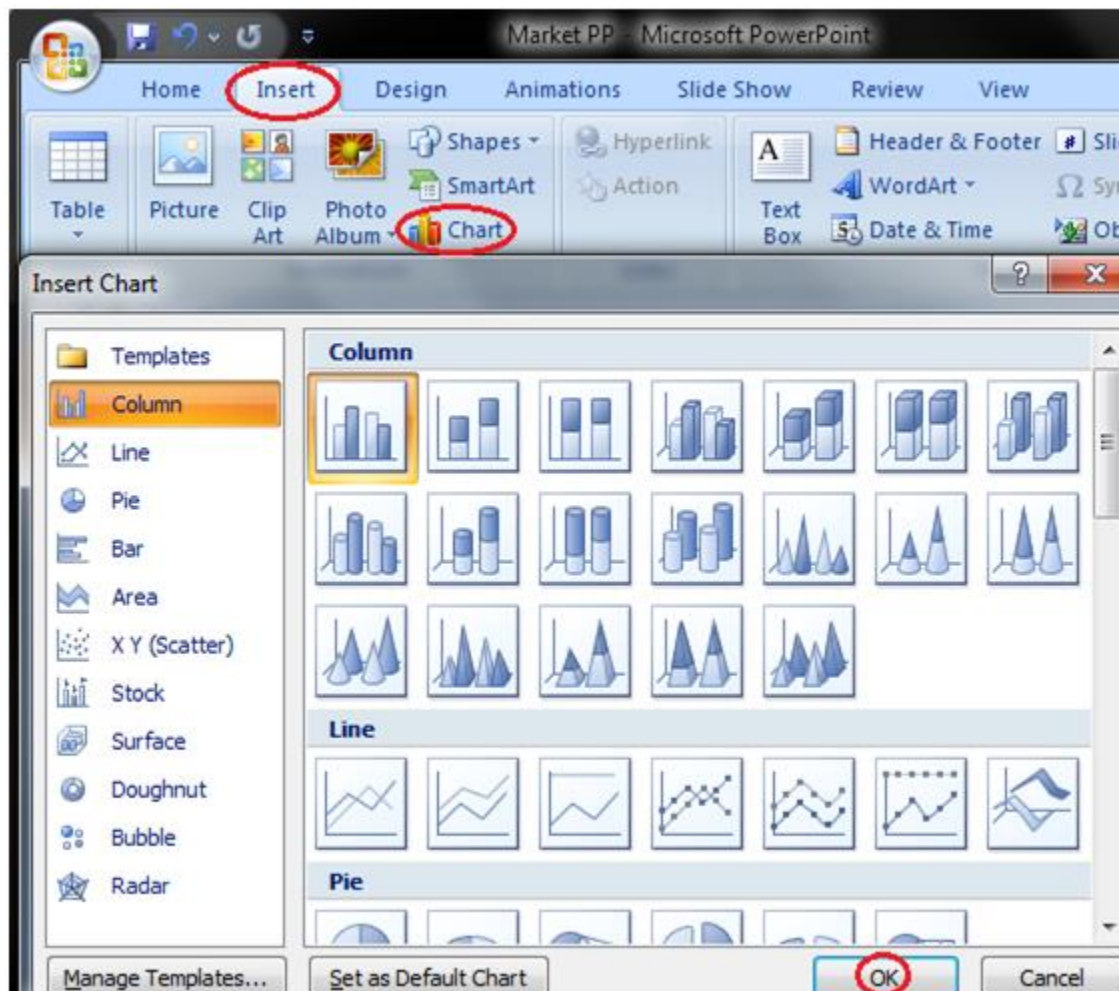


Figure 69 charts

12 Organisation Charts

Create an organization chart with a labelled hierarchy by using a built-in organization chart feature.

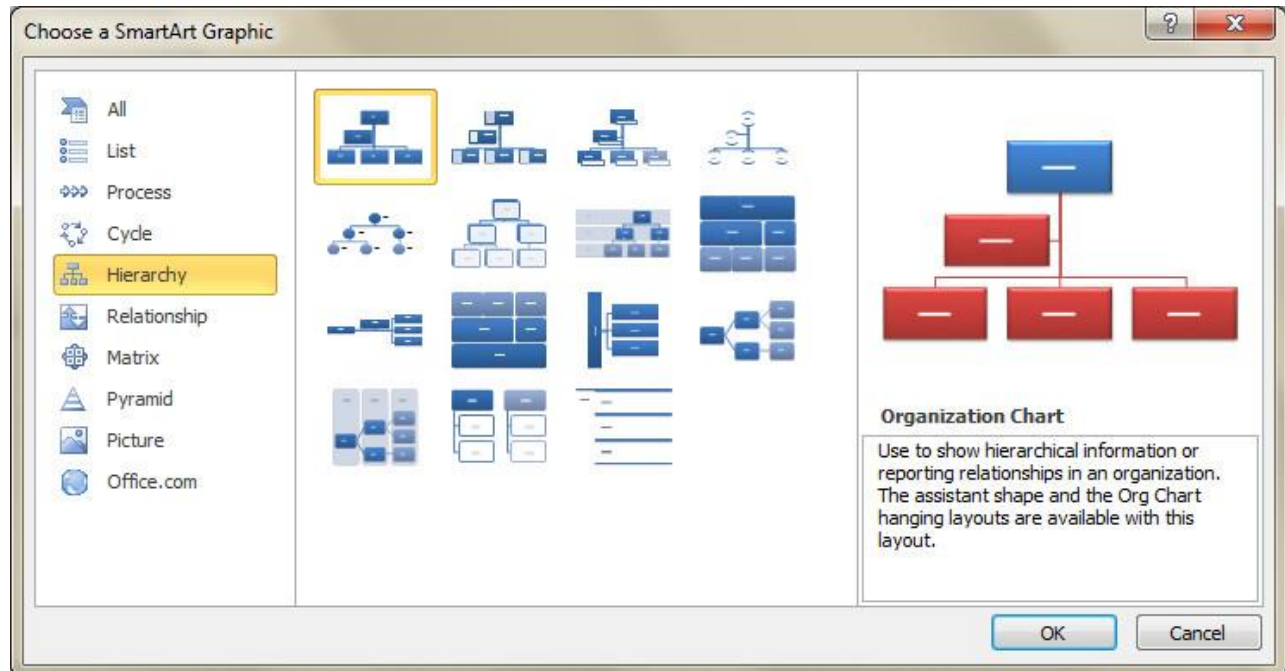


Figure 70 Organization Chart

- On the Insert tab, in the Illustrations group, click the Smart Art button.
- Click Hierarchy, and then click the Organization Chart button.
- Click OK.

Change the hierarchical structure of an organization chart.

- Select the shape to change.
- On the Design tab, in the Create Graphic group, click the Demote, Promote or Right to Left button.

Add co-workers, subordinates in an organization chart.

- Click the outside of the shape to add the co-worker or sub-ordinate to.
- On the Design tab, in the Create Graphic group, click the Add Shape arrow.
- Click Add Shape After or Add Shape Below as required.

13 Drawing

Add different types of drawn object to a slide: line, arrow, block arrow, rectangle, square, oval, circle.

- On the Insert tab, in the Illustrations group, click the Shapes arrow.
- Click the object required.

- Click the slide and drag to adjust the size of the object.

Add different types of drawn object to a slide: text box.

- On the Insert tab, in the Text group, click the Text Box button.
- Click the slide and drag to adjust the size of the text box.

Text must be entered as soon as the text box is created or the text box disappears.

Enter text into a text box, block arrow, rectangle, square, oval, circle.

- Click the shape and enter the text required.
- To add text to a text box, it must be entered as soon as the text box is created.

Change drawn object line weight.

- Select the object.
- On the Format tab, in the Shape Styles group, click the Shape Outline button.
- Select Weight and click the line weighting required.

14 Insert a graphical object (picture, image, drawn object) into a slide.

- On the Insert tab, in the Images group, click the Picture or Photo Album button.
- Navigate to the object to insert.
- Click Open or Insert.

Insert a graphical object (drawn object) into a slide.

- On the Insert tab, in the Illustrations group, click the Shapes button.
- Click the shape to insert.
- Click the slide and the shape selected is inserted.

15 Apply slide transition

Slide transitions are motion effects that occur in Slide Show view when you move from one slide to the next during a presentation. You can easily apply transitions between slides using the Transitions tab.

Add transition effects between slides.

- On the Transitions tab, in the Transition to this Slide group, click the More arrow at the bottom right of the transition effects.
- Click the effect required.
- On the Transitions tab, in the Timing group check the On Mouse Click or After checkbox and enter a time if required.

- On the Transitions tab, in the Timing group, click any sound required in the Sound box and enter any timing required in the Duration box.
- Click the Apply to All button.

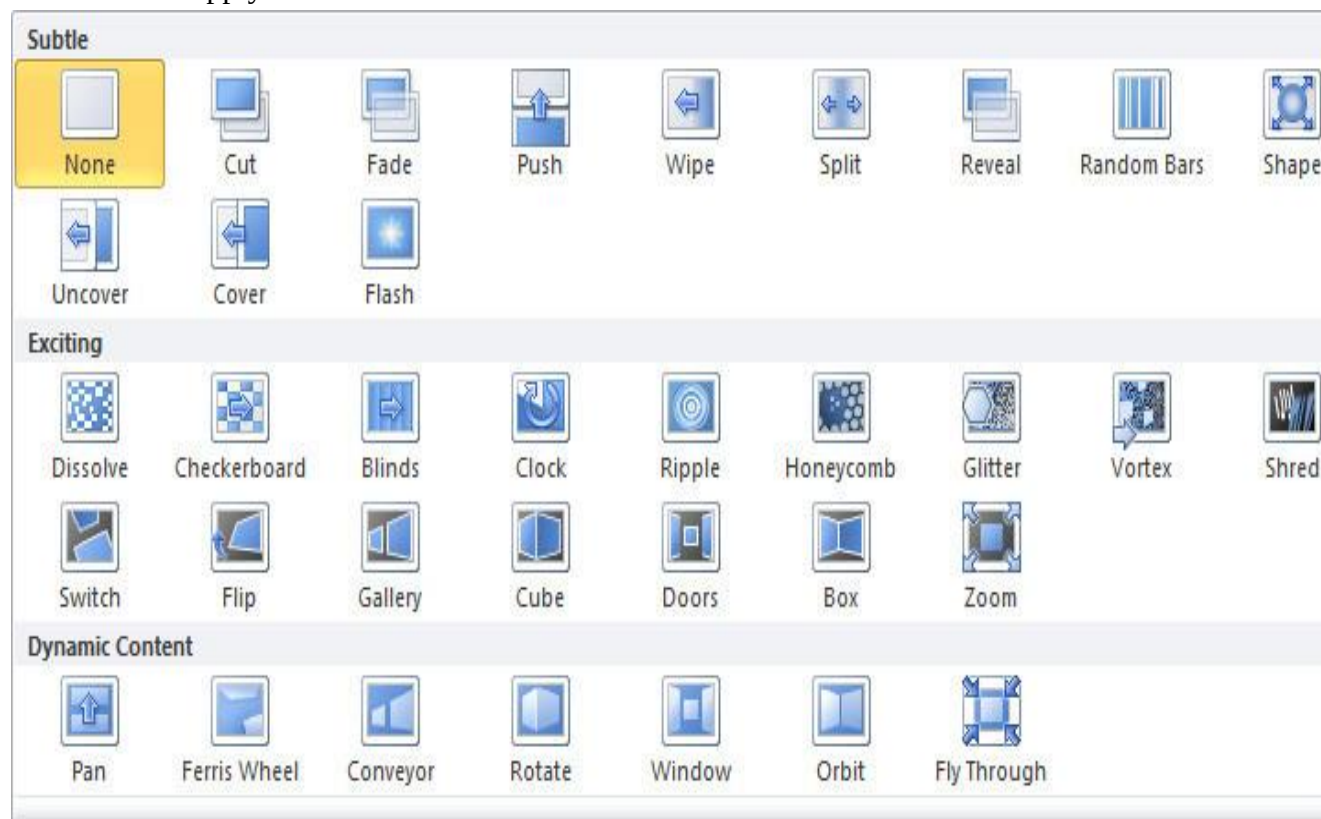


Figure 71 Slide Translation

Select appropriate output format for slide presentation like: overhead, handout, on- screen show.

- On the Design tab, in the Page Setup group, click the Page Setup button.
- Click the output required in the Slides sized for box.

How to Apply Animation Effect

You can also animate text and objects on your slides, if you want to emphasis a point or make your presentation more dynamic.

- Select the text or object you want to animate
- Select the Animations tab
- In Animations group click the drop-down arrow next to Animate option
- Animation options will appear

- Move the cursor over different options to see live preview on the slide
- Select the desired animation

Change slide setup, slide orientation to portrait, landscape.

- On the Design tab, in Page Setup group, click the Slide Orientation button.
- Click Portrait or Landscape.

16 Print entire presentation, specific slides.

Printing a presentation is a common step for presenters who wish to give their audience a hard copy of the slide show they are about to see, for note taking purposes or other. You can print an entire presentation in PowerPoint, or a specific range of pages.

- On the File tab, click Print.
- To print the entire presentation, under Settings, click Print All Slides.
- To print specific slides, under Settings, enter the slide numbers required in the Slides box.
- Click Print.

Print handouts, notes pages, outline view of slides.

Printed handouts contain slide images that are smaller than the original Presentation Lessons slides. You can designate one, two, three, four, six, or nine slides per page. The more slides per page, the smaller they are on the page.

You can print an outline of your presentation. The printed outline displays the contents of each slide as it appears on the Outline tab. If the outline is collapsed to display only the slide titles, the printed outline will include only the slide titles.

You can print your presentation to include any Notes you have added. Printed Notes Pages display a copy of the slide at the top of the page and your notes below it. You can refer to Notes Pages as you rehearse or deliver your presentation.

You can use Print pane to view the Notes Pages before you print them.

- On the File tab, click Print.
- Under Settings, click Full Page Slides.
- Click format required from Handouts or click Notes Pages or Outline.
- Click Print.

4.2.4.4 Learning Activities

Learning Activities	Special Instruction
Activity 1 1. Open Microsoft PowerPoint 2010, creating a new presentation. 2. Insert a new slide layout in Slide Master View and insert a Text placeholder in the top half of the slide. 3. Insert a Picture placeholder in the bottom half of the slide. 4. Apply the Ion Boardroom theme to your presentation. 5. Apply Top Spot - Accent 2 Gradient Fill to your presentation. 6. Select Slide 1 and type “General Welcome and Introduction to Company” into the Notes pane. 7. Increase the magnification to 100%. 8. Switch your slide to appear in Portrait orientation. 9. save the presentation on desktop as General welcome.	Avoid overcrowding to avoid accidents and damages. Do not tamper with computers and their accessories. Cover the computers after use
Activity 2 Q.No.1 Create a presentation for a teacher to present in his class about Computer Generations. The presentation should contain 5 slides, one for each generation. The text should appear flying in when slide show.	
Activity 3 Create a presentation with three slides to introduce your village. In the first slide include your name and your title. In the second indicate the name of your county and insert a clip art of an animal. In the third slide indicate the subcounty Set up slide timing so that the first slide will appear for 2 seconds, second slide for 3 seconds and third slide for 2 seconds.	

4.2.2.5 Self-Assessment

Q1) What is the advantages of Microsoft PowerPoint?

Q2) Explain Microsoft PowerPoint

- Q3) How can we create a video in PowerPoint?
Q4) Is it possible to do animation for objects in PowerPoint?
Q4) Why do we need to use animations in PowerPoint?

Q6) What is the Purpose of Microsoft PowerPoint

Q7) what are the five advantages of MS PowerPoint

Q8) Which are the five views available in PowerPoint slides?

Q9) By use of drawing, outline any five slide layouts

Q10) what is the procedure of Saving a presentation under another name.

4.2.2.6 Tools, Equipment, Supplies and Materials

- Software (Windows, MS Office, Antivirus, Games)
- Computer
- Printer
- Digital instructional material including DVDs and CDs;
- Storage Devices (Flash Disks, CDs, DVDs, Memory cards)
- Stationery

4.2.2.7 References

<https://www.tutorialspoint.com/powerpoint/index.htm>

<https://www.javatpoint.com/powerpoint-tutorial>

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J. Makori . J Mwende , K Munene , Longhorn Information communication Technology , An introductory to Course For Tvet Students , 2018, Lognhorn Publishers .

D. Mulli , D Ochieng , J. Ndengwa , J. Kioko Logon Computer studies form two , 2013 , Kenya Literature Bureau.

Answers to self-assessment

Q1) What is the advantages of Microsoft PowerPoint?

Ans: Microsoft Power Point helps the organizations to organize the content in visual form like adding charts, objects, posters, and visuals.

Q2) Explain Microsoft PowerPoint

Ans: Power Point is a part of Microsoft Office and is used to create slides for the presentation. It contains slideshow presentation. We can display the content more attractively by combining graphics, text etc.,

Q3) How can we create a video in PowerPoint?

Ans: To create a video in PowerPoint

Click on File tab -> Export -> Create Video

Once you click on the Create Video option -> Choose Quality of the video

After saving your Power Point, the recorded video will be saved in .MP4 format.

Q4) Is it possible to do animation for objects in PowerPoint?

Ans: Yes, we can animate the pictures, tables, shapes, text and other objects. On an object we can make effects to appear, disappear, or move.

Q5) Why do we need to use animations in PowerPoint?

Ans: The animations

Enhance the appearance of your slides.

To make a PowerPoint presentation more dynamic

We can also add sound to increase the power of your animation effects.

Q5) What is the Purpose of Microsoft PowerPoint

- (i). Marketing or internal company presentations
- (ii). To deliver company results to shareholders meeting
- (iii). To report on sales figures
- (iv). To launch new product in the market
- (v). In the induction of new employees to a company
- (vi). In advertisements

Q5) what are the five advantages of MS PowerPoint

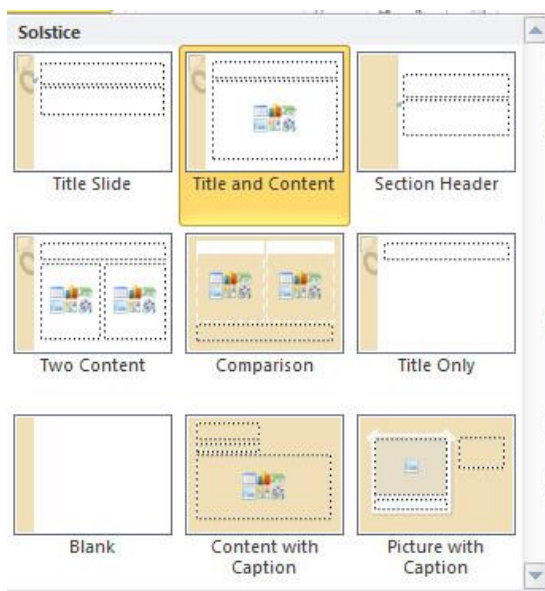
- Quick and easy: The basic features are easy to master and can make you appear to be organized, even if you are not.
- Simple bullet points: It can reduce complicated messages to simple bullet points. Bullet points are a good basis for a presentation and remind the speaker of main points and the organization of the message.
- Easy to create a colorful, attractive design: Using the standard templates and themes, you can create something visually appealing, even if you do not have much knowledge of basic graphic design principles.
- Easy to modify: When compared to other visual aids such as charts, posters, or objects, it is easy to modify.
- Easily re-order presentation: with a simple drag and drop or using key strokes, you can move slides to re-order the presentation.
- Finally, PowerPoint is integrated with other products that allow you to include parts of documents, spread sheets, and graphics.

- Audience size: PowerPoint slides are generally easier to see by a large audience when projected than other visual aids.
- Easy to present: You can easily advance the slides in the presentation one after another with a simple key stroke while still maintaining eye contact with the audience.
- No need for handouts: They look good visually and can be easily read if you have a projector and screen that is large enough for the entire room.

Q6) Which are the five views available in PowerPoint slides?

- Normal View is the main editing view to write and design a presentation.
- Slide Sorter View shows all slides in thumbnail form so they are easy to sort.
- Outline View displays all the text from the slides in a list for ease of reference and editing.
- Slide Show View uses the full computer screen and is used when presenting a slide show to an audience.

Q7) By use of drawing, outline any five slide layouts



Q8) what is the procedure of Saving a presentation under another name.

- On the File tab, click Save As.
- Enter a new file name over the existing file name and navigate to the location required.
- Click Save.

4.2.15 4.2.5 Learning outcome 5: manage personal information using Ms outlook

4.2.5.1 Introduction to Managing Personal Information using Ms Outlook

The past few years have seen the increase in popularity of personal information management systems that track contacts, appointments, to-do lists, priorities, and goals.

Microsoft Outlook 2010 is a personal information manager which is commonly used in the workplace. While Outlook is perhaps best known as a tool for sending and receiving email messages, it also includes powerful features for managing calendars, contacts, and tasks.

4.2.5.2 Performance Standard

- 4.2.5.2.1 Features of an email client software are outlined
- 4.2.5.2.2 Features of MS Outlook interface are identified
- 4.2.5.2.3 Sending and receiving of emails is done.
- 4.2.5.2.4 Organization of personal information using Ms. Outlook is done
- 4.2.5.2.5 Configuration of Outlook is done
- 4.2.5.2.6 Printing of emails is done.

4.2.5.3 Information Sheet

Electronic mail, generally known as e-mail, is a technology for exchanging information or messages on the Internet between a sender and one or many recipients.

E-mail is generally acknowledged to have revolutionized business correspondence, and has become the main medium of electronic communication for many organizations. E-mail is easy to use and is more practical and efficient than postal mail.

An Email Client is a desktop program that allows users to access their emails on their computer without having to log in via the web. They are linked to email accounts through POP3 or IMAP addressing. This means they can handle email for accounts with ISPs and other non-webmail services.

An email client is a program that lives on your computer and lets you send or receive emails. Typical examples include Outlook and Windows Live Mail.

Popular **email clients** include Microsoft Outlook, Mozilla Thunderbird, macOS Mail, IncrediMail, Mailbox and iOS Mail. The most popular web-based email client is Gmail;

Features of email client

Microsoft Outlook is both a personal information manager and electronic messaging system rolled into one. Outlook can be used to keep track of your diary, hold the contact details of your customers, suppliers and associates, schedule meetings, send messages, and generally keep track of things you have to do.

To do this, Outlook provides you with five main tools. These are Mail, Calendar, Contacts, Tasks and Notes. These tools work together, as well as independently, to provide you with a useful package known as Microsoft Office Outlook 2010.

- **Composing messages-**
When you write an email, you'll be using the compose window. This is where you'll add the email address of the recipient(s), the subject, and the body of the email, which is the message itself.
- **Managing messages**
The Mail tool allows you to manage electronic mail. You use this aspect of Outlook to send messages and to receive them from others. These messages can either be ones sent from within your own organization (internal email) or externally using the Internet.
- **Managing calendar**
The Calendar tool provides you with an electronic diary which can also be used to schedule and plan meetings with other people connected to your computer system or over the Internet.
- **Managing Contacts**
The Contacts tool allows you to manage business and personal contacts by recording the names, addresses, telephone numbers, and email details of people such as colleagues, customers, suppliers, friends, relatives, and the like.
- **Managing tasks, meetings and appointments**

The Tasks tool provides you with a To-Do list. You can also use it to priorities tasks and to delegate them to others and track how many of them have been completed.

- Journal which automatically records actions you choose that relate to specific contacts and places those actions in a timeline view, and
- Outlook Today which allows you to see what messages you have, what you need to do, plus other important information in one handy screen.
- he Notes screen in Outlook is used to jot down and manage short notes. These notes can be anything that you like such as short simple memory joggers, telephone

Getting to know the Outlook interface

If you're familiar with Outlook 2007 or 2003, you'll notice several changes to the 2010 interface. The main change is the addition of the Ribbon, which appears in all Office 2010 applications. Outlook 2010 also uses backstage view, which we will cover later in this lesson.

Whether you're new to Outlook or familiar with previous versions, you should take some time to learn your way around the interface.

Click the buttons in the interactive below to become more familiar with the Outlook 2010 interface.

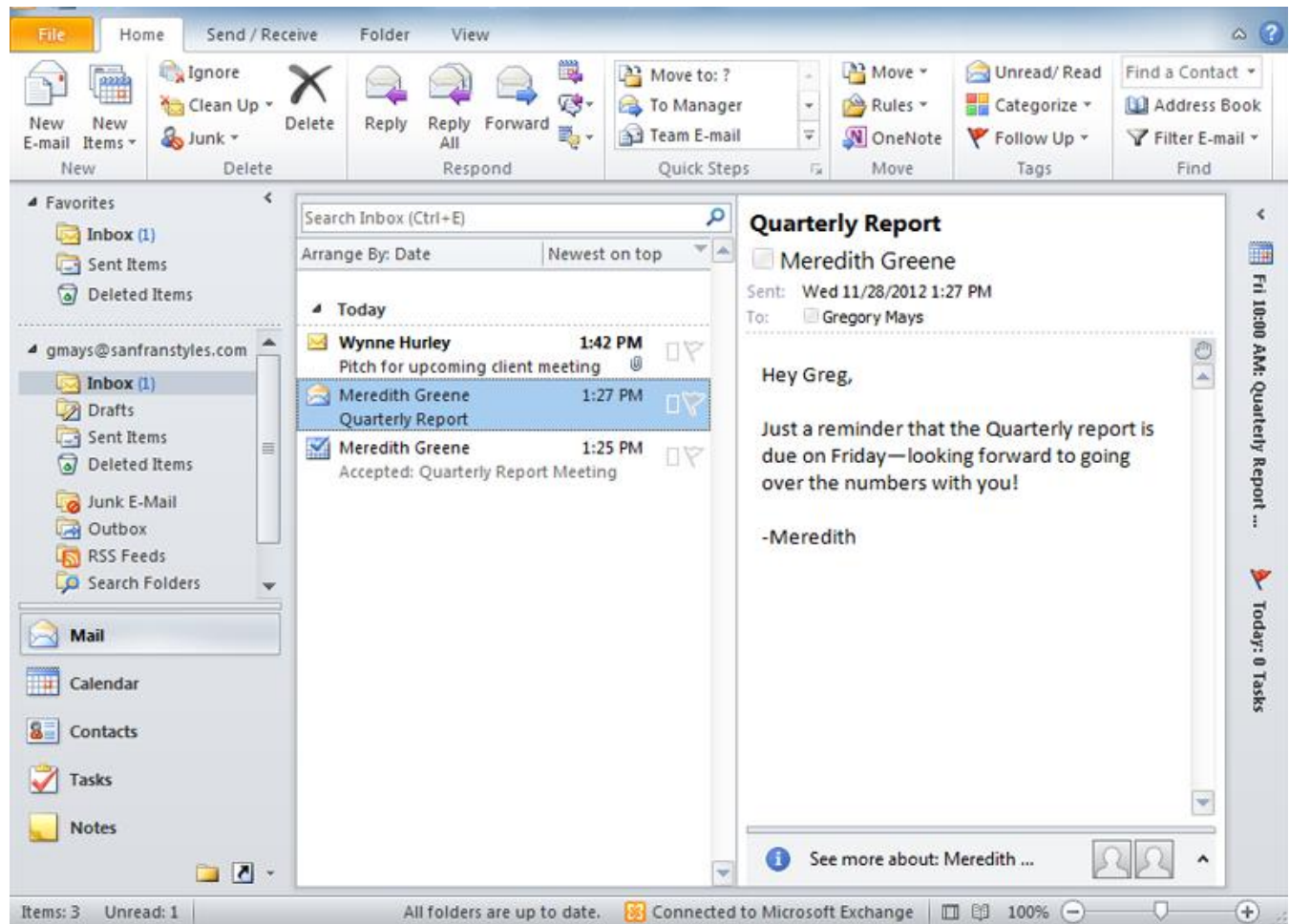


Figure 72: Microsoft Outlook Interface

Mail

Allows you Compose, send, read, or manage e-mail messages.

Calendar

Schedule appointments, meetings, or events.

Contacts

Manage contact list, as with address book.

Tasks

Track and prioritize your activities.

Outlook Today

Preview brief summary of appointments, tasks and e-mails.

Journal

Track Outlook activities you specify in timeline view.

Notes

Enter brief notes, similar to sticky notes.

Folders list

Display folders in top portion of Navigation pane.

Instant Search

Enter search criteria and see results display as you type.

Type a Question

Enter question or keyword to get help on Outlook topic.

Vertical Split Bars

Drag to show more or less of pane on either side.

Navigation Pane

Move between different modules or components of Outlook.

E-mail List

Displays information for each module or folder.

Reading Pane

Displays contents of e-mail highlighted in E-mail List pane.

To-Do Bar

Displays date navigator, appointments, and task list.

Date Navigator

Switch to Calendar and view schedule for selected date.

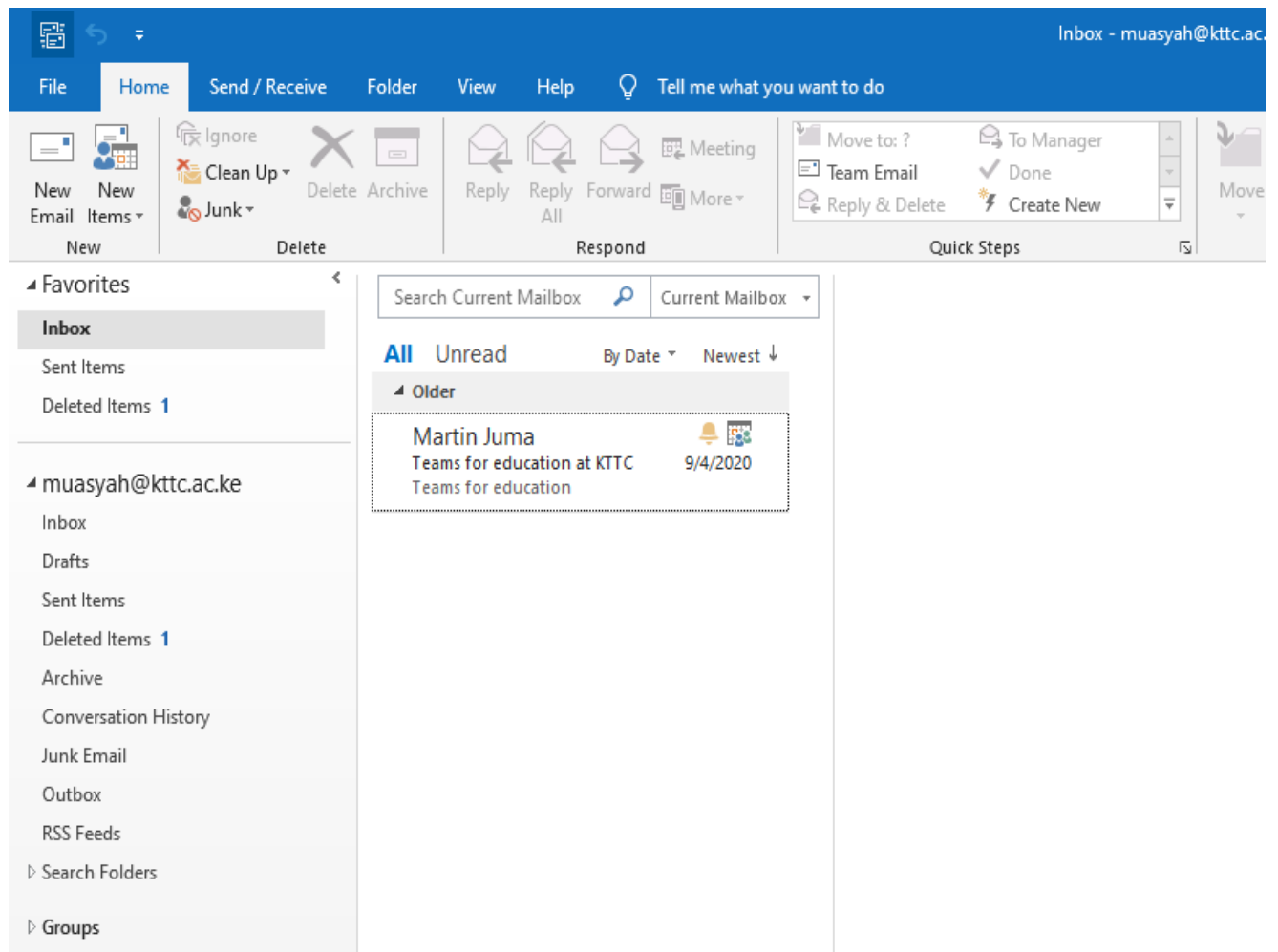
Appointments

Displays list of upcoming appointments.

Task List

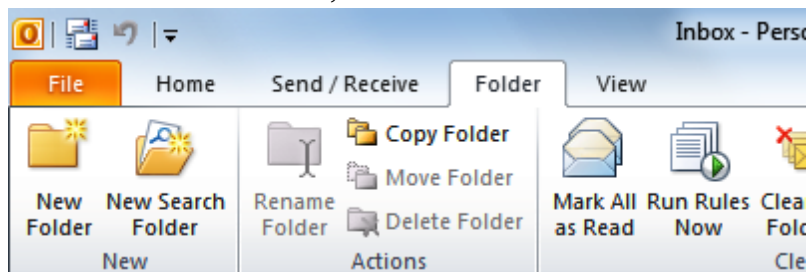
Displays list of all tasks arranged in sort order you select.

The Ribbon is the tabbed band that appears across the top of the window. It is the control centre of Outlook 2010. Instead of menus, you use the tabs on the Ribbon to access the commands that have been categorised into groups. The commands include galleries of formatting options that you can select from, such as the Quick Steps gallery shown here.



The Quick Access Toolbar

The Quick Access Toolbar is positioned at the top left corner of the Microsoft Outlook 2010 screen. In its default state, it includes the Send/Receive All Folders tool and the Undo tool.

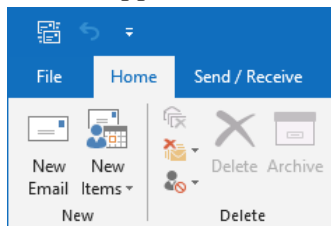


Sending emails

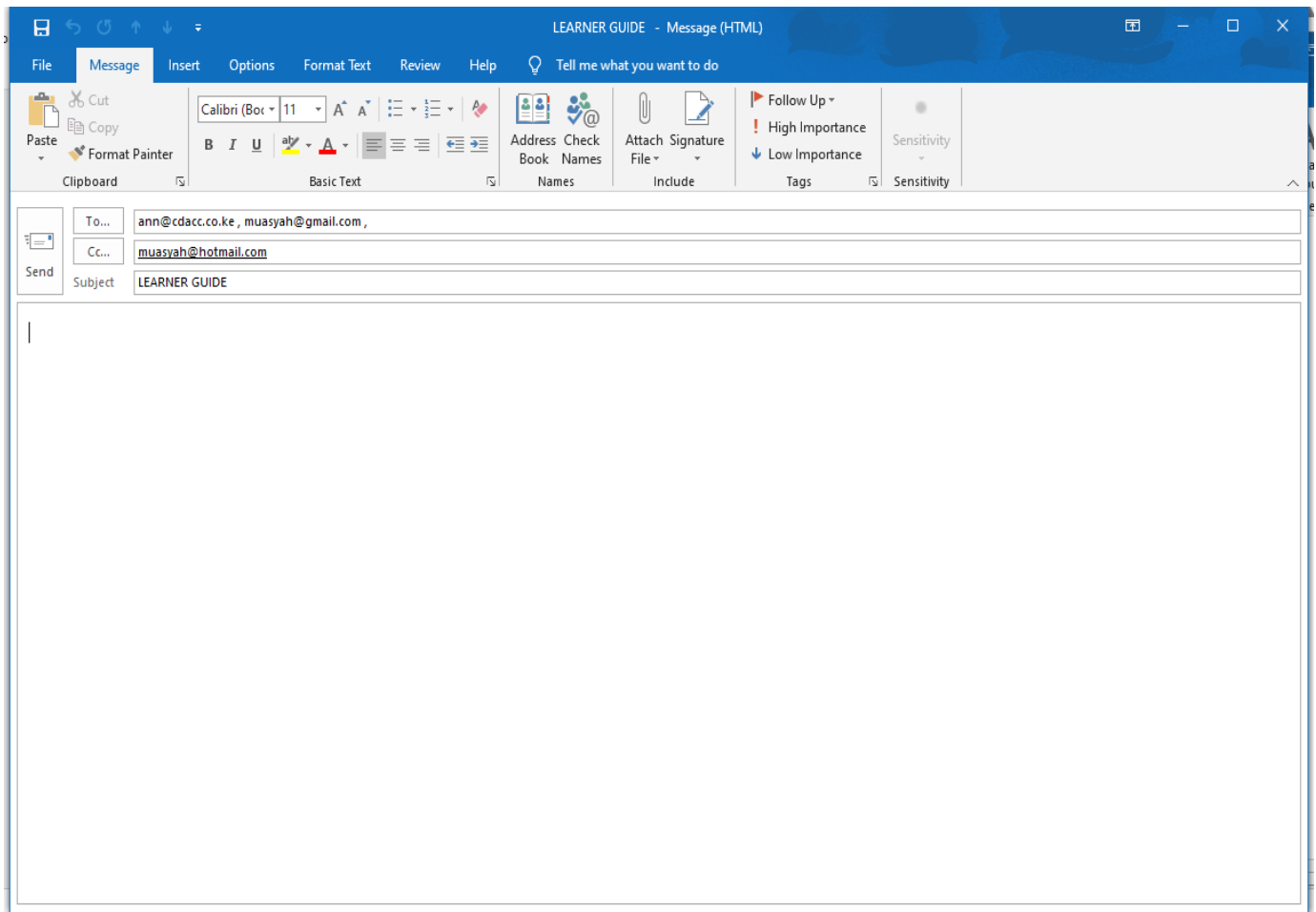
When you write an email, you'll be using the **Compose window**. This is where you'll add the **email address of the recipient(s)**, the **subject**, and the **body** of the email, which is the message itself. You'll also be able to add various types of **text formatting**, as well as **attachments**.

To send an email:

- Click the **New Email** command on the **Ribbon**. The **Compose window** will appear.



The compose window is where you'll add the email address of the recipient(s), the subject, and the body of the email, which is the message itself.



E-mail address and e-mail structure

An **E-mail address** contains information about the e-mail box to which e-mail messages are delivered.

For example, an e-mail address such as Jdoe@cdacc.org is comprised of a user name (Jdoe), an @ symbol, a domain name (cdacc), and an extension (.org).

E-mail Message

E-mail messages comprise of two areas, the message header and the message body. The header is organized into fields, for example, From, To, CC, Subject, Date, and other data about the e-mail.

The body contains the message and sometimes a signature towards the end.

To: The e-mail address(es), and alternatively name(s) of the message's recipient(s).

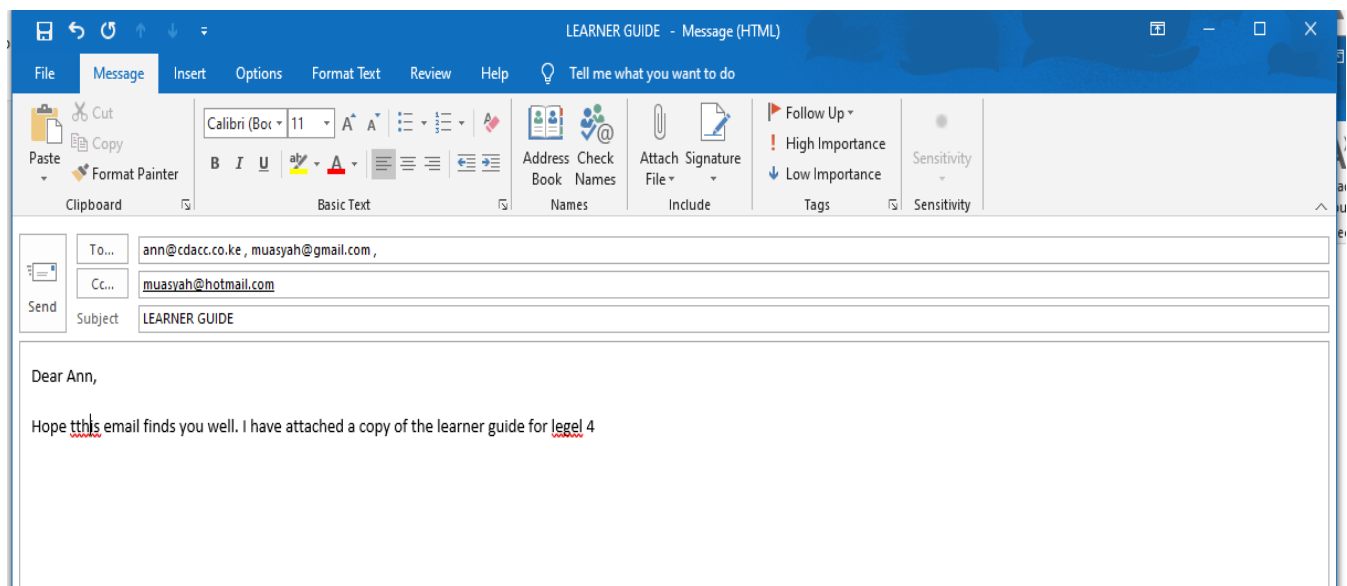
Cc: Carbon copy; for optional recipients who are not the primary intended recipient.

Bcc: Blind carbon copy; addresses added to the list but not recorded in the message information, so that they cannot be read by other recipients.

Subject: A brief synopsis of the topic of the message. Abbreviations are usually utilised as a part of the subject, including "RE:" for reply and "FW:" for forward.

To use Spell Check:

Whenever you're composing an email, it's important to make sure your message is free from spelling and grammatical errors. Some spelling errors will be detected automatically as you write your message, which should feel familiar if you've ever used the Spell Check feature in Microsoft Word. Check out our tutorial on Email Etiquette and Safety to learn more about best practices when using email to communicate in the workplace.



To print email messages

If you need to reference or document an important message away from your computer, it's easy to **print** an email message.

- Click the **File** tab on the **Ribbon**.
- **Backstage view** will appear. Locate and select **Print**.
- The **Print pane** will appear. Choose your **settings**, then click **Print**.

An e-mail attachment

An e-mail attachment is a computer file, such as a document, image, or audio clip that is sent together with an e-mail message. One or more files can be attached to an e-mail message, and is a common method of sharing files between people.

An e-mail client typically uses a paper clip symbol to indicate that a file is attached to an e-mail.

Downloading an attachment

Most of the time, you'll see attached files in the Reading Pane, directly under the message header or subject. Occasionally, you'll see the attachments in the message body.

- Double-click the attachment icon to open the attachment.

Save one or more attachments

- Click the attachment in the Reading Pane or the open message.
- On the Attachments tab, in the Actions group, click Save As.
- You can also right-click the attachment, and then click Save As. To select multiple attachments, hold down the Ctrl key while clicking the attachments. To save all attachments, choose Save All Attachments.



To create an appointment:

Whenever you schedule a new **appointment**, it's easy to add it to your calendar.

1. Locate and select the **New Appointment** command on the **Ribbon**.
2. The **New Appointment dialog box** will appear. Enter the **desired information** for the appointment. At the very least, you should include a **subject, time, and location**, but you can also include lots of other information, such as **reminder preferences and detailed notes**.
3. When you're done entering the appointment information, click **Save & Close**.

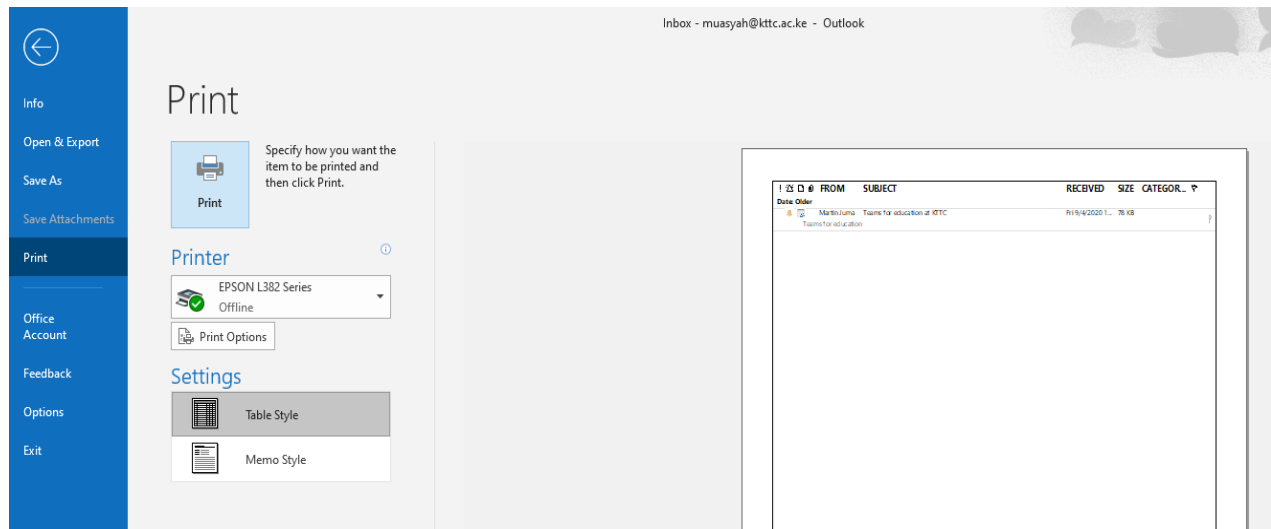
A screenshot of the 'New Appointment' dialog box in Microsoft Outlook. The title bar reads 'LUNCH WITH A CLIENT - Appointment'. The ribbon at the top includes 'File', 'Appointment' (which is active), 'Insert', 'Format Text', 'Review', 'Help', and a search bar. The 'Appointment' ribbon has several groups: 'Actions' (Save & Delete, Close), 'Show' (Appointment, Scheduling Assistant), 'Skype Meeting', 'Teams Meeting', 'Meeting Notes', 'Invite Attendees', 'Options' (Show As: Busy, Reminder: 15 minutes, Recurrence, Time Zones), 'Tags' (Categorize, High Importance, Low Importance, Private), and 'My Templates' (View Templates). The main form area contains the following fields: 'Subject' with the text 'LUNCH WITH A CLIENT', 'Location' with a dropdown menu showing 'RENOS RESTAURANT', 'Start time' with a date picker for 'Fri 6/18/2021' and a time dropdown for '11:30 AM', and 'End time' with a date picker for 'Fri 6/18/2021' and a time dropdown for '12:00 PM'. There is also an 'All day event' checkbox which is currently unchecked.

4. The appointment will be **saved** and **added** to your **calendar**.

To print calendars:

If you need to reference your schedule on the go, it's easy to **print your calendars**.

1. Click the **File** tab on the **Ribbon**.
2. **Backstage view** will appear. Locate and select **Print**.

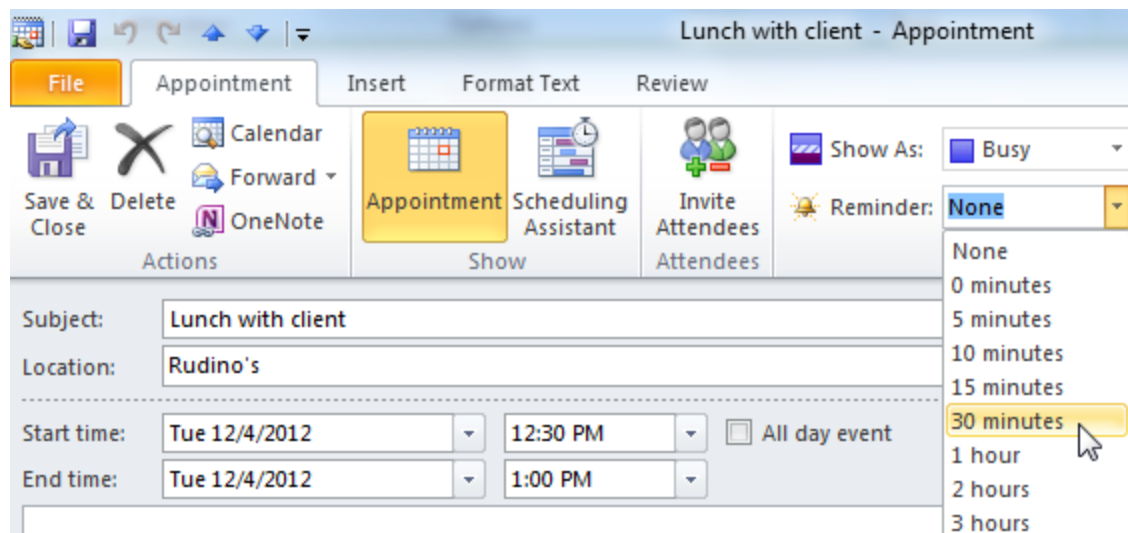


3. The **Print pane** will appear. Choose your **desired layout**, including **daily, weekly, and monthly** summaries of your appointments and meetings, then click **Print**.

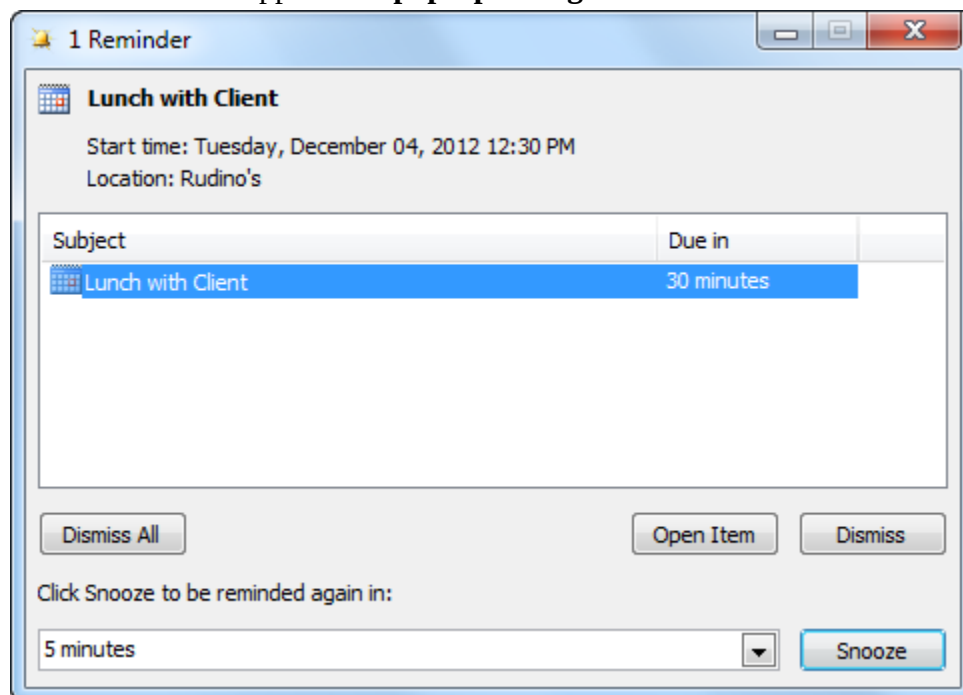
To create appointment reminders:

You can create **reminders** for your most important appointments, which can be especially helpful if you keep a busy schedule. For example, you might schedule a reminder for an important lunch date that would appear 30 minutes before the appointment.

To create a reminder, simply set a **reminder time** on the **Ribbon** when creating a new appointment.



The reminder will appear in a **pop-up dialog box** at the scheduled time.



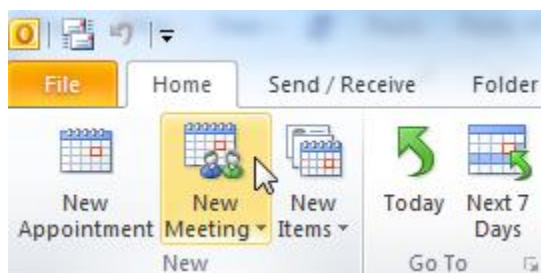
Scheduling meetings

Once your calendar is **shared** with other users in your workplace, you can use your shared calendars to **schedule meetings**.

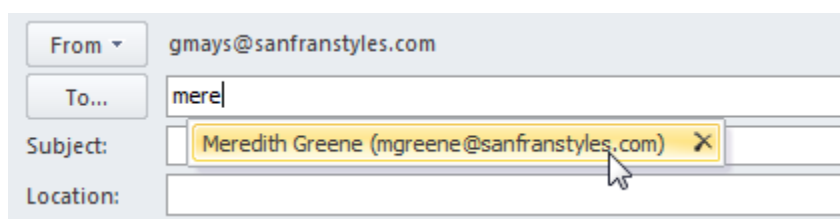
To send a meeting request:

A **meeting** is just like an **appointment** on your calendar, but with other **attendees**. To schedule a meeting, you must first send a **meeting request**.

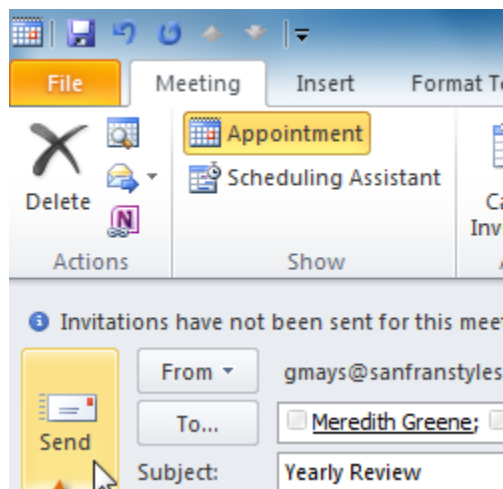
- 1 Locate and select the **New Meeting** command on the **Ribbon**.



- 2 The **New Meeting dialog box** will appear. Whenever you request a meeting, you'll actually be sending an **email message** to attendees. Enter **attendees** for the meeting into the **To: field** as you would enter recipients in the Compose window of an email.



- 3 Enter the **information** for the meeting. At the very least, you should include a **subject, time, and location**. You can also include a **message** as you would in an email.
- 4 When you've finished entering meeting information, click **Send**.



- 5 The meeting request will be sent to the selected attendees, and the meeting will appear on your calendar. When your attendees **accept the meeting request**, the meeting will appear on their calendars as well.

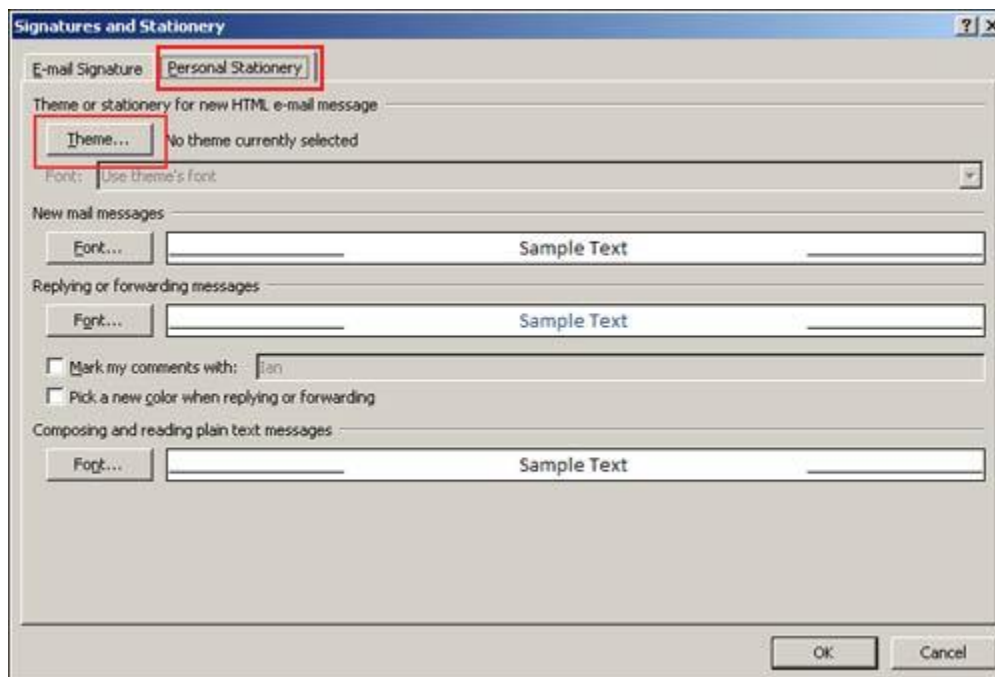
How to Personalize Microsoft Outlook 2010

Everybody likes to have things their own way. That's not always possible but there are a number of things you can do in Outlook 2010 to customize the user interface and the style of your email messages.

1 Main theme

You have three choices when it comes to the main interface screen – black, blue and silver. The options were originally put in to bridge the gap between the Windows Vista theming method and Windows XP theming method, and to accommodate the new ribbon design.

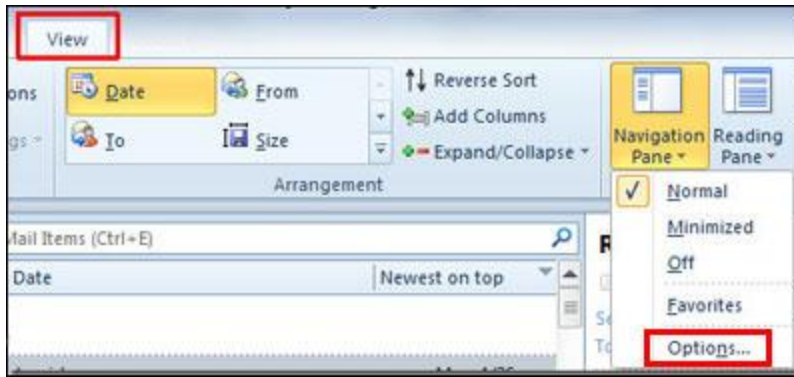
You can change the theme by navigating to the 'Options' screen from the 'File' menu. Select 'Signatures and Stationery' and then select 'Theme'. Here you can select your preference.



2 Navigation panes

You can change the appearance of your navigation pane (the main list of folders on the left-hand side of the screen) from blanket formatting right down to specific fonts for individual categories like flagged or unread messages. This is particularly useful if you are running multiple email accounts through one Outlook install.

Open the 'View' tab and bring up the 'Navigation Pane' drop-down menu from the 'Layout' section. Then select 'Options'.



This will bring up a screen where you can choose which buttons are actually displayed in the navigation pane e.g. tasks, calendars etc. You can also edit the order in which they appear from top to bottom. If you want to drill down further and change the font for individual buttons just select the button and then click on 'Fonts'. You can select the font family, size and style as you would do in a Word document. Click 'OK' once you've got your desired look. Then click 'OK' again on the 'Options' screen to save the changes.

3 Email messages

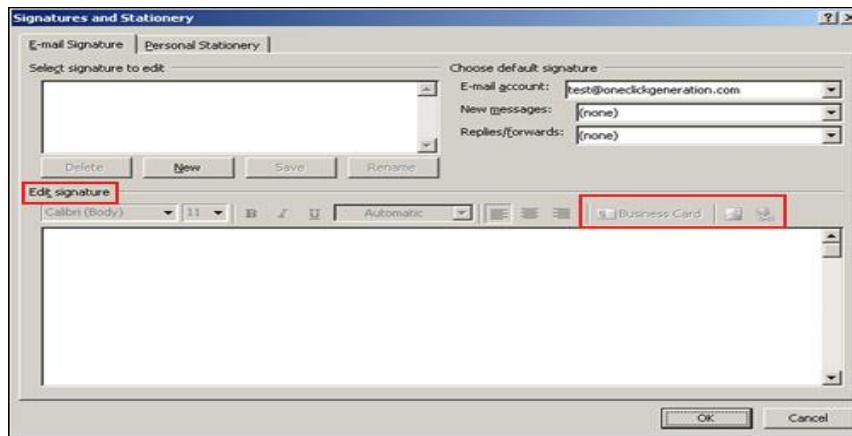
You can change the default font family, size, style and colour of your messages in the compose window to inject some personality into your emails. Simply click on 'Options' in the 'File' menu. Then click the 'Stationery and fonts' button. Navigate to the 'Personal Stationery' tab and you can then select whether you want to change the default fonts for new email messages or replying/forwarding messages. Click on the 'Font' button under each of the categories to make the desired changes. Along with the standard family, size, style and colour options you can also add extra effects such as small caps or superscript.

4 Email signatures

Having an email signature containing your title and contact details is pretty much standard but a lot of people still don't know how to create one. Even if someone else set one up for you, it's good to know how to edit it in case you change your title or telephone number.

To create a signature, open up a new message and click on the 'Signatures' option from the 'Signature' drop-down menu. Then click 'New' on the 'Email signatures' tab. Create a name for your signature and then use the 'Edit Signature' box to create your masterpiece.

You can format text in the usual way and you also have the option of adding graphics and hyperlinks.



Once you've clicked 'OK' to save it, you can automatically add your new signature to all your messages or just add it when you need to.

4.2.2.4 Learning Activities

visit a computer lab in your institution and carry out the following activities. Activity 1 Open a new task window and From the To-Do Bar, do the following: • Create a task with the subject CDACC Dinner Reservations. • Flag the task for completion this week. • Assign the task to the Management category (or another category you choose). ➤ Open a new task window, and do the following: • Create a task with the subject CDACC Send Dinner Invitations. • Set a due date of next Tuesday with a reminder at 5:00 P.M. • Set the status to Waiting on Someone Else. ➤ Open the CDACC Dinner Reservations task and do the following: • Mark the task as private and high priority. • Set the task to 25 percent complete. ➤ Create a new task with the subject CDACC Status Report that must be completed on the first Monday of every month for six months. ➤ In the Notes module, do the following: • Create a note that contains your full name. • Modify the note content so that only your first name appears as the note subject, and your last name is in the note body. • create a color category named CDACC. Assign the note to the CDACC color category. Activity 2 Open a new task window and Create the Following Appointment: • A Recurring One-Hour Appointment on The First Monday Of The Month At 6:00 P.M. With The Subject CDACC Book Club. • Set The Series To Start At The Beginning Of Next Month And End After Six Occurrences. ➤ Create The Following Event: • A Two-Day Event On Tuesday And Wednesday Two Weeks From Now In Nakuru, Mombasa, With The Subject CDACC Annual Meeting And Retreat. • Show The Time As Out Of Office. ➤ Create the Following Meeting Request: • Request A Half-Hour Meeting with A Colleague, With The Subject CDACC Status Meeting, At 3:00 P.M. Tomorrow. • Enter Test – Please Accept In The Location Box, And Send The Request To Your Colleague.	Avoid overcrowding to avoid accidents and damages. Do not tamper with computers and their accessories. Cover the computers after use

4.2.2.5 Self-Assessment

1. Microsoft Outlook provides you with five main tools. Which are these they?
2. An **E-mail address** contains information about the e-mail box to which e-mail messages are delivered.

Explain the structure of the following email

idoer@cdacc.org

3. Outline the main purpose of standard e-mail folders
4. How do I set up an appointment in Outlook?
5. What is an email signature?
6. Which are the Popular email clients available on the internet?
7. What is the difference between email and email client?
8. What are the five advantages an organization may benefit from making maximum use of email client software?
9. What is the procedure of creating a meeting in a calendar?

4.2.5.6 Tools, Equipment, Supplies and Materials

- Software (Windows, MS Office, Antivirus, Games)
- Computer
- Printer
- Digital instructional material including DVDs and CDs;
- Storage Devices (Flash Disks, CDs, DVDs, Memory cards)
- Stationery

4.2.5.7 References

https://www.sos.wa.gov/assets/library/libraries/projects/ita/mos_2016_study_guide_microsoft_outlook.pdf

<https://edu.gcglobal.org/en/outlook2010/>

Answers To Self-Assessment

1. Microsoft Outlook provides you with five main tools. Which are these they?

- Composing messages-

When you write an email, you'll be using the compose window. This is where you'll add the email address of the recipient(s), the subject, and the body of the email, which is the message itself.

- Managing messages

The Mail tool allows you to manage electronic mail. You use this aspect of Outlook to send messages and to receive them from others. These messages can either be ones sent from within your own organization (internal email) or externally using the Internet.

- Managing calendar

The Calendar tool provides you with an electronic diary which can also be used to schedule and plan meetings with other people connected to your computer system or over the Internet.

- Managing Contacts

The Contacts tool allows you to manage business and personal contacts by recording the names, addresses, telephone numbers, and email details of people such as colleagues, customers, suppliers, friends, relatives, and the like.

- Managing tasks, meetings and appointments

The Tasks tool provides you with a To-Do list. You can also use it to priorities tasks and to delegate them to others and track how many of them have been completed.

- Journal which automatically records actions you choose that relate to specific contacts and places those actions in a timeline view, and

- Outlook Today which allows you to see what messages you have, what you need to do, plus other important information in one handy screen.

2. An **E-mail address** contains information about the e-mail box to which e-mail messages are delivered.

Explain the structure of the following email

jdoe@cdacc.org

For example, an e-mail address such as Jdoe@cdacc.org is comprised of a user name (jdoe), an @ symbol, a domain name (cdacc), and an extension (.org).

3. Outline the main purpose of standard e-mail folders

- Inbox - Folder all e-mails are sent to by default
- Outbox - Temporary folder that stores e-mails until they have been sent
- Sent - Folder that stores all sent e-mails
- Deleted / Trash Items - Stores mails no longer needed
- Draft - Stores mails before the user chooses to send them
- Spam/Junk - Stores any incoming mail

4. How do I set up an appointment in Outlook?

- a) From your Calendar folder, select **New Appointment** or click Ctrl+N. From any other folder, click Ctrl+Shift+A.
 - b) Enter a subject, location, **start** time, and end time.
 - c) Select Save & Close to save your **appointment**.
5. What is an email signature?
- An email signature is a block of text that is automatically inserted to the end of an email message you send. Generally, a signature is used to provide the recipient with your name, email address, business contact information, website URL or even memorable anecdotes.**
6. Which are the Popular email clients available on the internet?
- Microsoft Outlook, Mozilla Thunderbird, macOS Mail, IncrediMail, Mailbox and iOS Mail. The most popular web-based email client is Gmail;
7. What is the difference between email and email client?
- Electronic mail**, generally known as e-mail, is a technology for exchanging information or messages on the Internet between a sender and one or many recipients.

An email client is a program that lives on your computer and lets you send or receive emails. Typical examples include Outlook and Windows Live Mail.

8. What are the five advantages an organization may benefit from making maximum use of email client software?
- Here are the benefits of E-mail:
 - Reliable
 - Convenience
 - Speed
 - Inexpensive
 - Printable
 - Global
 - Generality
9. What is the procedure of creating a meeting in a calendar?
- In Calendar, click Create.
 - Enter a name in the Untitled event box.
 - Set a time and date for the event.
 - Enter a location for the event.
 - Type a description of the event.
 - Click a colour option, if necessary.
 - Select the notification settings.
 - Select the appropriate setting from the Show me as buttons.
 - Click Save.

CHAPTER 5: INTERNET SKILLS

Unit of learning code: IT/CU/ICTA/CR/05/4/A

Related Unit of Competency in Occupational Standard Use the Internet

5.1 Introduction to the unit of learning

This unit covers the competencies required to understand how internet communication and browsing is done. It involves defining internet terminologies, identifying requirements for internet connectivity, identifying internet access and web browsing techniques and identifying application areas for the internet.

5.2 Summary of Learning Outcomes

1. Explain fundamental concepts of Internet connectivity and application
2. Demonstrate ability to use a web browser to provide and customize access to preference
3. Select a suitable search engine to find information
4. Conduct online communication effectively and safely

4.2.16 5.2.1 Learning Outcome 1: Explain fundamental concepts of Internet connectivity and application

5.2.1.1 Introduction to the learning outcome

This learning outcome explains the basic concept about the internet and how to access it. It also highlights the impact of internet in today's society.

5.2.1.2 Performance Standard

- 5.2.1.2.1 **The internet terminologies are defined.**
- 5.2.1.2.2 **Application areas of the Internet are outlined.**
- 5.2.1.2.3 **Requirements of internet connectivity are outlined.**
- 5.2.1.2.4 **Impacts of internet are outlined.**

5.2.1.3 Information Sheet

Definition of Internet terminologies

Internet: it can be defined as an interconnection of millions of devices that are connected for the purpose of communication and sharing information. It can also be termed as a network on networks.

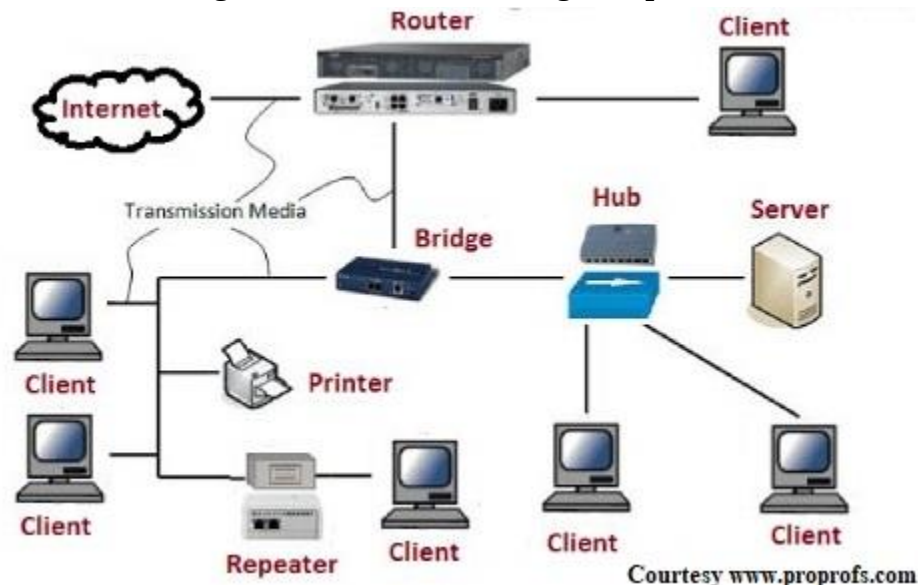
Computer network: it is an interconnection of two or more devices that are connected together for communication and sharing of resources over telecommunication infrastructure. Computers use set down rules and protocols to communicate and in transfer of data.

Internet service provider (ISP): this is an organization (company) that provides the service of connecting internet users to the world. Examples of ISPs in Kenya include Safaricom, Airtel, Telecom Kenya and many other providers.

Components of a computer network

An organization computer network can be as simple or complex network depending with the number of users, device connected and the type of user that are in the organization. Below is basic LAN networking components.

Figure 73: LAN Networking Components



1. **Router:** is a networking device that is used to connect the local network to other networks like internet. Just like the name suggest it is used to route the message from within the LAN to the destination using the best and fastest route.
2. **Bridge:** it is used to logically divide a large LAN it small manageable networks. Each section of network can be managed separately
3. **Hub:** it acts as a central point where divices can be connected to link each other. It broadcast the received signl to all connected devices.
4. **Network switch:** just like Hub it act as a central connection point for devices. But unlike hub switch doesn't broadcast the signal rather it is intelligent enough to forward the signal to the desitination device on the network.

5. **Server Computer:** it is a powerful computer that is used to server and manage other computer and devices within the network.
6. **Client:** this can be any end user device such as personal computer, laptop, smartphone etc that are connected to the network.
7. **Repeater:** when signal are moving long distance they can become weak and they need a boost. Repeater is used to regenerate and resend the signal to the final destination device.
8. **Access Point:** it is a network device that is used to broadcast signal that can be used by wireless connected devices.
9. **Transmission media:** the media that are used can either be cables or wireless signal such as radio signal.

How the internet works

Internet being an interconnection of millions of device it requires an organized system to ensure these devices connect and communicate to each other effectively. For internet to work it requires the hardware component and the protocols that should be followed.

The hardware includes devices like computers, mobile phones, laptop and many others that mostly act as the client devices. Client devices are ones that request information and data from a more powerful computer called computer server.

A computer server is a much more powerful computer than your personal computer that is loaded with data that other devices can access.

Other hardware device that makes internet components includes modem, router cables and all other related hardware.

The next components required are protocols. These are rules and methods that each device requires to communicate over the internet should follow and meet. Just like human requires a common language to communicate and understand each other the protocols create a common language for all devices. Without protocols no communication can happen.

There are 2 main protocols that are used over the internet: Transmission Control Protocol (TCP) and Internet Protocol (IP) which is grouped to form TCP/IP.

After the protocol next is each computer is given an address to ensure the message is delivered to the right device. Devices are assigned an address called IP address. There are 2 types of address that are used;

1. IP4
2. IP6

Note // currently the most common is IP4.

How message/ information is transferred from one device to next over internet

Assuming you require to login to your Facebook account. First ensure your device has internet access. Automatically when connected to the internet you device is assigned a temporally IP address. When you send a request to Facebook server computer your computer uses relevant

protocols with the connectivity from you ISP. The ISP directs (route) your message to the next device until the message is delivered to Facebook server.

The Facebook server recognizes your computer by the use of IP address your computer was assigned. The server sends back the reply message back to your computer and that how you are able to login to your Facebook account.

Uses of internet

Internet in today's world it is used in all sectors of life

The following are some of the uses Internet:

1. Electronic Commerce

Many people are actively using the Internet to do business on the Internet. The use of the Internet in E-commerce can be used in a number of ways;

a) Electronic Store

It is a Website that lists all the products or services a business wishes to sell, thus enabling customers to purchase them by using the Internet itself. E-store sites provide physical goods and services.

b) Electronic Marketing

It focuses on the products or services of one company with aim of increasing sales. This type of site supports the sales process, but does not make actual sales. The goal is to attract and keep customers.

c) Customers Service sales

This provides a variety of information for customers after they have purchased a product or service to allow customer's access most commonly needed information 24 hrs.

2. Electronic mail (e-mail)

This is a technology that enables users to electronically send and receive messages over the internet. Each user is assigned a user account that can be used to identify where the email will be delivered. Emails are cheap ways to communicate.

3. Online chatting

This is where user can send message and reply in real time. Today we have many chatting platform such as WhatsApp, telegram etc. chatting can be made through a text, audio or even video.

4. Video Conference services

Internet offers platform that user can hold virtual online meeting that can accommodate more than 2 people communicating at the same time. The platform can be used for virtual meeting, virtual classroom that can accommodate over 500 user at the same time.

5. Entertainment (Games, Music and Movies)

Internet user can play computer games, listen to music and even watch movies over the internet. It has offered users a variety of choices that was not possible without internet. Platform such as YouTube and Netflix are some of the area users can get movies and music

6. Downloading of programs

Internet offers user a place to download freeware or open source programs that people can use on their devices

Internet connectivity requirements

For a user to be able to connect to the internet they require the following:

- 1. Device/computer/client**

This is the device that user will use to connect to the internet.

- 2. Modem**

A Modem is a device that enables you to connect to the Internet, and access information. From the transmitting device (sender), it translates computer information (which is in digital form) into analogue form (the form that can transmit over telephone lines/cables) a process is called Modulation.

On the receiving device (receiver), it translates the information back into digital form (a form that your computer can understand); a process called Demodulation.

- 3. Cables/connectivity**

This is the method that user is connected/link to the ISP. It can be through Dial-up, wireless or satellite

- 4. Internet Service Provider (ISP)**

It is a commercial organization (or a company) that provides Internet connections along with a set of support services at a fee. The company uses their internet infrastructure to link user to the internet. Other requirements may include routers, cables, browsers and internet software.

Impacts of using the Internet

Internet has impacted every sector in our society today. From security to agriculture internet has in one way or another affected all those areas. The impact can be categorized into 2 main classes: positive and negative impacts.

Positive impacts

- 1. Speed of communication**

Internet has increased the communication speed to the point that people can have live chat and even video chat. Before internet communication was either through a letter or physically going to deliver the message.

- 2. Cost of communication**

Internet has reduced the cost of communication to small charges that people have to pay to the ISP to be connected to the internet. People don't need to travel to deliver the message they can connect to the internet from ISP and communicate to each other.

- 3. Paperless environment**

With internet people don't need to print letter or even picture since they can view and reply digitally. This has reduced the use of paper.

- 4. Global village**

With internet and social media platform the world has reduced to a small village where people can know and follow what happening in the neighbouring countries in real time.

Negative impacts

- 1. Cyber bullying**

Internet can be used to harass and intimidate other people by using race, body shaming and other form of online harassment. Some of the bullying has led to people harming self or others, committing suicide, depression and many other societal issues.

2. Internet addiction

Internet can be addictive in the sense that people over spend time on different platforms. Users are afraid of missing out on what is going on social media platforms hence they are always on social media, if they miss even for few minutes they feel that they are left out. Internet addiction is becoming a reality on today world of fast internet speed.

3. Scams

Internet is used to scam people and steal either their identity or even material things. Many companies recruit new employee over the internet and scammer can use that opportunity to scam people who are not keen.

4. Electronic gambling

Many users are being addicted to online gambling and hence losing money and other variables. Internet offers a platform to conduct even illegal gambling which users may not be aware of.

5. Privacy issues

With social media where people post their life activities it leads to reduced privacy. Someone may be stocked online by predators who may harm them, their children, relatives or friends. People should be careful what they post on social media since you cannot control who views your content most of the time.

5.2.1.4 Learning Activities

Practical activities

You are required to draw a layout diagram of you institute LAN. The diagram should include network from the institute router to all other buildings. Label all network components that are used on the network.

5.2.1.5 Self-Assessment

You are provided with the following questions for self -assessment, attempt them and check your responses.

- 1. In a college setup what are some of the areas that internet is used and for what purpose?**
- 2. What is the purpose of giving a computer connected over the internet an address?**
- 3. Kenya is considered an agricultural county. What are some of the things that you can advise a farmer to use internet for?**
- 4. How can a Kenyan youth use internet to earn living online?**
- 5. What is the different between computer network and internet?**

5.2.1.6 Tools, Equipment, Supplies and Materials

The following resources are provided

- 1. Computer connected to the internet**

2. Internet browser installed
3. Network switch
4. Access point
5. Router

5.2.1.7 References

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Diomidous, M., Chardalias, K., Magita, A., Koutonias, P., Panagiotopoulou, P., & Mantas, J. (2016). Social and Psychological Effects of the Internet Use. *Actainformaticamedica : AIM : journal of the Society for Medical Informatics of Bosnia & Herzegovina : casopisDrustvazamedicinskuinformatikuBiH*, 24(1), 66–68.
<https://doi.org/10.5455/aim.2016.24.66-68>

Jonathan Strickland "How does the Internet work?" 7 May 2010.

HowStuffWorks.com. <<https://computer.howstuffworks.com/internet/basics/internet.htm>> 12 February 2021

Model answers for self-assessment

1. In a college setup what are some of the areas that internet is used and for what purpose?
 - a) Online learning and teaching
 - b) Research
 - c) Collaboration with other colleges over internet
 - d) Online application of courses
2. What is the purpose of giving a computer connected over the internet an address?
 To uniquely identify all devices connected to the internet
3. Kenya is considered an agricultural county. What are some of the things that you can advise a farmer to use internet for?
 - a) Research on new and better agricultural practices
 - b) Sale of farm produce
 - c) Sharing experiences with other farmers
 - d) Monitoring their farm over internet
4. How can a Kenyan youth use internet to earn living online?
 - a) Sales of product and services over the internet
 - b) Advertisement of product for a fee
 - c) Social media influencer for product endorsements
 - d) Offering advice through videos or a blogs
5. What is the different between computer network and internet?
 Computer network can be made up of only 2 device or more but internet is connection of millions of devices.

5.2.2 Learning Outcome 2 Demonstrate ability to use a web browser to provide and customise access to preference

5.2.2.1 Introduction to the learning outcome

This learning outcome explains the basic concept about web browsing applications and how to navigate. It also covers common browser interface and how to customize to fit the user needs.

5.2.2.2. Performance Standard

- a. *Web browsing applications* are identified.
- b. *Common interface features* of web browsers are identified.
- c. Navigation within a web page and across web site is done.
- d. Customization of web browser is done.

5.2.2.3 Information Sheet

Definitions of the World Wide Web concept

1. **World Wide Web** - these are pages that are stored in different computers over the internet. It is just one way of accessing and using internet.
2. **Website** - they are different web pages that are related to each other and located in same computer. These are owned and developed by a specific company or individual.
3. **Web page** - it is a single page in a website
4. **Home page** - it is mostly the entry page to most website
5. **HTML (Hypertext Markup Language)** -The language used to create Web pages. To view HTML documents, use Web browsing Software.
6. **Web/internet browser** – it is a software that is used to retrieve web pages from internet or server to user device.
7. **Universal Resource Locators (URLs)**

URL is an address that is used to locate where different resources are stored over the internet. It is made up of a number of parts which include the following;

Using an example of an URL from CDACC TVET

<https://www.tvetcdacc.go.ke/wp-content/uploads/Approved-OS-and-Curricula-List.pdf>

1. **https://**

This identifies the protocol that is used to connect to the internet. HTTPS stands for Hypertext Transfer Protocol Secure. If a URL doesn't have the S it means it is not secure and it is not recommend entering personal details to such websites

2. www.tvetcdacc.go.ke

This represents the website domain and domain suffix. It is unique address that is assigned to each website for identification

3. /wp-content/uploads/

It give the directory/folder that the resource is store in the domain computer.

4. Approved-OS-and-Curricula-List.pdf

It identifies the specific resources that the user requires to retrieve in this case the CDACC approved Oss

Internet Domains

Each website is given an IP address that can be used to identify it. For the user to be able to read the address in a simple way it is converted into a name called a domain name. Hence a domain is a human readable website address. A domain is made up of 2 main parts. Let use the CDACC TVET domain again to explain.

tvetcdacc.go.ke

tvetcdacc: This is the part that makes a domain unique from all others. It is also called second level domain

.go.ke: This are called top level domain (TLD) and they comes after the (.) dot in the domain name. They are also called extensions and they are assigned by The Internet Corporation for Assigned Names and Numbers (ICANN), which is the entity that coordinates domains and IP addresses for the internet.

TLD are used to represent the purpose and the geographical area that they are used. Table below shows some of the most common.

Table 2: Top Level Domain (TLD)

TLD	Purpose/County used
.com	Commercial
.ac	Academic
.mil	Military
.ke	Kenya
.co	Company
.gov	Government
.edu	Education
.net	Network organization
.ug	Uganda

Purpose of a web browser

A web/internet browser is an application program that is used to retrieve web pages that are developed using HTML.

Functions of web browser

1. To fetch and retrieve hypertext mark-up text from the internet to user device
2. Act as an interface for user to interact with webpages

3. Provide a secure method of accessing content over the internet.
4. Caching of most retrieved content to increase access speed
5. Provide user with navigation tools to navigate and read web page content

Comparison of various web browsers

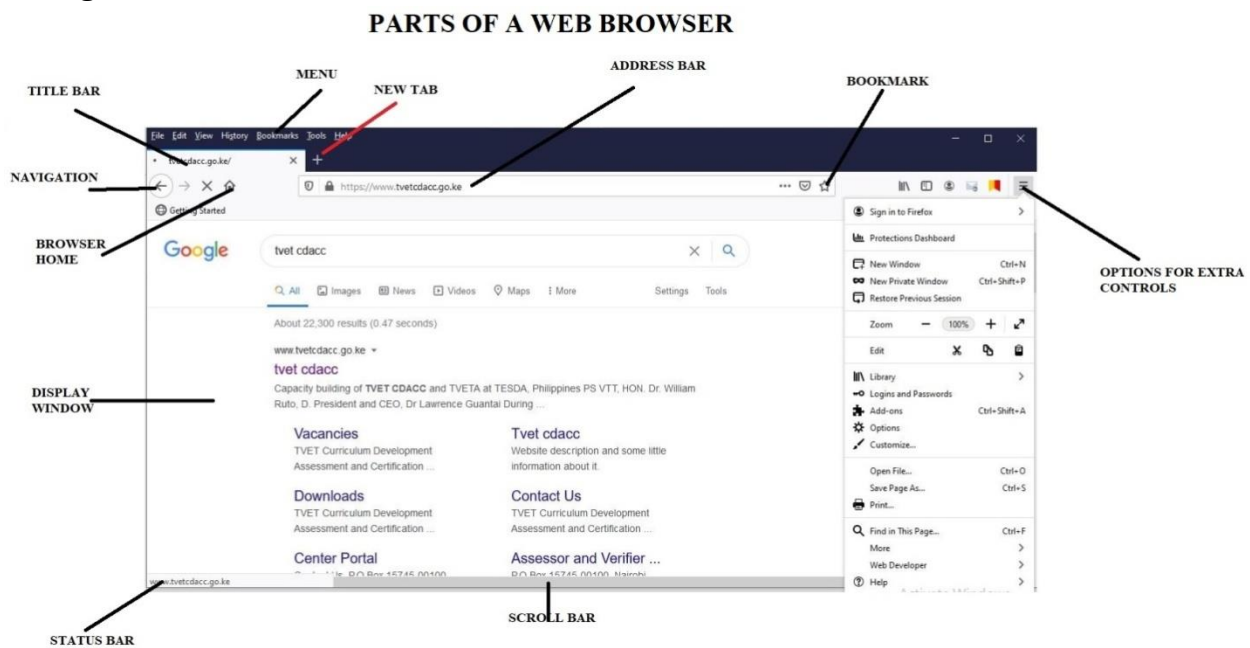
There are many web browsers that are used to access web pages over the internet. We are going to compare some of the most commonly used.

Table 3: Common Browsers

Browser	Google Chrome	Mozilla Firefox	Internet Explorer	Safari	Opera Mini
Icon					
Company	Google	Mozilla foundation	Microsoft	Apple Inc.	Opera software
Private browsing	Available	Available	Available	Available	Available
Speed	Relatively slow	Relatively slow	Slow	Relatively slow	Fast
Automatic Ad blocker	No	No	No	No	yes
Tracer blocker	Yes	Yes	Yes	Yes	Yes

Common web browser features

Figure 74: Parts of Browser



Parts of Browser

1. **Title bar:** the name that is assigned to the webpage is displayed as the title

2. **Menu:** display options that user can use to navigate the browser. The menu can be customized to displayed or hidden. They include file, view, edit, history, tools, bookmarks etc.
3. **Tab:** a browser allows a user to open many webpages on the same browser program using tab. Tabs are like browser pages where we can open many pages (without closing others)
4. **Address bar:** this is where the URL is displayed for the website. The user can enter the URL of any website they need and click enter to allow browser to fetch and retrieve it.
5. **Bookmark:** they are used to save the URL of a web page that you may want to reference later. The address is saved but you can open it only if you are connected to the internet
6. **Options:** it offers extra customization option for the browser. Setting is one of the option which can be used to customize more on the browser.
7. **Scroll bar:** there are horizontal and vertical scroll bar that help user to move the web page side by side or from top to bottom.
8. **Status bar:** it is the bar at the bottom of the browser that displays the URL and shows if it is loading or not.
9. **Display window:** this is where the webpage displays in full.
10. **Home:** it is the main page of the browser. If the home page is not customized to a different page then it opens the browser website.
11. **Navigation:** they are used to move from previous page next page or stop the page from loading.
12. **Refresh:** it is used to resend the request to retrieve the page. It can be used to update a webpage if there were any changes made.
13. **History:** it keeps record of pages visited. History can be used to as a reference point. User can set the browser to ensure they don't save any browsing history
14. **Downloads:** any time a file, document is downloaded it is saved in this folder called download. It shows a list of downloaded file from the time browser was open. User can customize to save file in a different folder other than the download.
15. **Extensions:** it is used to add extra functions to a browser that were not originally there. Extensions can be from third party provider and they can be used to achieve different capabilities.
16. **Zoom:** it is used to increase or reduce the size of the content in the display window. If a user has a challenge with small font they can use the zoom to increase the whole display window.
17. **Print:** it is a button that can be used to print the webpage.

Using a browser

Opening/closing a browser

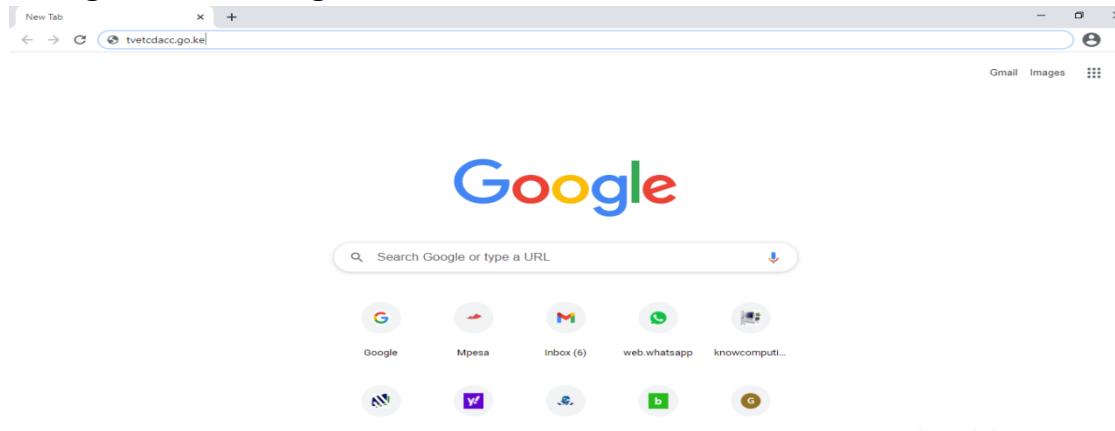
Browser like any other software is first installed to the computer as application software.

For windows computer you will find all installed programs in application area or desktop if

a shortcut way is created. Double click on the browser to open. When it opens the first time it will open the page that was set as the browser home page.

After opening the browser you enter the preferred URL that you want to move to on the address bar and click enter to be directed to that address as shown below.

Figure 75: Entering URL



If you want to reload/refresh the page you can use F5 button or click on refresh button on the browser. To stop the webpage from loading, you click on (X) button on the navigation part of browser.

The page that opens mostly when you enter the URL is the home page of the website. To move to other pages of the website you click on the webpage name to activate the link to direct you to that specific page. Most websites have the navigation to different pages either positioned on top or on the left side of the website layout. TVETCDACC website navigation to different pages is positioned on top as shown below.

Figure 76: Website Navigation



Opening a web page in a new tab, new window.

By default when you click on a link to open a new webpage it is opened on the same window. There are 2 ways that we can open more than one webpage.

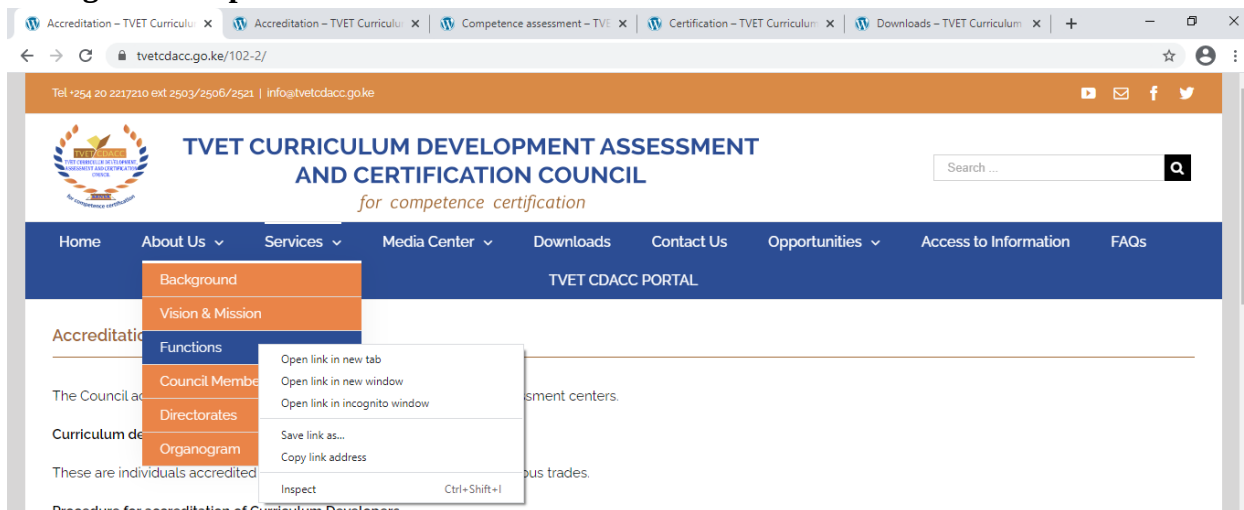
New tab

A tab is like a new page of a browser that you can use to open more than one page on the same browser window. To achieve this you right click on the link and select “open link in new tab” and it will open a new tab with a different webpage.

New window

A new browser window is like opening two instance of browser software. To achieve this right click the browser and select “open link in new window”. The webpage will open in a completely different instance of the browser. The example below shows the two options;

Figure 77: Open Link in New Window



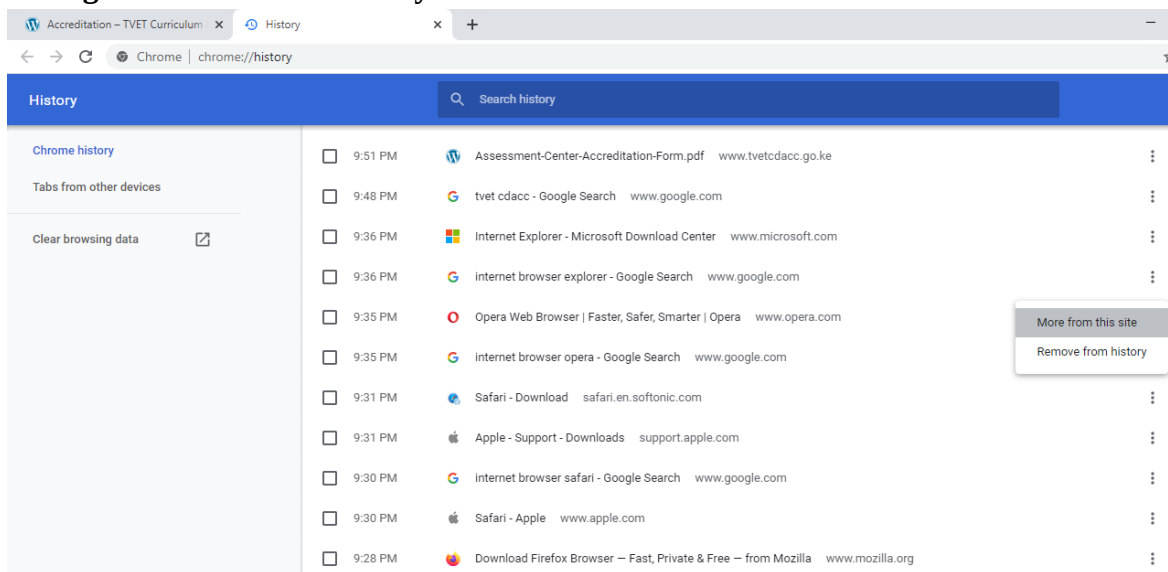
A tab can be closed without affecting the other tab but when you close the browser window it will close all tabs that are open on that browser. To move from one tab to the next you click on the desired tab and it will open.

Using the browser history

Browsing history is the record of the web pages visited from a specific browser for a gives period. The device keeps record of all pages visited unless user has set the browser not to keep the records. Below is an example of a browser history.

When you click on the link it will open the page. You can also click to delete the history.

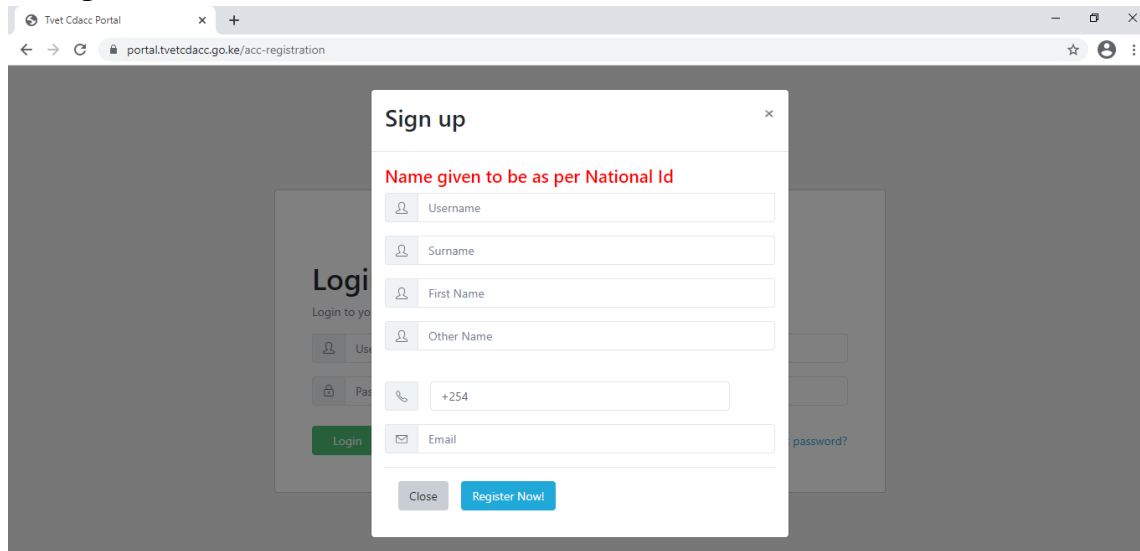
Figure 78: Browser History



Completing, submitting and resetting a web-based form

Forms are used to collect information that can be used to create account to enable user to login to website. Below is a form from TVETCDACC website that is used to collect trainer details for registration. The user fills all details correctly then submits to register.

Figure 79: Web Form

The image shows a web browser window with the address bar displaying 'portal.tvetcdacc.go.ke/acc-registration'. A 'Sign up' modal form is open in the center. The modal has a title 'Sign up' and a close button. Below the title, there is a red instruction: 'Name given to be as per National Id'. The form contains several input fields: 'Username', 'Surname', 'First Name', 'Other Name', a phone number field with a dropdown set to '+254', and an 'Email' field. At the bottom of the modal are two buttons: 'Close' and 'Register Now!'. In the background, a 'Login' form is partially visible, showing fields for 'Username' and 'Password'.

Customization of web browser

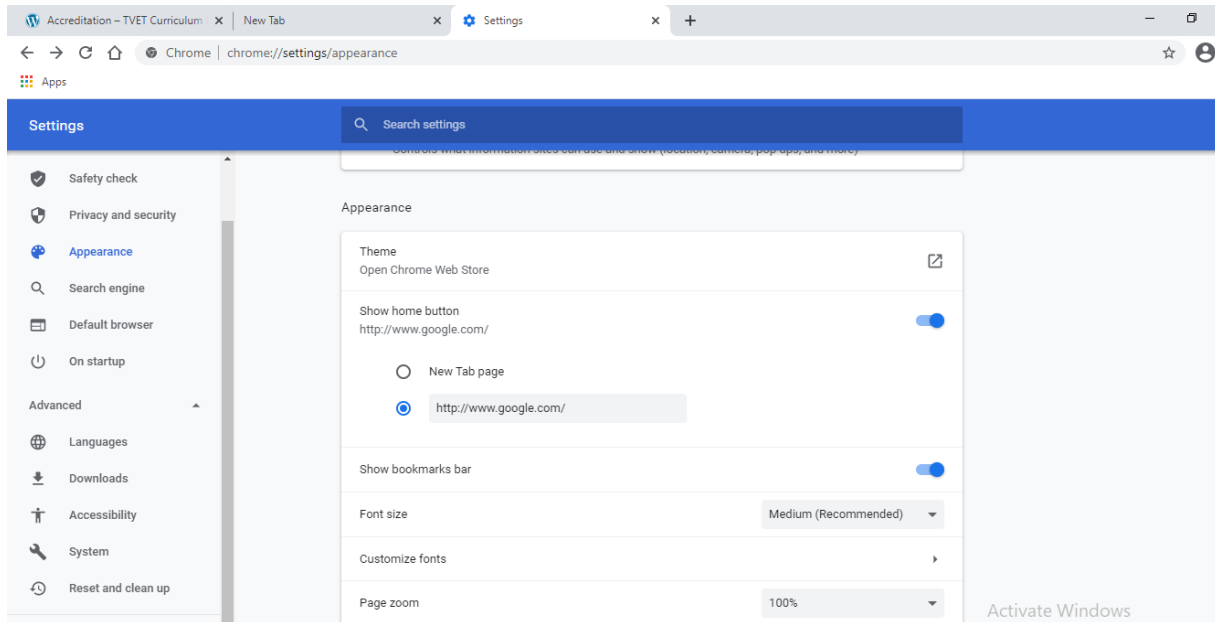
Each and every browser has its own ways that user can be able to customize the setting an appearance. For this particular explanation I will use Google chrome to explain.

Appearance settings: Display/show built in toolbars, fonts

To access the customization you select the setting of the browser and you will be presented with many options to set as shown below. The appearance of the web content can be set to include themes, home button, font size, font type and page zoom.

To set the home page, you first activate the home button then type the URL of the page that you want to open being the first page when the browser loads the first time as show below www.google.com is set has the homepage.

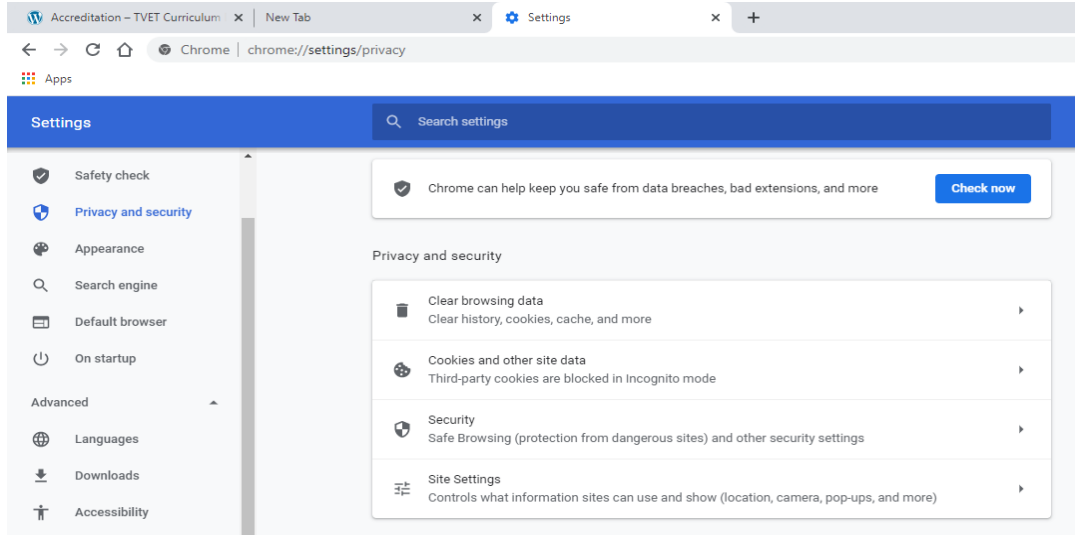
Figure 80: Home Page Setting



Deleting history/temporary files

To delete history, cookies, cache and more we move to privacy and security option. These can be used to set all security issues to ensure safe internet browsing. On cookies the user can block those that they don't want stored into their device.

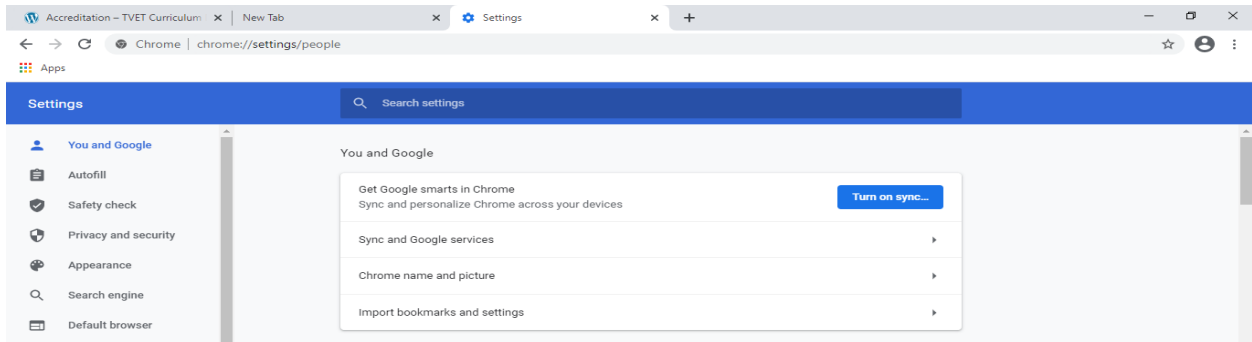
Figure 81: Deleting history/temporary files



Synching email accounts with browser activities

User can register their email account on the browser so that every time they open it opens using that specific account. The browsing can be synchronized in different device such that all user devices have same content. To access these options in Google chrome select on you and Google option.

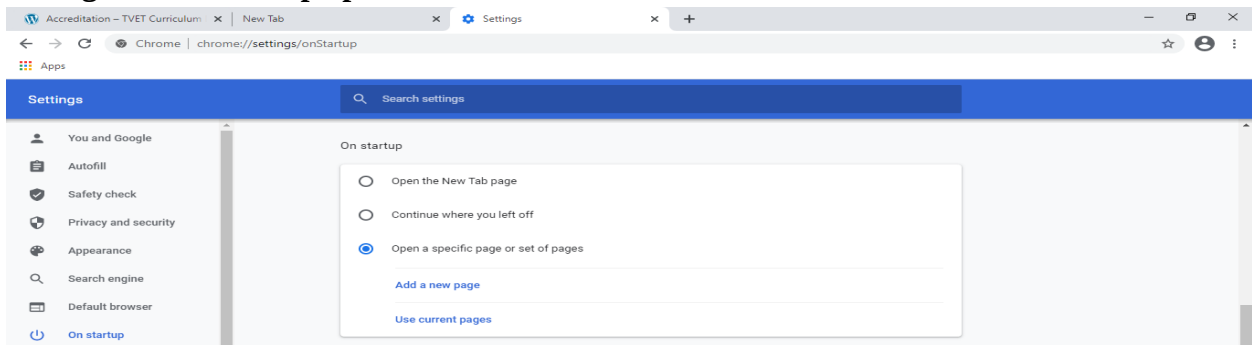
Figure 82: Syncing email accounts



Start-up options

These options allow the user to choose how the browser will open in terms of number of tab that will open. It can be set to open from where the last browsing was done, open a new page or set to open specific pages as shown below.

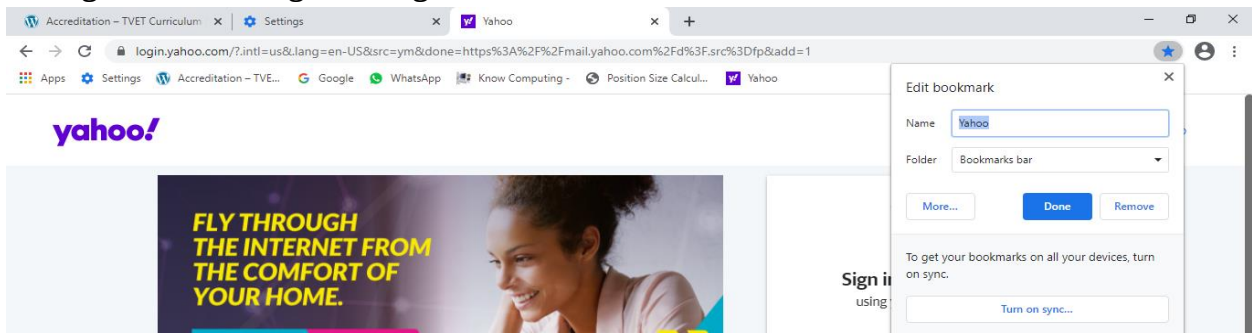
Figure 83: Start-up options



Adding, deleting and showing favourites/bookmarks

Bookmarks are used to automatically save favourite web pages that user can visit later. To add a new bookmark, click on the star icon at the end of address bar. Give a name to the bookmark and click on done to save it. In Google chrome browser when bookmarks are activated are displayed below the address bar like shown below, apps, settings, TVETCDACC, Google, Know Computing etc.

Figure 84: Adding, deleting bookmarks

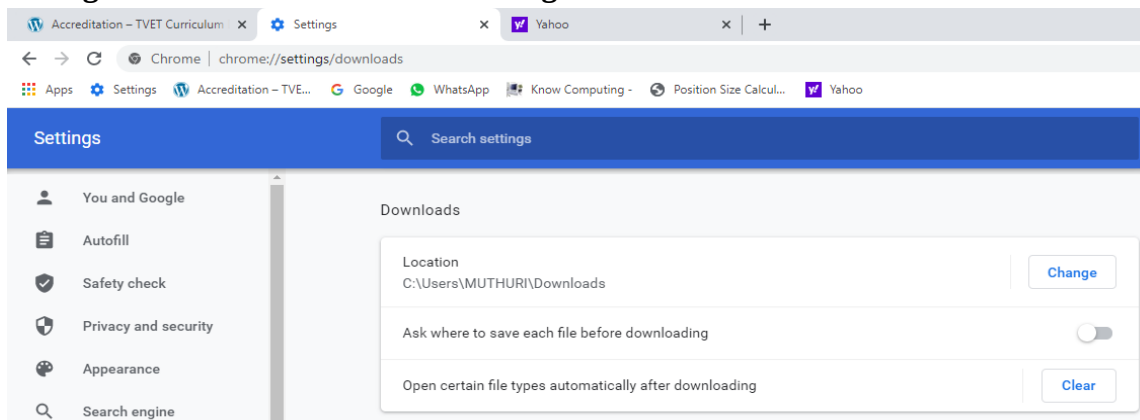


Download location settings

The user can use download setting to change where downloaded file will be saved. By defaults they are saved in a folder called download but user can change it. It can also be

used to set so that specific files will open when they finish downloading. Download settings are as shown below.

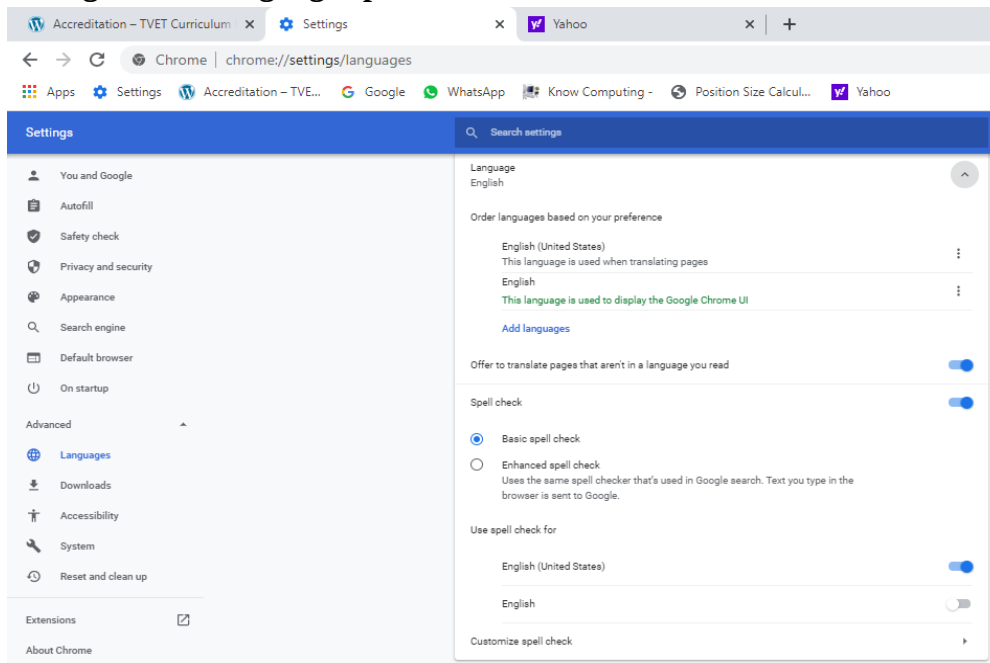
Figure 85: Download location settings



Language options

It is setting option that is used to change the type of language that is used to view the webpage. It can also be set to do spell checking. Below is language setting option.

Figure 86: Language options



Web outputs

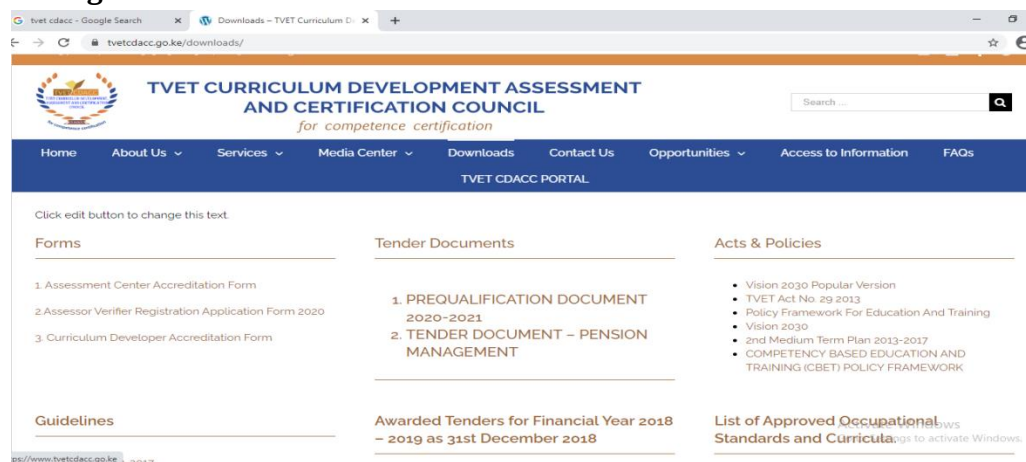
How to download file

When you retrieve a file from the internet to your computer we say you have downloaded a file. User can download a variety of files from internet from documents, video to audio and all other types of file formats. Browsers come with capability to download files but user can install other software that can be used to help download files at a faster speed.

Most of the website have page that is dedicated to files that the user can download. Using TVET CDACC website we can see a page called Downloads where you can download files/documents as shown below.

When you click on the document they are directly downloaded to your device and saved to download folder into your computer for future use.

Figure 87: download file



How to save/copy webpage content

Note: Avoid plagiarism of online content without acknowledging the author/website.

There are two main ways of saving online content to read it later even without the internet connection.

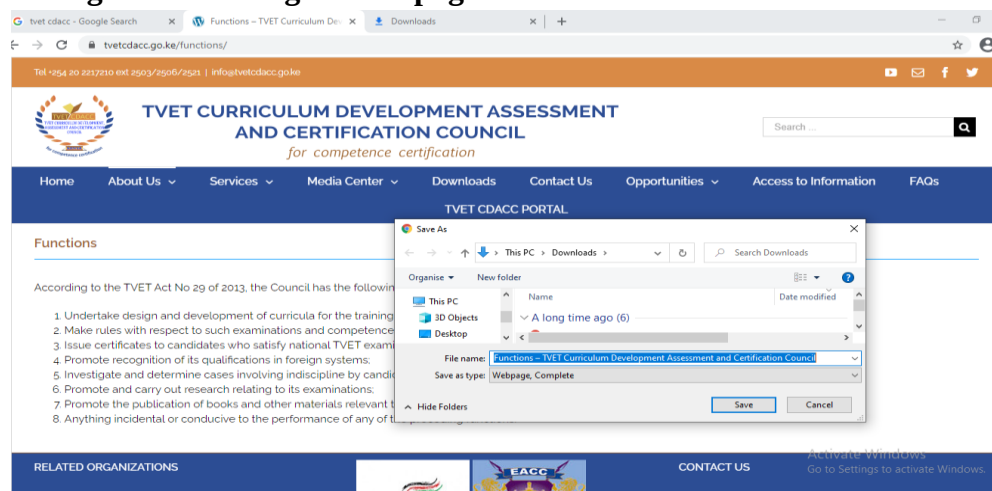
Copy pasting the whole webpage content to a word document

The user can select the required content from a webpage and paste it to a word processor document that they can read later.

Saving the webpage

The user can save the whole page by right clicking anywhere on the webpage and selecting save as. This will give user the option to save the webpage in the desired folder as shown in the example below.

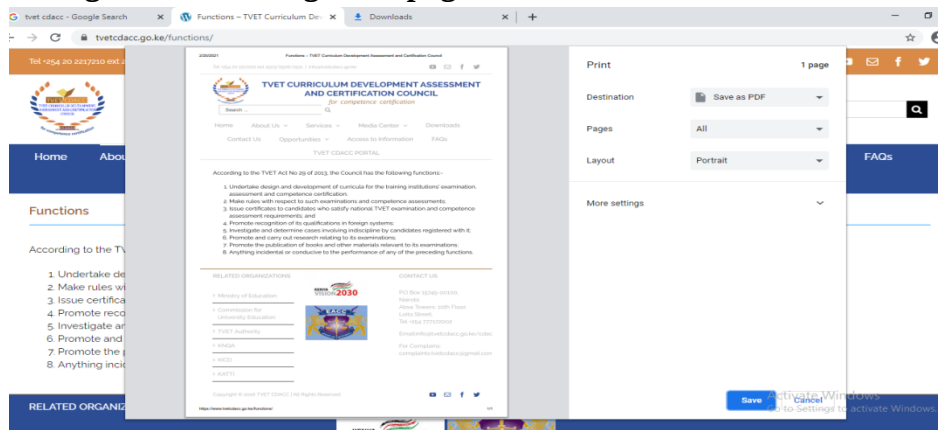
Figure 88: Saving the webpage



Printing a webpage

User can print a webpage by right clicking on the webpage and selecting print. This will first display print preview window where the user can then decide on how to print. Example is as shown below.

Figure 89: Printing a webpage



5.2.2.4 Learning Activities

Practical activities

Open an internet browser and set the home page to www.tvetcadcc.go.ke. Create a bookmark of the page. From the website navigate and download any file from the website. Change the default folder where you save all your downloaded files.

5.2.2.5 Self-Assessment

You are provided with the following questions for self -assessment, attempt them and check your responses.

1. Differentiate between a webpage and website?
2. What are some of the Top Level Domain (TLD) that you know about?
3. What are the main features that you will find common in all internet browsers?
4. How can you use history to better internet surfing experience?
5. What is the keyboard shortcut button to refresh a webpage?
6. What is hyperlink as used in website development?
7. What is the difference between download and upload files?
8. What are the cookies as used in internet browsers?

5.2.2.6 Tools, Equipment, Supplies and Materials

The following resources are provided

1. Computer connected to the internet
2. Internet browser installed

5.2.2.7 References

Jain, A. (2013). The Role and Importance of Search Engine and Search Engine Optimization. *International Journal of Emerging Trends & Technology in Computer Science*.

Mark Graham, W. H. (2019). *Society and the Internet*. Oxford University Press.

Model answers for self-assessment

1. Differentiate between a webpage and website?
Webpage is a single page on internet that is written using HTML while website is a collection of many web pages that ???below to same organization.
2. What are some of the Top Level Domain (TLD) that you know about?
.ac, .ke, .com, .net, .mil
3. What are the main features that you will find common in all internet browsers?
Title bar, homepage, address bar, bookmark, tabs
4. How can you use history to better internet surfing experience?
When you visit you history you just click on the link that you need and it open even if you forgot about the web address.
5. What is the keyboard shortcut button to refresh a webpage?
F5
6. What is hyperlink as used in website development?
It is a way of linking a document where you click a simple text, image link to open a different document/page
7. What is the difference between download and upload files?
Download is when you get the file from the internet to your computer while upload is where you move file from your computer to the internet.
8. What are the cookies as used in internet browsers?
These are temporary files saved on the browser to increase the speed of access data from the server. They contain most frequently accessed data.

4.2.17 5.2.3 Learning Outcome 3: Demonstrate ability to effectively search and evaluate web content.

5.2.3.1 Introduction to the learning outcome

This learning outcome explains search engine concept and how to effectively carry out search of information.

5.2.3.2 Performance Standard

- 5.2.3.2.1 Common *search engines* are identified.
- 5.2.3.2.2 Effective *search principles* are outlined.
- 5.2.3.2.3 Downloading and uploading of files is done.

5.2.3.3 Information Sheet

Definitions

Search engine: it is a computer program that is used to search for information, text and multimedia. Search engine are used to search user query from the internet and display the most relevant results of the search.

Crawling: it is the method that engine uses to scan the internet website and record new webpages. They are then stored in engine database and can be used later when a search is done.

Indexing: it involves arranging webpages using keywords that can be used in search for certain information. Indexing arranges information in terms of the mostly relevant as per a specific keyword.

Keyword: it is a specific word or combination of words that are used to search for information. The words that users enter to search for information over the internet can be termed as keyword.

Purpose of search engines

Any search engine that is used today has the following functions that help find information that user requires.

1. Crawling websites

Search engine scan the websites using bots/crawler to search for webpages that they can store in the database and use them to display results when user search for information.

2. Indexing

After crawling the engine sorts the content using keyword to generate the best content per given keyword. The indexing tries to ensure the most relevant results are displayed for each search query.

3. Ranking of webpages

From indexing the engine ranks the webpages to ensure those pages with most relevant information are displayed first when user make a search.

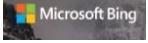
4. Data Storage

Engines have database of webpages that they use to give feedback when user makes a search. They keep on crawling looking for more webpages to expand on the database or the owner of the website can submit the newly created webpages to be crawled.

5. Display results

Search engine offer a user friendly interface that the user can use to search and retrieve the best search results.

Table 4: Comparisons of various search engines

Search Engine	Google	Yahoo	Bing	Ask.com	Duckduckgo	AOL
Icon						
Company	Alphabet Inc.	Verizon Media	Microsoft	InterActiveCorp	Weinberg	Verizon Media
Year founded	1998	1994	2009	1996	2008	1995

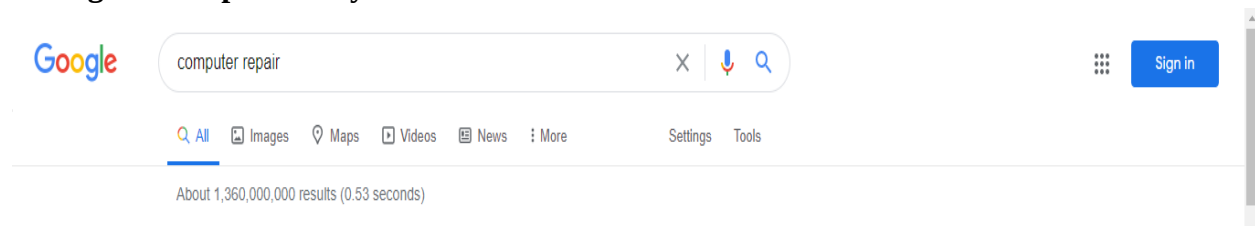
Tips for effective use of a search engine

With search information you can use different techniques to ensure that you get the most relevant content for a certain search. The following are some of the techniques.

Using specific keyword

This is the most common and basic way of doing a search on a search engine. You enter the word or words that you want to find and search. This search mostly will retrieve many results some that are not even that relevant. The example below shows a search for computer repair keyword that gives about 1.3billion results.

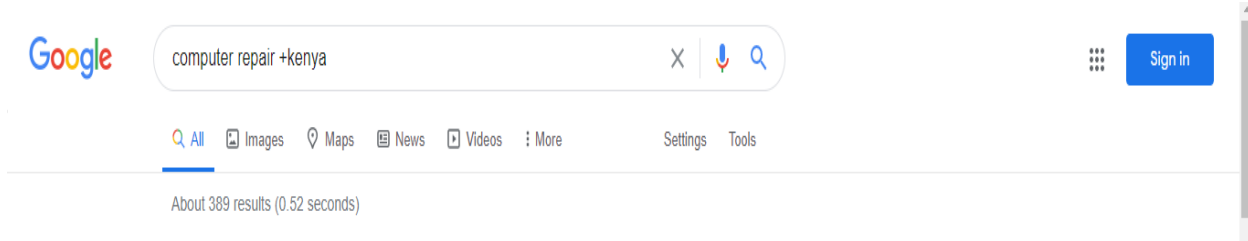
Figure 90: specific keyword search



Narrowing and expanding search using minus and addition operator

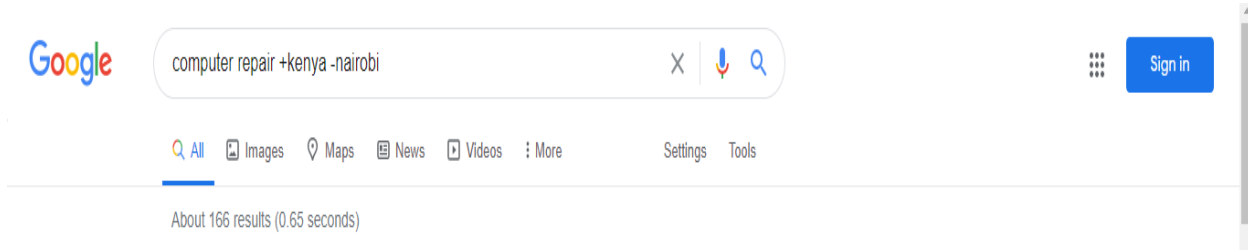
We can narrow down the search by using a plus (+) to ensure that it include computer repair and another word. Example below show how we move from 1.3 billion results to 389 results by making sure we only display computer repair that have term Kenya in it.

Figure 91: search using operator 1



We can use minus (-) sign to ensure we get computer repair and the content that don't include a specific word. The example below moves from 389 to 166 results when we search for computer repair pages that have Kenya name in it and no Nairobi name.

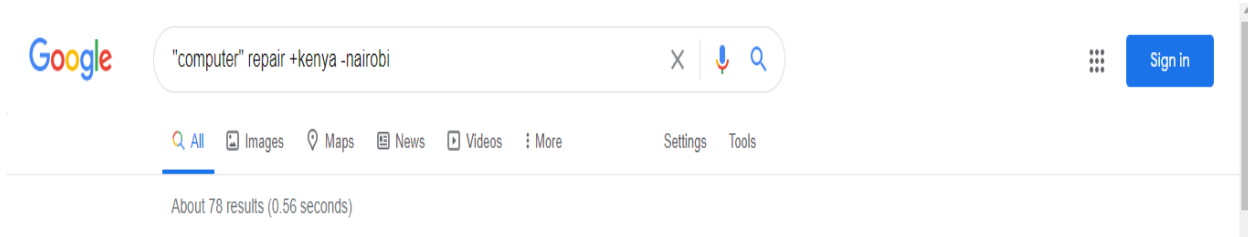
Figure 92: search using operator 2



Exact phrases using quotation marks

We can further narrow down our search by having the specific word in quotation to ensure that in is a webpage that has that specific word. The example below we have narrow our search to computer repair pages that must have the word "computer" that has Kenya and no Nairobi name. Results moves from 166 to 78.

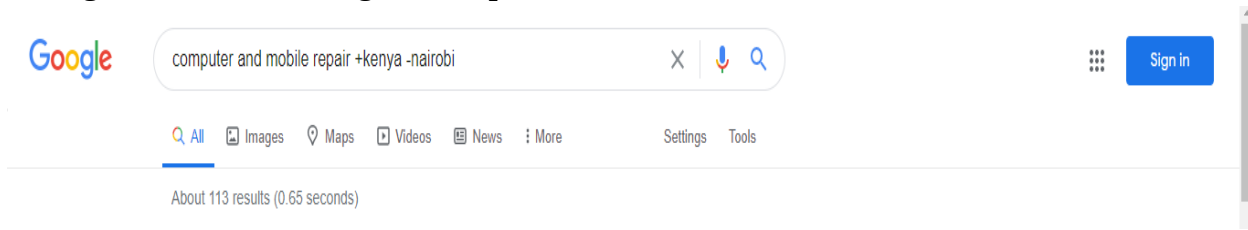
Figure 93: search using quotation marks



Boolean expressions (AND, OR)

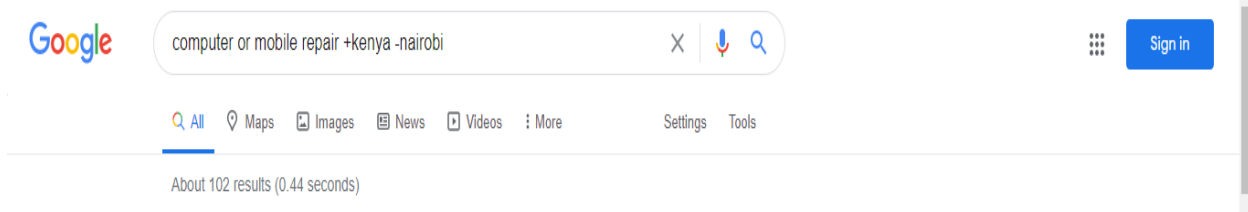
We can add the AND/OR expression to narrow or expand our search results. The example below we have used AND to get computer and mobile repair that are in Kenya and not in Nairobi to get 113 results.

Figure 94: search using AND expressions



If we use OR for the same search we get 102 results to get webpages that have name computer or mobile in Kenya and not in Nairobi.

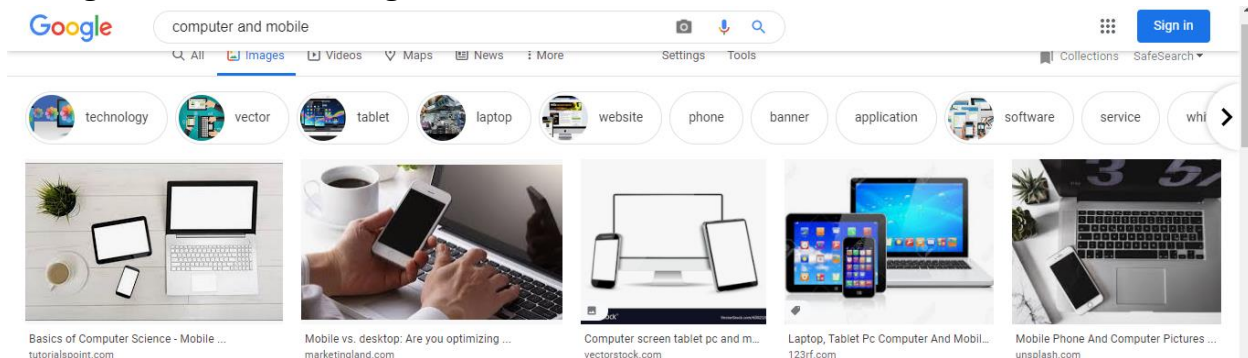
Figure 95: search using OR expressions



Pictures search

Search engines can be used to search for images. Google search engine allows searching image using text search or even using an image to make the search. Below is an image search for computer and mobile.

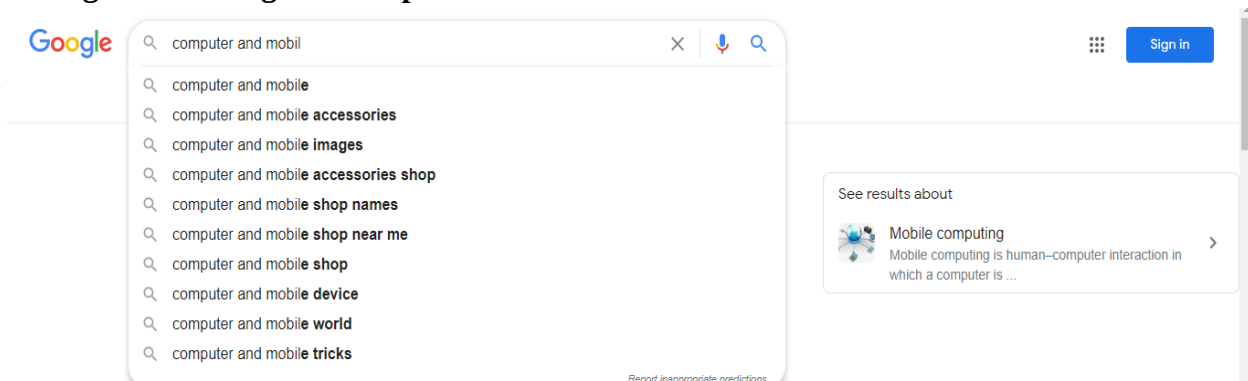
Figure 96: Pictures /images search



Maximising autocomplete

Autocomplete is a feature that search engine uses to suggest the search name that user may want to search for. Below is an example of autocomplete suggestion words to fill my search keywords when I search for computer and mobile.

Figure 97: using autocomplete



Factors that determine the credibility of web content

Internet is made up of billions of webpages that have a specific keyword that a user may search. To ensure user get the best and most credible content they can use the following as bases to evaluate content for credibility.

1. Website Author/owner

Ensure that you are accessing the genuine website of the company or organization that you intend to get information from. Check the author of the webpage to ensure they are expert in the field that they are discussing since anybody can create a website and publish content.

2. Content Up-to-date

Check the date the webpage was published. The more recent the most likely it has the latest information about the topic. Also check if the whole website has some latest update in terms of content.

3. References

Website that can reference to other authors is more credible since they don't claim to own all the knowledge about a topic. A website with reference can help the user to check the credibility of the content from the references that are given.

4. Webpage ranking

Most search engines try to display the most relevant outcome of a search being the on top of the list. Try and use the first list displayed by the search engine for information.

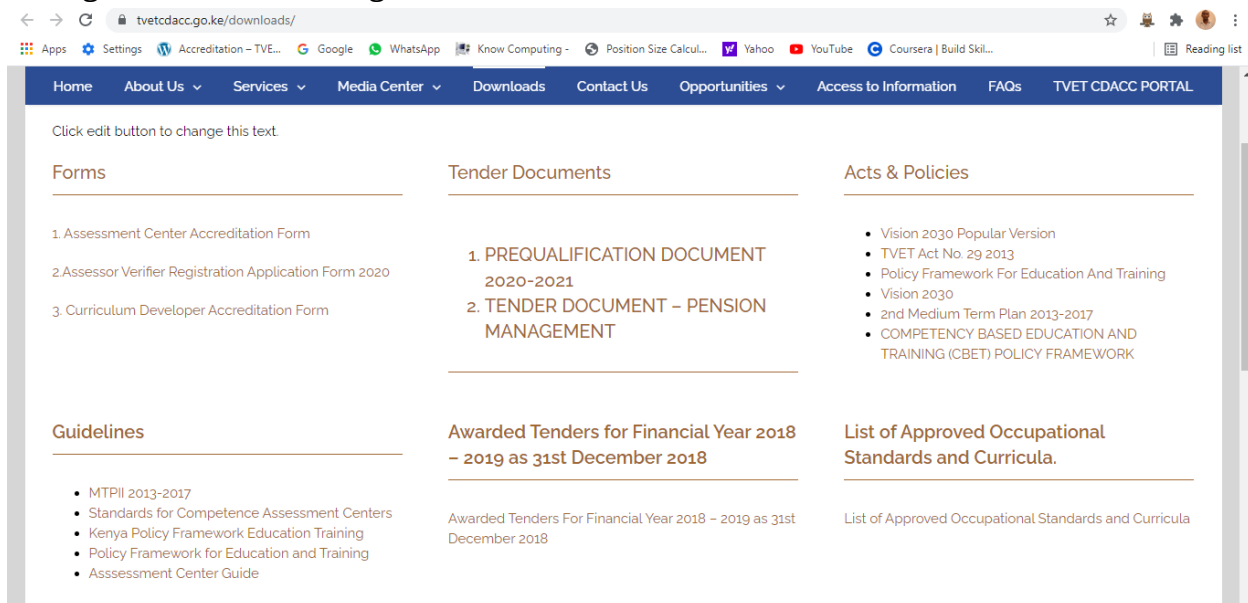
Downloading and uploading files

Downloading: it means retrieving information from the internet to your device. File downloaded can range from small size webpages to big size file like video and software.

How to download a file,

Visit the webpage that you wish to download a file. We will use TVETCDACC download webpage to demonstrate.

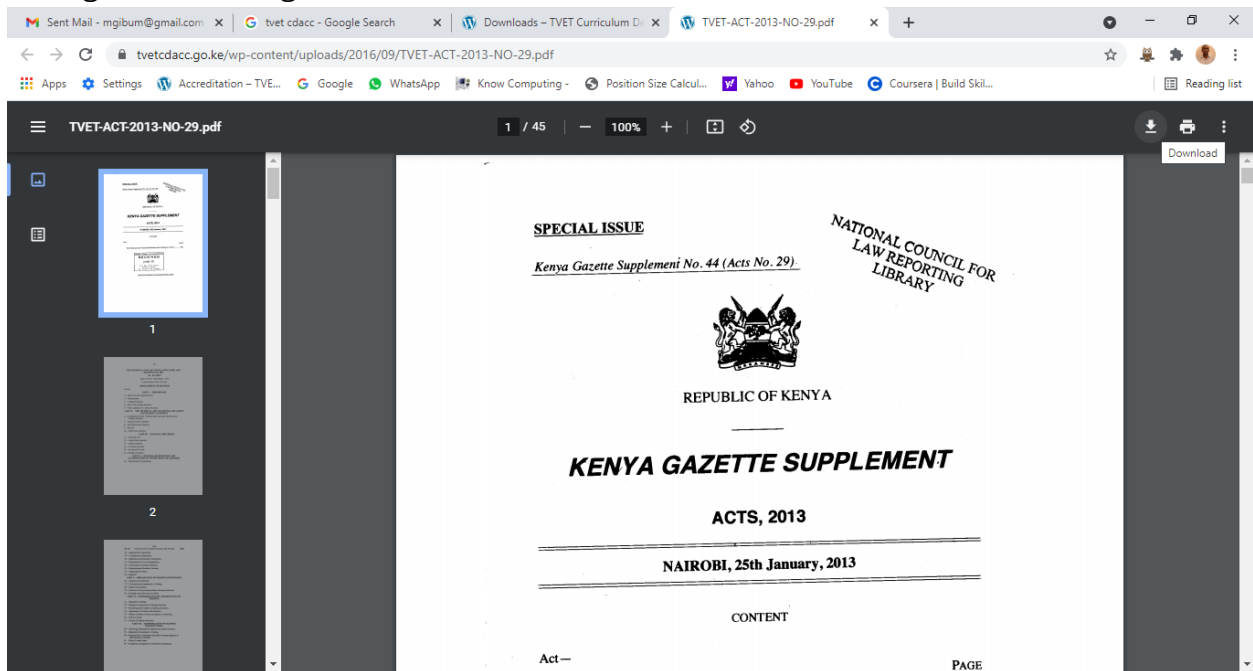
Figure 98: Downloading files



Click on the file that you wish to download. We will download TVET Act No. 29 2013 from the website.

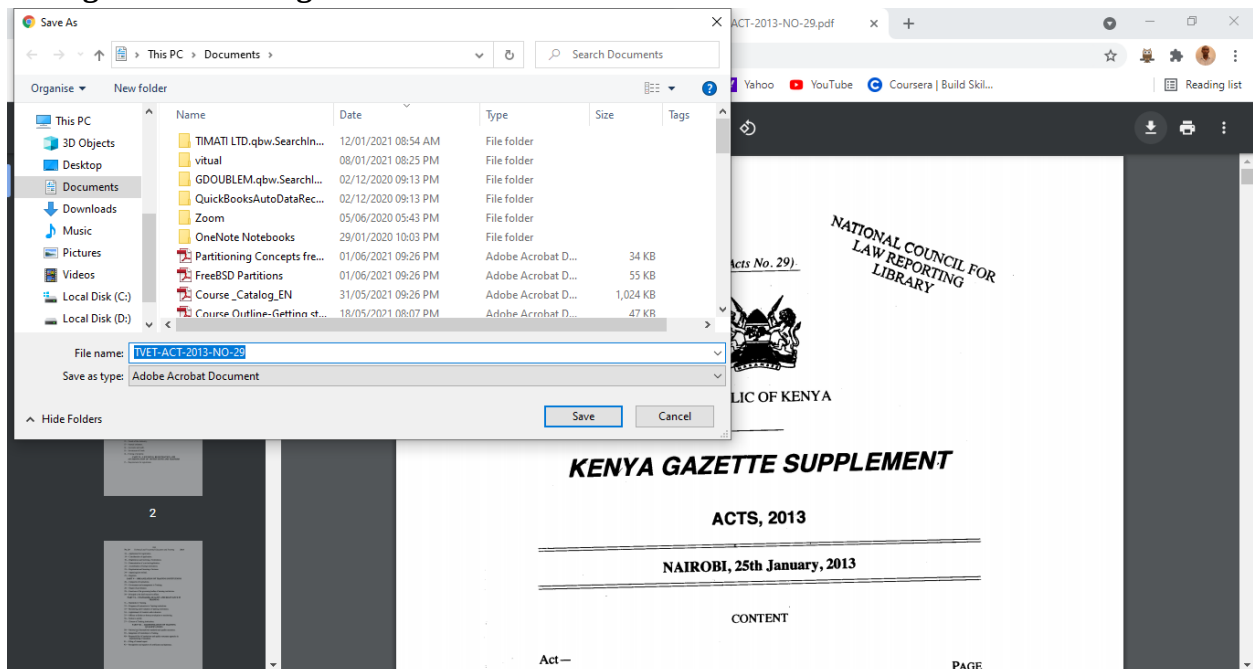
When you click on the link it opens on a new tab depending on how the webpage was designed. This allows users to only read the document. To download the document, click on the download icon on the top right corner.

Figure 99: Saving Downloaded files 1



When you click on the icon it opens the specified folder on your computer where you can save document for later use. Note you can change the location and change also the file name. Click on save to complete down loading the file.

Figure 100: Saving Downloaded files 2



Uploading: it means moving files from you device to store it over the internet. Uploading can be of any file type and size depending with what the website allows you to upload.

How to upload document

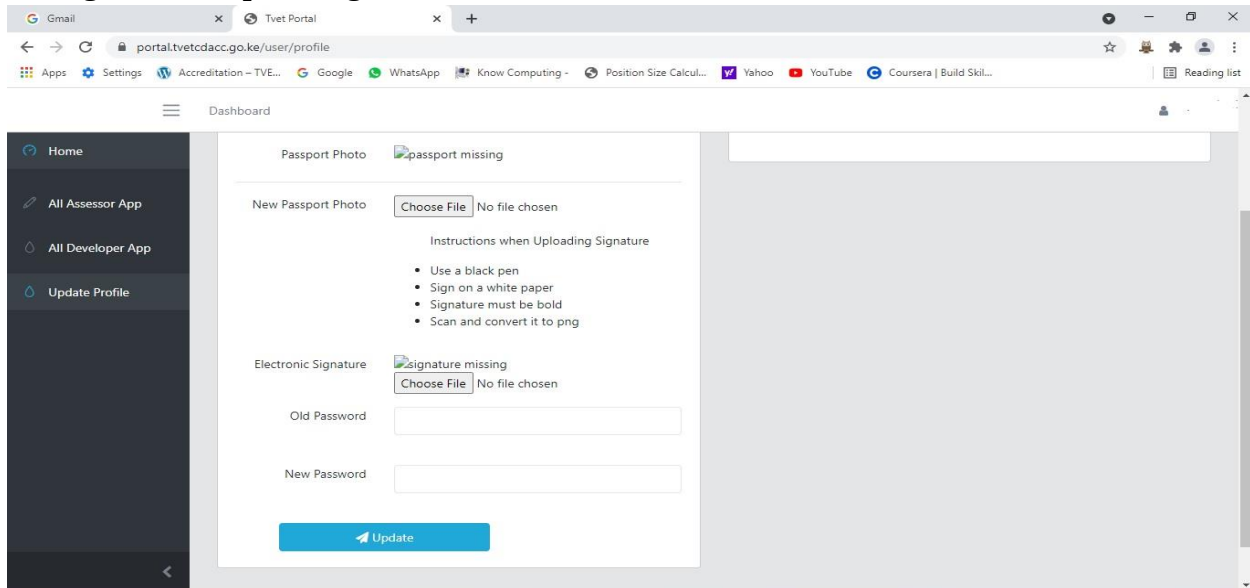
To upload a file the webpage should have provided an option for the same. Mostly they limit the size and type of files that can be uploaded to their webpage.

We will use TVETCDACC portal to demonstrate how to upload. To upload a file most website will require user to login to an account.

Navigate the webpage where upload is required. In most cases you are given instruction on what you can upload.

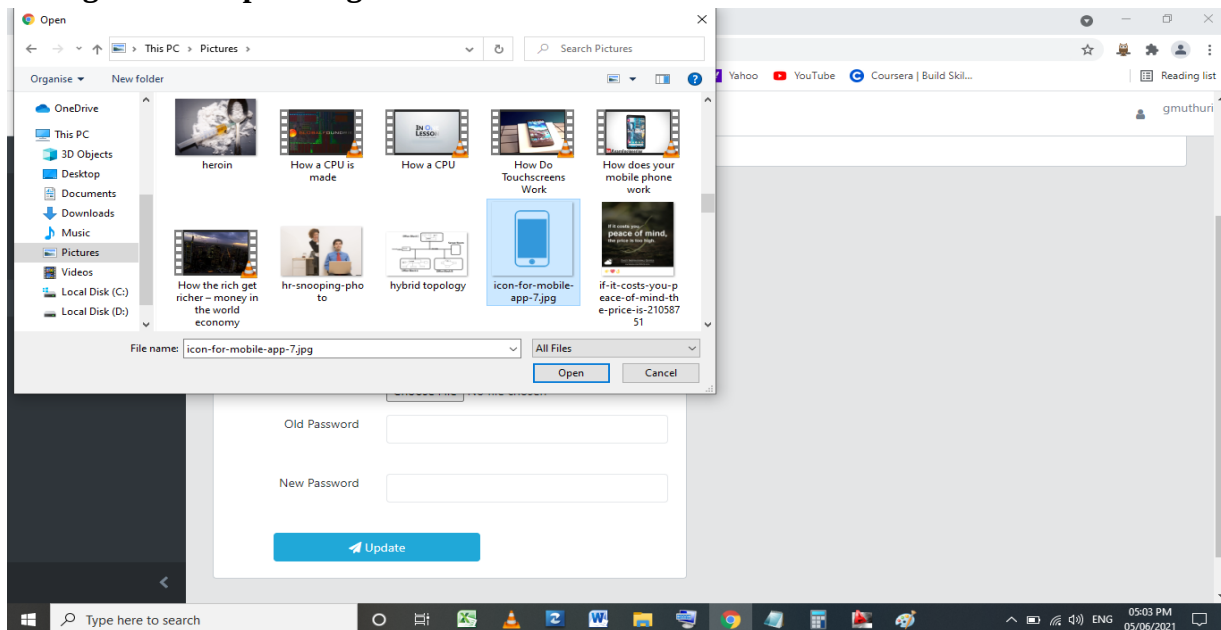
To upload a new picture on our portal click on choose file.

Figure 101: Uploading 1



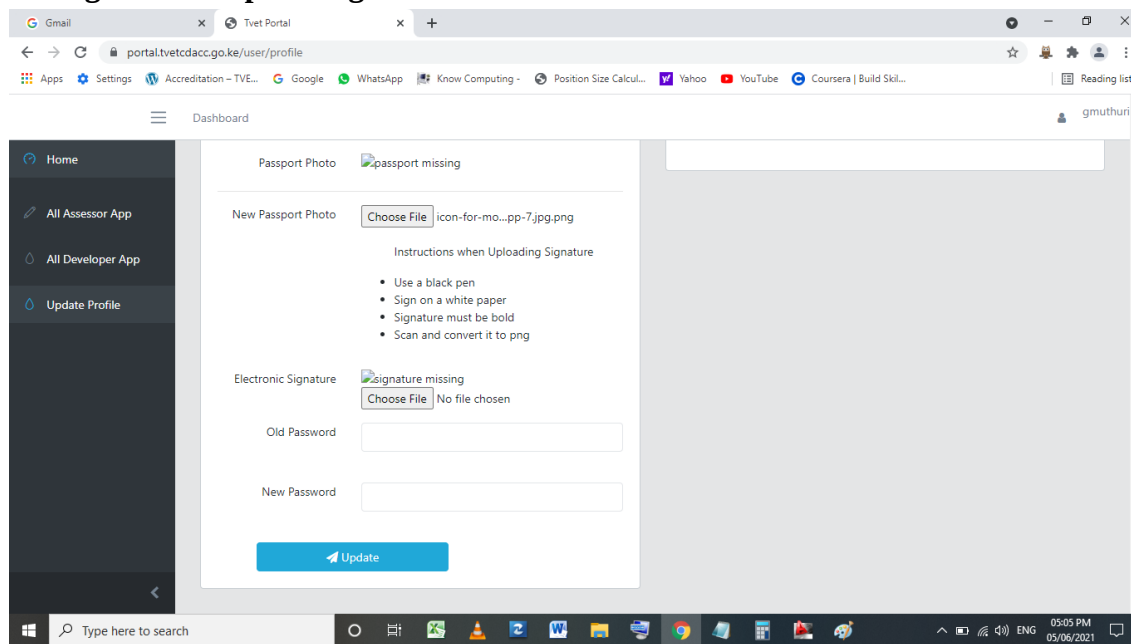
When you click it open your computer directory for you to choose where the file/ picture are stored. Select the picture and click open to start upload.

Figure 102: Uploading 2



When you click on open the name of the file is seen on the webpage where no file chosen was.

Figure 103: Uploading 3



To complete the upload process updates the webpage by saving the new changes. The pages should have a button that helps to update or save the new changes.

5.2.3.4 Learning Activities

Practical activities

To cover:

- Practical activities related to the Performance Criteria statements
- Knowledge in relation to Performance Criteria given as content in the curriculum
- Special instructions related to learning activities

5.2.3.5 Self-Assessment

You are provided with the following questions for self -assessment, attempt them and check your responses.

1. Give ways that a user can save a webpage for later use when not connected to the internet.
2. Name other search engines other than Goole and yahoo.
3. What is the difference between a search engine and browser? Give example in each case.
4. Using Google search engine what are some of search categories can you make?

5.2.3.6 Tools, Equipment, Supplies and Materials

The following resources are provided

1. Computer connected to the internet

2. Internet browser installed

5.2.3.7 References

Jain, A. (2013). The Role and Importance of Search Engine and Search Engine Optimization. *International Journal of Emerging Trends & Technology in Computer Science*.

Kailash Kumar, V. B. (2013). A COMPARATIVE STUDY OF BYG SEARCH ENGINES. *American Journal of Engineering Research (AJER)*.

Sample answers for self-assessment items

1. Give ways that a user can save a webpage for later use when not connected to the internet.
 - a) Right click on the webpage and save the as webpage.
 - b) Copy the whole document and paste on a word processor.
2. Name other search engines other than Goole and yahoo.
Bing, AOL, ask.com
3. What is the difference between a search engine and browser? Give example in each case.
Search engine is an online program used to search for information online while a browser is used to retrieve information online from different server. It is also used to interface the user with the server by sending user request and getting replies.
4. Using Google search engine what are some of search categories can you make?
Website search, image search, video, news, application

4.2.18 5.2.4 Learning Outcome 4: Conduct online communication effectively and safely

5.2.4.1 Introduction to the learning outcome

Online communication should follow the normal communication etiquette. Online user should consider other has they communicate.

5.2.4.2 Performance Standard

- 5.2.4.2.1 **Communication tools** are identified.
- 5.2.4.2.2 User accounts are created and customized.
- 5.2.4.2.3 Effective application of communication tools is demonstrated.
- 5.2.4.2.4 Appropriate **netiquette principles** are applied when communicating.
- 5.2.4.2.5 Necessary **privacy principles** are applied when communicating.

5.2.4.3 Information Sheet

Definitions of terms

Communication tools

Communication tools are different technologies that business and people use to communicate to each other. In today's world we have a number of technologies that has made communication cheap, fast and very effective. They include the following.

Electronic mail (E-mail)

It is a mode of communicating short messages through computer network. Email makes communicate to be fast and relatively cheap when you compare with the old mode of communication like using postal to deliver hand written messages. To have an email address you required to create one from free webmail provider like Gmail and yahoo mail. If you own a website you can have customized email that have domain name to identify that email below to that organization.

Email has 2 parts the user chosen username and the domain of the website offering the webmail separated with @ symbol.

Example of an email info@tvetcdacc.go.ke where info is the username and tvetcdacc.go.ke is the domain that hosts the email. Other email examples are username@gmail.com, username@yahoo.com

When writing an email, first identify the relationship between you and the recipient of the message and communicate accordingly. If it is official communication then use all official letter writing protocols to ensure that the message is official. Indicate the subject of the email to be

clear and precise. Ensure you indicate the correct email address for the email to reach the right person.

Social media

These are mostly online applications that help user to social network over the internet. They help user who have common interest to create, share and communicate virtually over the internet.

There are many social media platform today but the most common are the following.

1. Facebook
2. YouTube
3. Instagram
4. Pinterest
5. Twitter

The platform allows the user to create an account that they can customize to add their own content and share their views on different topics. Some are used for both text and multimedia content while other like YouTube is more on video content. According to

<https://wearesocial.com/> digital 2020 report there are over 3.8billion social media user. This means almost half of the whole world is on social media.

Instant Messaging (IM)

This is a type of online communication where user chat real time over the internet. They were initially designed to use text based messages but today they allow even multimedia kind of sharing. The most common IM platforms include the following:

1. WhatsApp
2. Skype
3. Facebook messenger
4. WeChat
5. Telegram
6. Viber
7. Snapchat
8. Signal

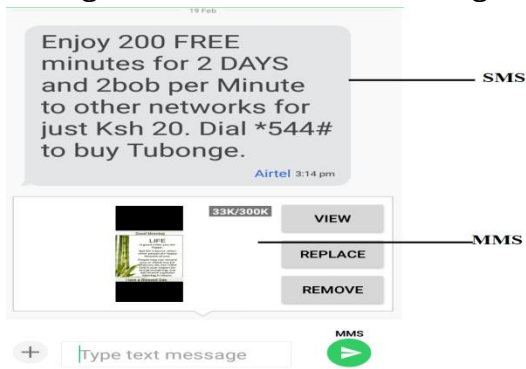
Short Message Services (SMS)

This is a technology where a text only message is sent over cellular network from one phone to another. SMS are mostly limited to the number of character that can be sent. The more character you send the more you pay.

Multimedia Message Service (MMS)

This is an improvement of SMS where now images, document and video files can be sent over the cellular network. The example below show difference between and SMS and MMS

Figure 104: Multimedia Message Service



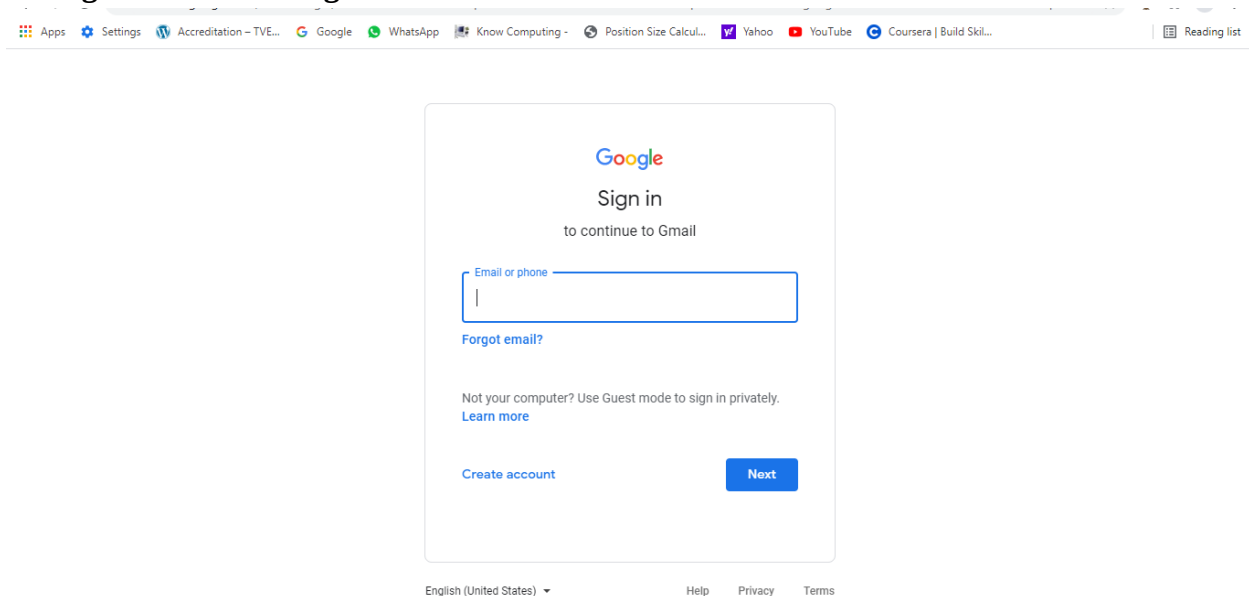
Creation and customization of User accounts

In today's life people have online account such as Facebook, Gmail, yahoo, job portal, student portal, online banking account etc. to be able to use this account user must register the account and customize their own account to be able to use.

We will use an example of creating and using a Gmail account.

Navigate to the Gmail website www.gmail.com to start the process. You will be presented with below interface. Click on create account.

Figure 105: Creating Gmail Account 1



You will be required to enter your details as shown below. Fill in the details appropriately and click on next. For user name Gmail gives suggestions if selected account already exists.

Figure 106: Creating Gmail Account 2

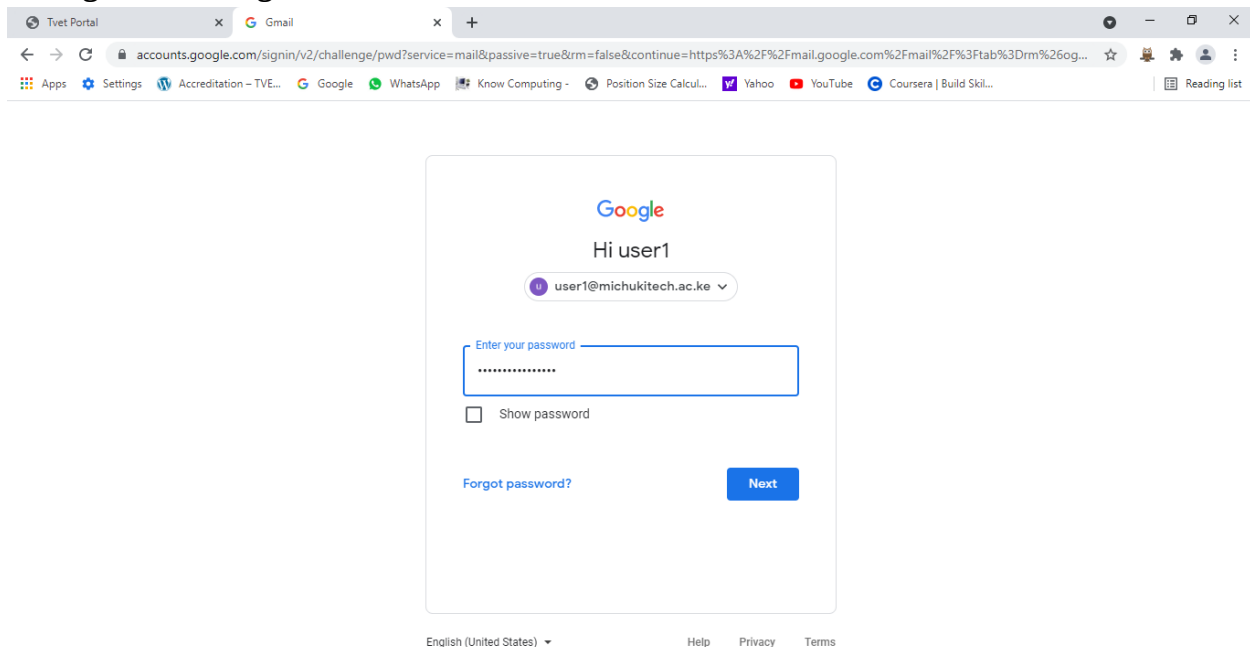
Continue entering the required data like age, phone number and gender until the account is open.

Figure 107: Creating Gmail Account 3

Ensure you enter a varied phone number since Gmail use that number to confirm if you are the one creating account. It will also be used to recover the account in case you forget the password of your account. Next step you will be required to accept the terms and conditions of using Gmail product. Click on accept.

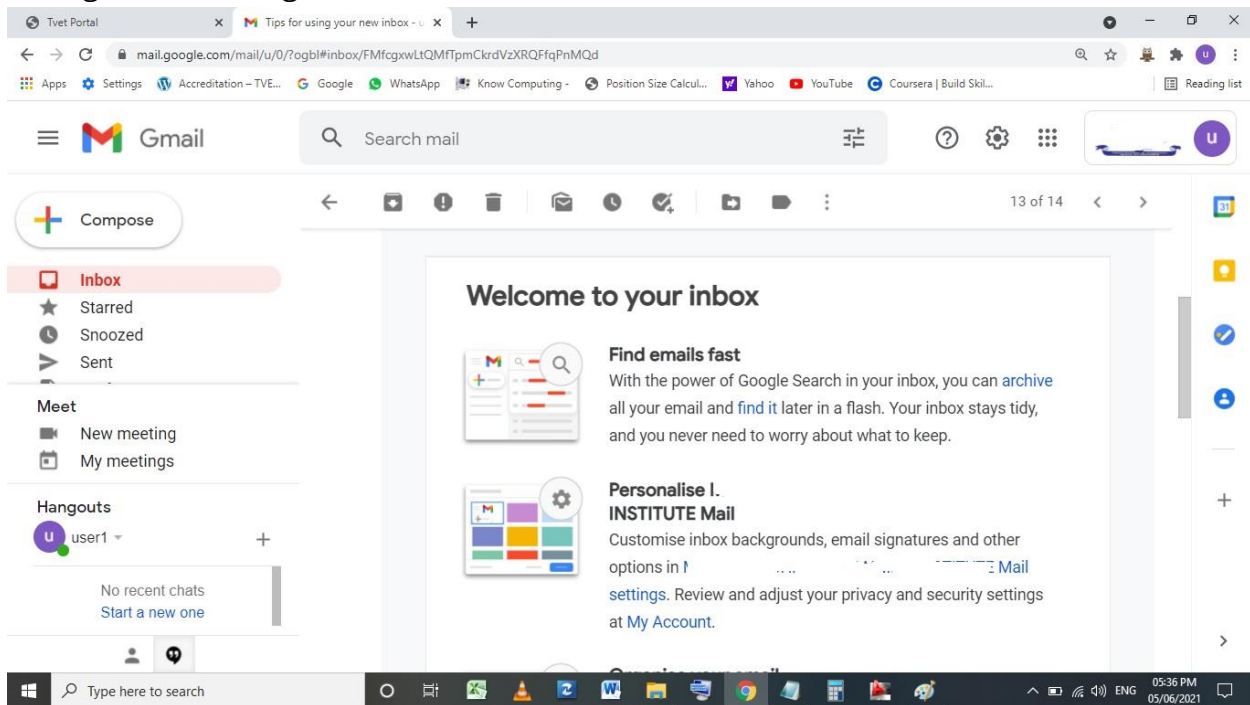
When you are through with the registration you will be required to login using the username and password that you used. As shown below and click next to login.

Figure 108: Login to Gmail Account



When you login Gmail will have sent you a welcome email on how to go about using their product. Now you have Gmail account and you can use many other Google products using the same account.

Figure 109: Using Gmail



How to compose an email

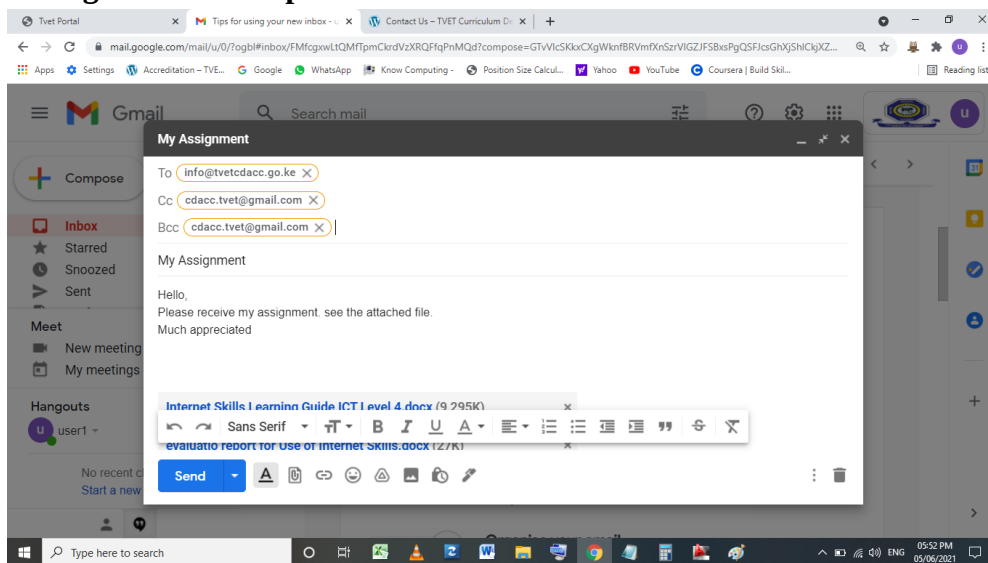
Click on compose button on the right top side. Enter the details of email appropriately.

On the *To* option add the email of the recipient. You can use Carbon Copy (CC) and Blind Carbon Copy (BCC) to send a copy. When you use a CC other recipient can see it was sent to whom but when you use the BCC the other users will not know. **Note**, when sending email to many recipients it is recommended to use the BCC so that it will look individualized email. Enter the subject of your email and message body. You can use formatting feature below to improve your message body look.

You can attach a document to the email by clicking on the attach icon below which will allow you to upload the document.

When you have done all and satisfied that everything is ok click on send. Email will be sent to all recipients.

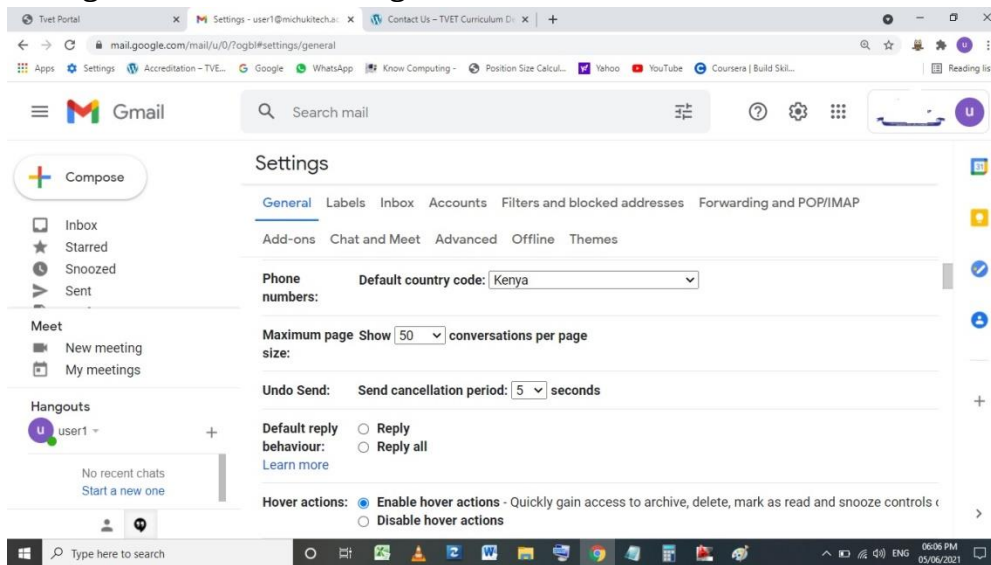
Figure 110: Compose Email



To customize your email you navigate to settings by clicking on the gear-like icon on the top right. From the settings you can change or add themes/background colour, email signature, which email to block, smart replies among many other settings.

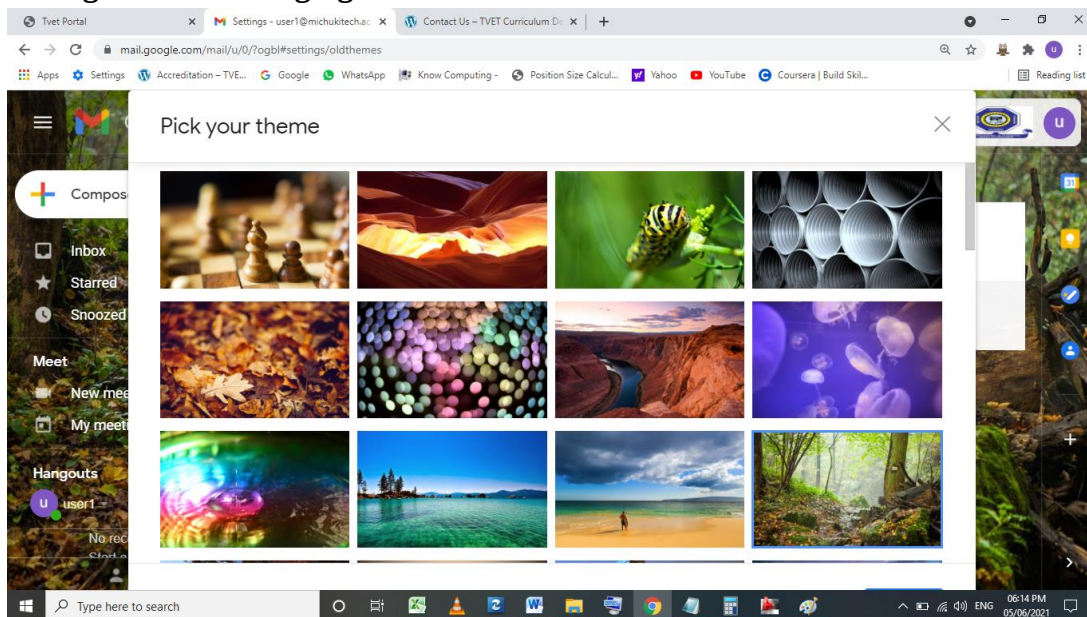
To change themes click on the themes option then add themes. You will be presented with many images to choose from; select one to add.

Figure 111: Email Settings



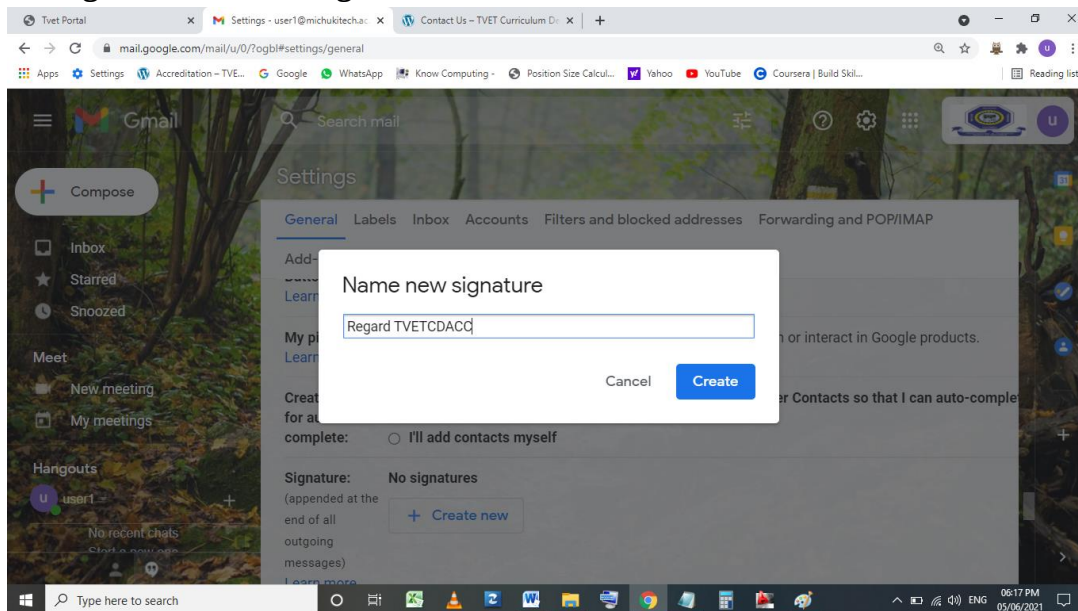
To changes themes click on themes option then add themes. You will be presented with many images to choose from select one to add.

Figure 112: Changing Themes



To add email signature scroll down on the setting. On the signature click on create new. Enter the desired signature and click on create. Signature will be appended on all outgoing email unless you decided to change or remove during email composition.

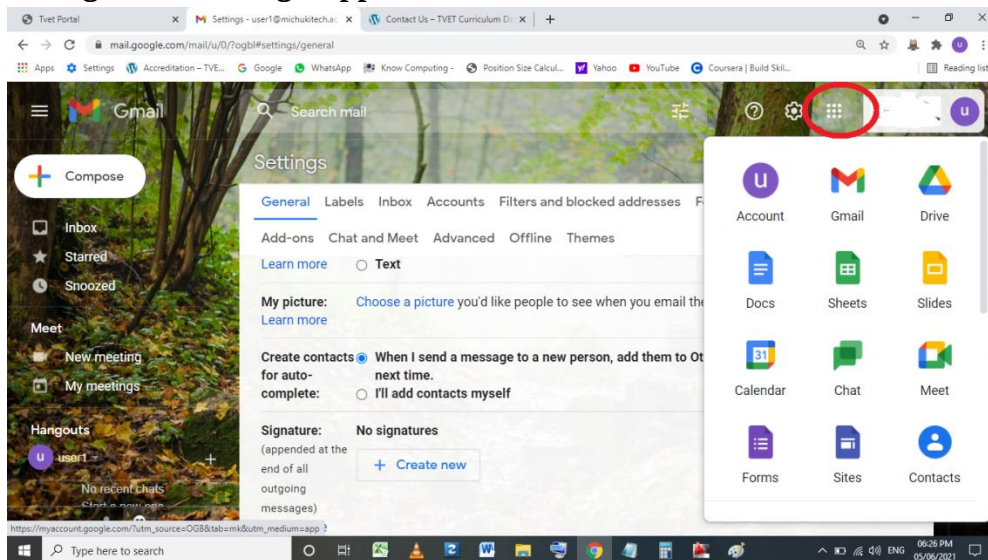
Figure 113: Email Signature



Using other Google products/applications

When you create a Gmail account you are given access to many other Google products using the same account. We will discuss some of them below. To access Google application click on the nine dots on the right top side.

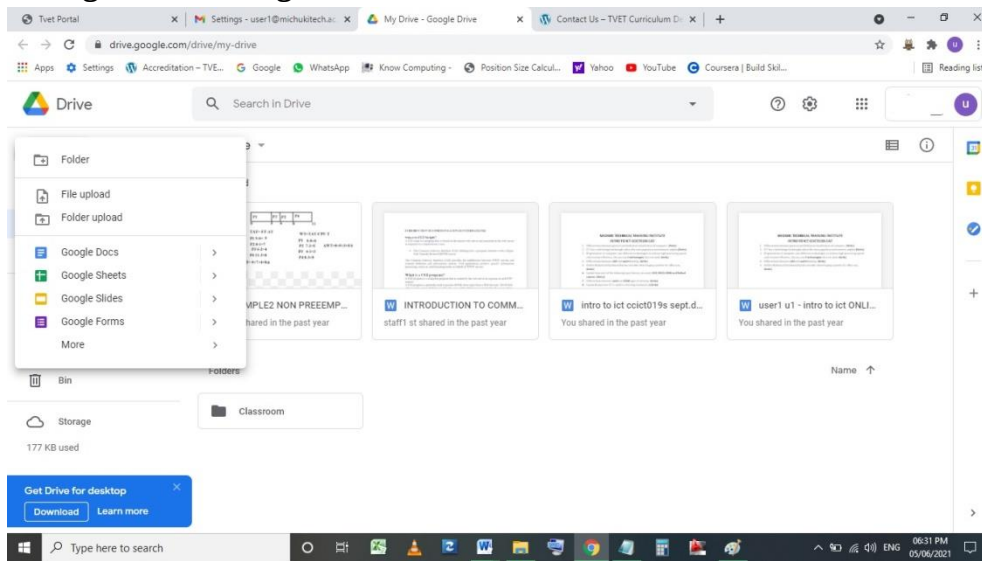
Figure 114: Google applications



Google Drive

It is a cloud storage space that you can use to store your data. Google offers free 15GB space and if you need more you can buy. Click on the drive to navigate. You will be presented with a platform like below. You can upload files of any size and share with anyone. Files on Google Drive can be accessed anytime anywhere as long as you have access to your account.

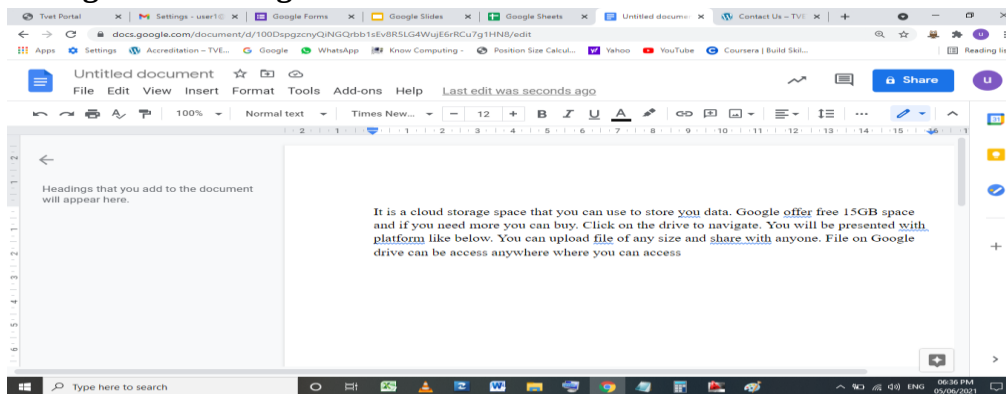
Figure 115: Google Drive



Google Docs

It is Google word processor software. You can do all things that you can do using the Microsoft Word only that is online and can be access anywhere.

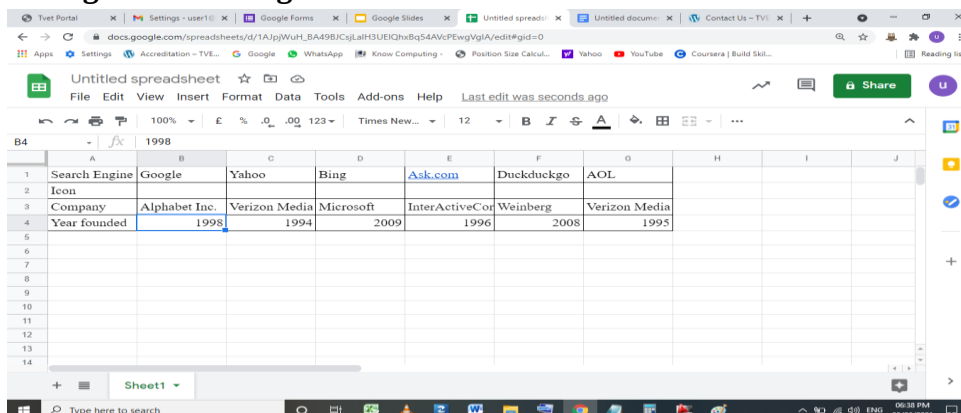
Figure 116: Google Docs



Google Sheets

It is Google spread sheet and can be used for analysis and formulae and function that are found in all other spread sheet programs

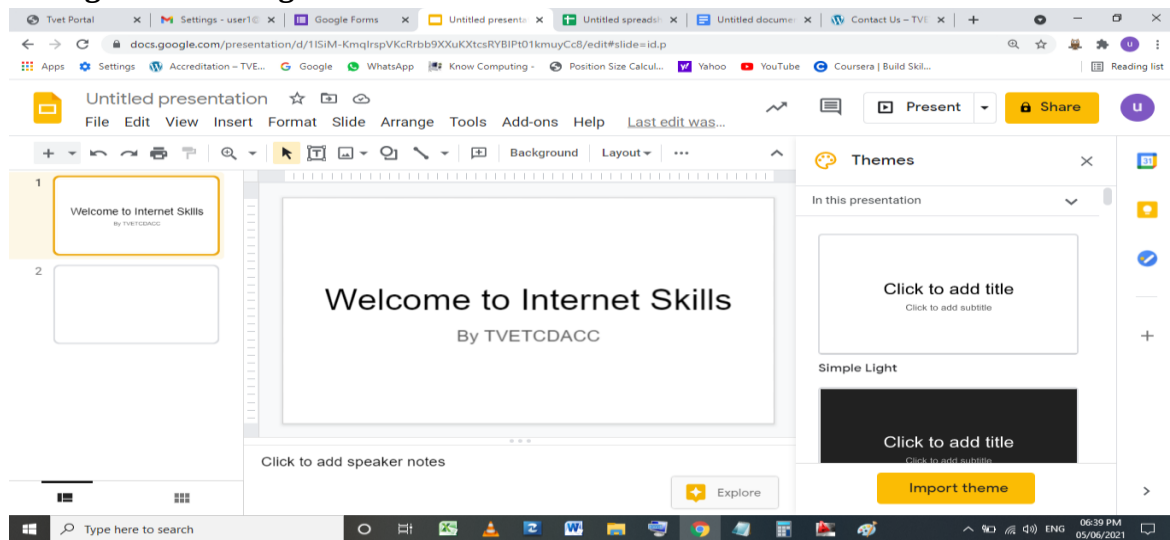
Figure 117: Google Sheets



Google Slides

They are online presentation that can be used to create slide and save online.

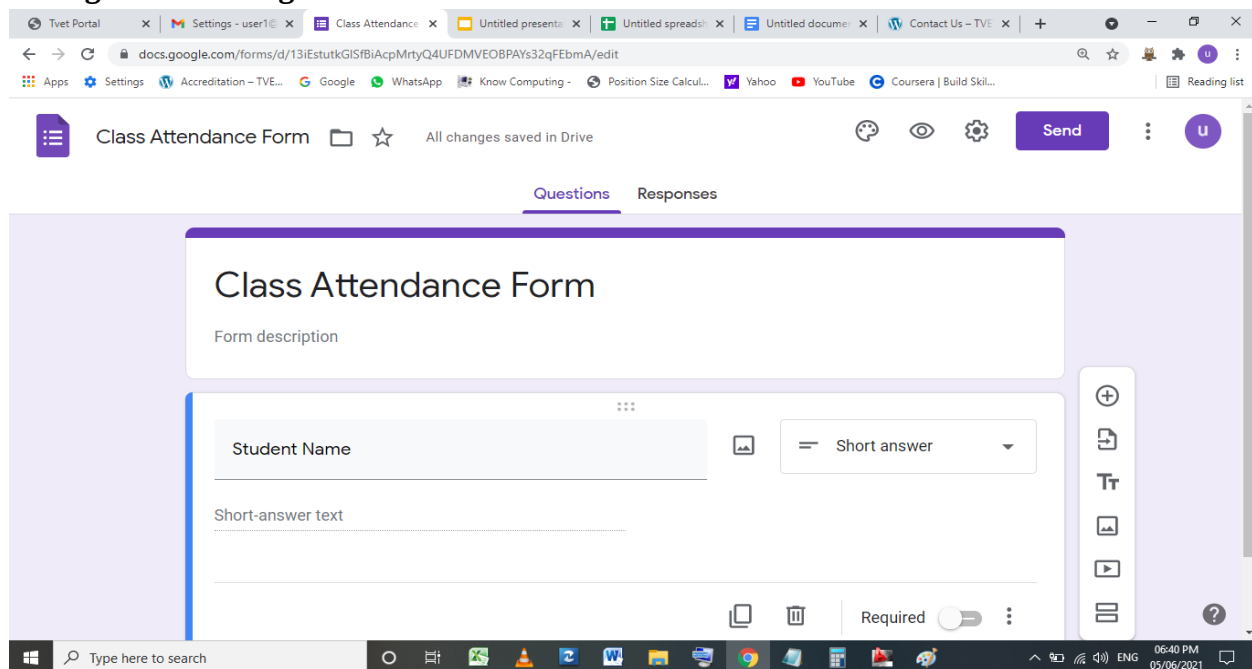
Figure 118: Google Slides



Google Forms

They are forms that can be used to collect information from users. They can also be used to create online exam and questionnaire. They are sent to the user as a link that they can open and fill.

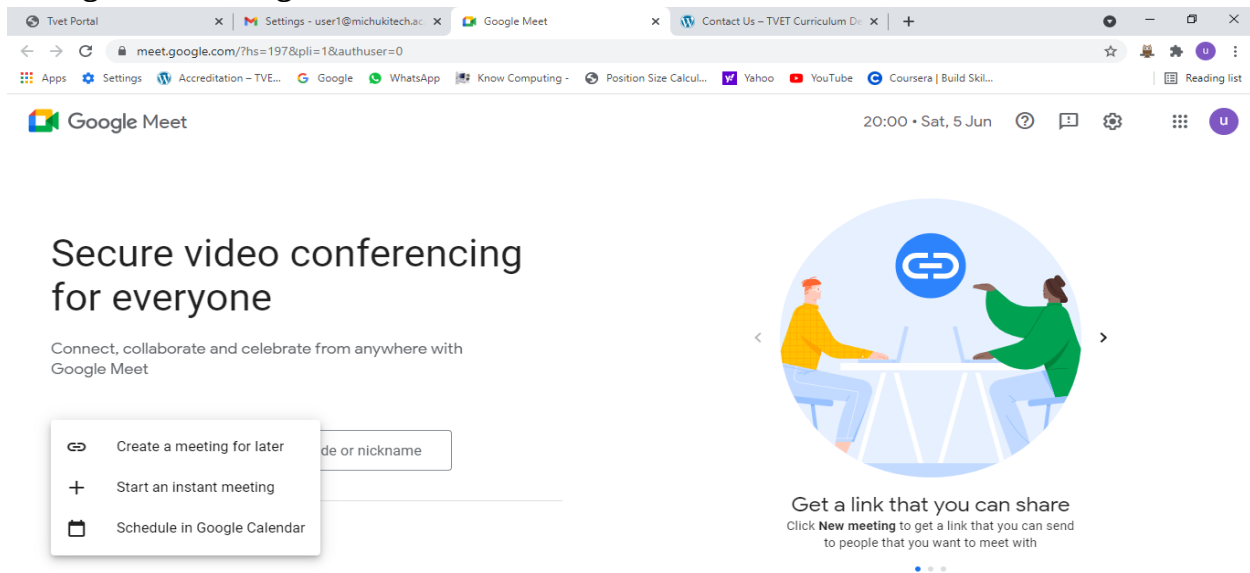
Figure 119: Google Forms



Google Meet

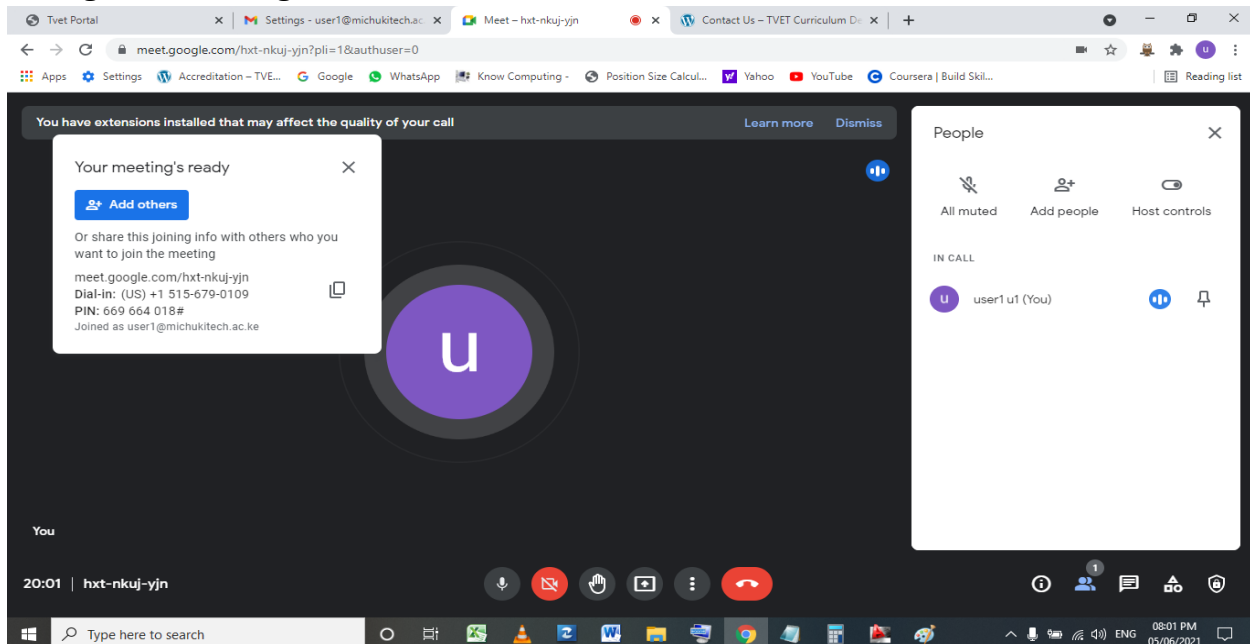
It is a platform that can be used to create a virtual online meeting. User can use audio, video and share file to interact on the platform. To create a meeting click on Google meet, then on new meeting. Choose from the 3 options provided to create the meeting.

Figure 120: Google Meet 1



When you create a meeting you can invite other by sending a link or a code that they can use to access the virtual meeting. When you create the meeting you will need to accept user when the meeting start and mostly you will be the first to enter the virtual room. These are setting that you can change later.

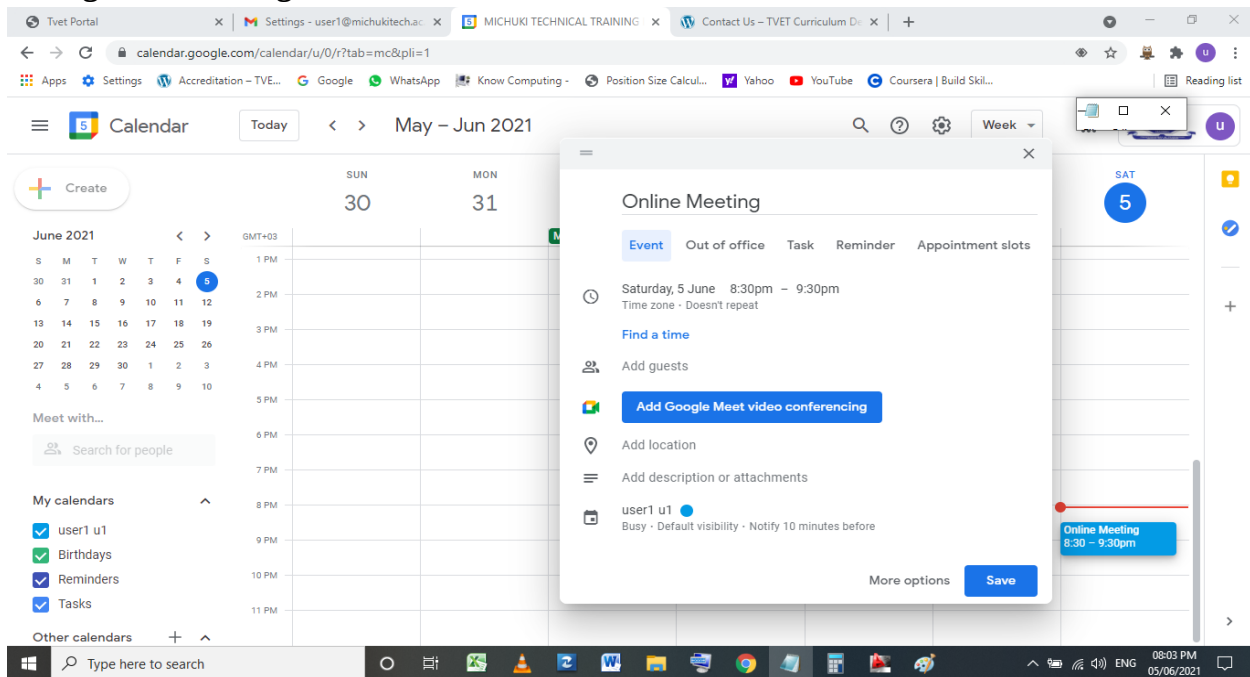
Figure 121: Google Meet 2



Google calendar

Calendars are used to schedule events and task. They help organize activities and you can set to have reminder when the event is near.

Figure 122: Google Calendar



Best practice when using electronic communication

Electronic communication should be taken like any other form of communication and all protocols should be followed. To ensure that we communicate correctly over the internet the following are some of the best practices that should be followed.

1. **Clarity:** The message to be communicated should be clear and precise to the point to avoid misunderstanding of the meaning. For email messages the subject should be simple and relevant to the topic of the message.
2. **Accuracy of grammar and spellings:** double check the spelling and grammar in all your messages before you click on the send button. For official communication spelling and grammar can be a huge mistake.
3. **Courtesy:** be courteous in your message since you don't even know who is on the other end of the internet where the message is going. Use kind word like please, sorry, humbly and so on.
4. **Verifying recipient list:** to avoid your message being delivered to the wrong person always double check the recipient address or account to ensure you are using the right address. Electronic messages once sent it becomes very hard to reverse the message or even cancel.
5. **Avoid using offensive language:** don't use offensive language both when communicating officially or even to a group of friends on any platform.
6. **Don't use all capital letter:** writing message in capital letter is considered shouting which is not recommended for electronic communication.

7. **Non circulation of inappropriate content:** on social media and chat avoid sending unverified content and vague information. This will stop circulation of rumour and propaganda information.

Necessary *privacy principles* are applied when communicating.

When communicate online your privacy and confidentiality can be exposed. To ensure you are secure and you data is well preserved you can follow the following principles or guidelines.

1. Use only trusted website that are secure. Check if the website is using HTTPS which offer security when data is being transmitted over the internet.
2. Never use remember my username and password when login your account on public computer unless it is in a device that you don't share.
3. Your password is your secret you should never share with anyone.
4. Always use an email or a phone number that you can access when creating account because it will be used to recover your account in case you forget password.
5. Always use a strong password. Recommended password should include; at least 8 characters mix Capital and lower case, number and special characters.
6. Always logout your account after you finish using.
7. When dealing with online banking or purchase always confirms that you are in the right website to avoid using a clone of the real website. This will lead to them harvesting your login detail that they can use to login to your real account.
8. Avoid using names that are predictable as you password such as your year of birth, your name, your best colour and all those common things that others can guess. Use a password that simple to remember but hard for other to guess.
9. Change your password frequently.
10. Don't use same password in all your account.

5.2.4.4 Learning Activities

Practical activities:

You are required to create a Gmail account. After creating an account or using an existing one schedule a Google meet virtual meeting and invite your class mate. Conduct a 10 minutes meeting and record.

5.2.4.5 Self-Assessment

You are provided with the following questions for self -assessment, attempt them and check your responses.

1. Give some of the recommend requirements to create a strong password?
2. When you forget a password for your account what are some of the options to recover the password?

3. You are required to set ground rules when conducting a virtual meeting. Mention some of the rule that you can give to ensure a successful meeting.
4. Name some of the email setting that you can apply to any email account.
5. What the difference between HTTP and HTTPS in terms of website security?
6. Mention some of the ways that we can reduce circulation of fake news on social media platforms?

5.2.4.6 Tools, Equipment, Supplies and Materials

The following resources are provided

1. Computer connected to the internet
2. Internet browser installed

5.2.4.7 References

<https://www.scu.edu/mobi/business-courses/starting-a-business/>. (n.d.). Retrieved february 21, 2021, from <https://www.scu.edu/>: <https://www.scu.edu/mobi/business-courses/starting-a-business/session-8-communication-tools/>

KEMP, S. (2020, January 30). *Digital-2020-3-8-billion-people-use-social-media*. Retrieved february 21, 2021, from wearesocial: <https://wearesocial.com/blog/2020/01/digital-2020-3-8-billion-people-use-social-media>

Model answers for self-assessment

1. Give some of the recommend requirement to create a strong password?
 - a) At least 8 characters,
 - b) Mix number, letter and special characters,
 - c) Don't use common name
 - d) Don't use year of birth
2. When you forget a password for your account what are some of the options to recover the password?
 - a) Use registered phone number to request for change
 - b) Use email that was used to request for password change
 - c) Contact the system administrator for manual password change.
3. You are required to set ground rules when conducting a virtual meeting. Mention some of the rule that you can give to ensure a successful meeting.

- a) No unmuting microphone unless when talking
 - b) No video stream to utilize internet well
 - c) Use raise hand button when you need to ask question.
4. Name some of the email setting that you can apply to any email account.
- a) Change themes
 - b) Set signature
 - c) Set how to treat spam
 - d) Set auto reply email
5. What the difference between HTTP and HTTPS in terms of website security?
HTTP is a connection that is not secure while HTTPS is a secure connection.
6. Mention some of the ways that we can reduce circulation of fake news on social media platforms?
- a) Don't forward message that you are not sure of the source
 - b) Always be considerate of others.
 - c) Treat every post as rumours unless verified.
 - d) Use news from reputable sources and media houses.