COMPUTER HARDWARE AND SYSTEM STARTUP

Computer hardware refers to the physical parts of the computer that one can touch and feel.

The physical device of computer is often referred to as computer hardware

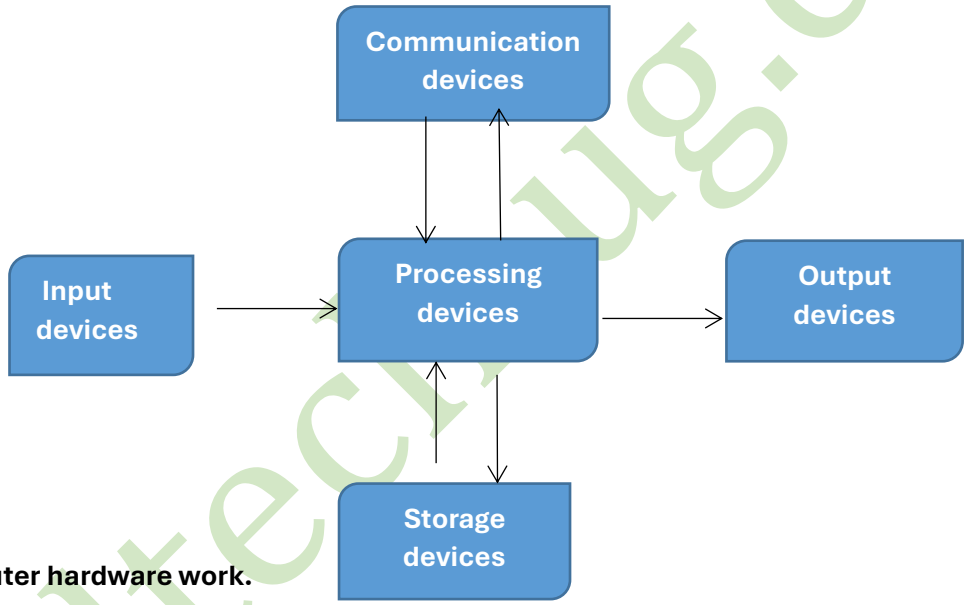
Computer hardware components are manufactured by different companies.

Some hardware parts are internal components within the system case while others are external components (peripherals) connected to the system case through openings called ports.

2.2 The meaning of technology

Computer hardware comprises of those parts of a computer that one can touch and feel. Therefore, hardware is the physical or tangible parts of a computer system. Fig. 2.1 shows some computer hardware devices of a personal computer.

Categories of computer hardware



How some computer hardware work.

Different hardware devices work differently. In this section, you shall look at the details of how a keyboard, mouse, printer, projector and hard disk work.

Input devices.

Input devices are used to enter data and instructions into the computer. They include

a keyboard, mouse, microphone, digital camera

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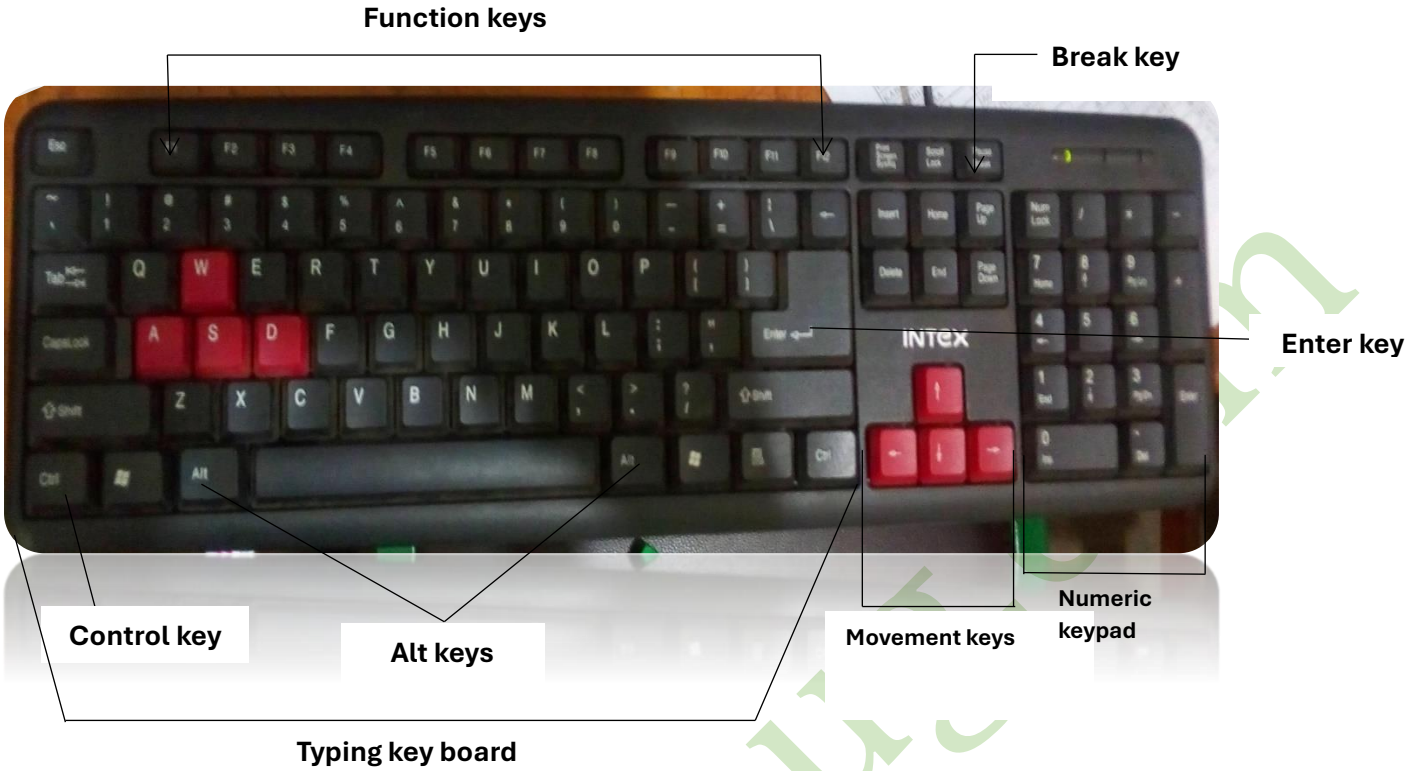
Keyboard



This is a primary input device of a computer. Data and commands are entered via (through) a keyboard. It has the following parts:

Typewriter area: This is apart that looks like or is similar to type writer keyboard.

Function keys: These are labeled F1-F12 that have different functions in different programs.

The numeric keypad: This is similar to a calculator and can be utilized as an adding machine once the num lock (number lock) is off. It is usually located on the right side of keyboard.

Special keys: On a computer keyboard, there are keys which perform functions in combination with other keys. They include ***alt (Alternate)*** and ***ctrl +B*** make a highlighted text bold.

Mouse

This is an input device that controls the movement of a pointer on the screen. The three types on computer mice are;

Desktop mouse: this is common with desktop computers and has two push buttons on top. See ***fig.2.5***. Moving he mouse over the surface causes the pointer to change appearance.

NOTE	Mice can be categorized as cord or cordless and optical or no-optical. An optical mouse uses a devices that emit and sense light to detect the mouse` s movement. A cordless mouse transmits data using wireless technology such

Rack ball mouse: this is common in laptops. In this type, a rolling ball and buttons are embedded within the keyboard.

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Touch pad mouse: this is a small, flat, rectangular pointing device that is sensitive to pressure and motion. The movement of the **finger** on the pad causes the mouse pointer to change position accordingly. They are common found in notebook/laptop computers.

The following are actions of the mouse.

Pointing: This means positioning the pointer over an item.

Clicking: this means pressing and releasing a left mouse button once.

Right clicking: place the in the object or text and press the right button once. A menu appears.

Selecting: hold down he left button and drag the cursor over the text you want to highlight.

Double clicking: This means to press and release a mouse button twice in quick succession

Dragging: this is the moving of items from one point to another around the screen.

Other forms of input devices

Touch screen

A touch screen is both an input and an output device. It can sense when a particular a particular oart of the screen is touched and it responds accordingly.

Do this activity in a pair.

1) Mention the devices that you know that have touch screens.
2) Explain the advantages and disadvantages of using touch screen.
   Compare your results with those of others.

Biometric devices

A biometric device is used to identify a person by the measurement of biological features such as fingerprints, facial images, iris (retina) prints and voice recognition.

When compared to a password, this type of system is much more difficult to counterfeit since it is unique to a person. Some of examples of biometric devices include;

- **Face scanner:** biometric face scanners identify a person taking measurements of thee face. For example, the distance between the person's chin, eyes, nose and mouth.
- **Finger scanner:** a biometric finger scanner identifies the person by the fingerprints.

Output devices

Output devices are computer hardware equipment that receive data from one computer and translate it into another form such as audio, visual, text or hard copy.

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Monitors

Endeavor to show learners two types of monitors shown in *fig.2.8* and *fig. 2.9*

A monitor or display unit is an electronic visual display of computers. Modern monitors are thin (flat) while older monitors are thick and big. Modern monitors use Liquid Crystal Display (LCD) and are referred to as LCD monitors. See ***fig. 2.8.*** Older monitors use a Cathode Ray Tube (CRT) and are referred to as CRT monitors.

Fig. 2.8: LCD monitor

In a desktop computer, a monitor is connected to the system unit through a cable.

Printers

Printers: Printers are used to produce text and graphics on a physical medium such as a paper or film. Printed information is often referred to as **hard copy.** ***Fig. 2.10*** shows examples of printers.

NOTE **Printers vary according to their printing technologies and purpose.**

Do this activity in a pair.

1. Visit any school office or computer lab and;
   - **i.** Identify the printer types available
   - **ii.** Read the manufacturers stickers and note down the manufacturer, the power rating and other information.
   - **iii.** Interview the person responsible for that printer about how that printer is used and how it is maintained.
2. Suggest the factors that one should consider when buying a printer.

Share your findings with the rest of the class.

Projectors

A projector, is an output device that can take images generated by the computer and produce and produce them by projection onto a screen, wall, or another surface. You could use a projector to show a presentation on a large screen so that any one in a room can see it.

Processing devices

Processing devices are used to convert data into information within the computer.

Processing of information that takes place in a computer is mainly handled by the CPU.

A CPU, like the many other parts, is housed in the system unit and fixed on the motherboard. A CPU works with primary memory or RAM. RAM serves a temporary storage area for data and the program instructions needed for processing. Information for processing must be transferred into the primary memory from the secondary storage devices for easy access by the CPU.

Processor speeds are measured in cycles per second or hertz, e.g. 1500Hz

NOTE 1000 Hz = 1 KHz, 1000 KHz = 1 MHz, 1000MHz=1GHz

Communication devices

In a computer system, the different hardware devices must communicate, or information to move from ne device to another. This communication can be internal within a computer system or external between computer systems. Internally, computer hardware components are connected through cables referred to as **buses.** Externally, devices are connected through cables such as VGA, HDMI, etc.

Network communication devices

Are your school computers connected to any network or the internet? Every computer that connects to another must possess a network communication device. A network communication device is designed to transmit information or data from one computer to another. Some examples or network communication devices include, among others;

- Network Interface Card (NIC)
- Modem (modulator-demodulator)
- Router
- Switch
- Bluetooth devices e.g. Bluetooth adapter.

NOTE Network communication hardware/devices can also be referred to as network hardware.

Activity

1. Use the list of communication devices given in the text above, find out the devices that are available in their school. State the function of each device.
2. Identify the network port on a desktop computer and use it to connect your computer to the internet. With help from the teacher, ensure that he network or internet signal is active. Attempt to have access to the internet.
3. Name the cable used in no.2 above for physical connections and the communication devices in use.
4. In pairs, observe the devices (router and network switch) provided to them. Use table 2.4 and describe the use of each device in network communication.

Device	Name	Use
	Router	
	Network switch	

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1. Computer communication devices and their functions in computer are summarized in the table below.

Device	Function
Router	Joins different networks to allow data to flow from source to destination.
Network interface card(NIC)	A circuit board that connects a computer to a network with a network cable.
Modem(modulator-demodulator)	Connects a computer to the internet.
Network switch	Joins computers on the same network.
Hub	Connects devices that use the same protocol on the network e.g. mouse, keyboard, monitors, etc.

Storage devices

Storage devices are pieces of computer hardware that are used for storing data. They are also referred to as storage media. They include hard disks and flash disks.

The hard disk

The hard disk is the main storage device of a computer system. It resides in the system unit and is attached to the motherboard. When software is installed on a computer, it is stored on the hard disk. Other storage devices include; a CD, a flash disk and external hard disk.

1. **Storage devices and their functions**

Storage device	Functions
Hard disk	This is usually internal device for mass storage of information in the computer.
Flash disk	A small device that connects through the USB port to provide mass storage of data outside the computer.
Rewritable compact disk(CD-RW)	Optical storage disk whose contents can be rewritten up to 680MB. Data is read or written by a DVD/CD writer.
Memory card	A small storage medium used to store digital information such as text files, pictures, audios and video files for use on mobile phones, digital cameras, laptops, MP3 players, etc.

3 Comparison of a flash disk and a CD-RW and advantages of a hard disk

- Flash disk, has a higher storage capacity compared to CD-RW.
- Flash disks are more portable compared to a cd-rw. You easily pocket a flash disk in any tiny space.
- The CD-RW gets damaged and can become unreadable very easily compared to a flash disk.
- On the flash disk, you can add or modify data in Real time, which may not be the case in a CD-RW.

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Classification of storage devices

COMPUTER STORAGE devices may be classified as primary storage or secondary storage. Primary storage, that is to say, random access memory (RAM), loses data when a computer is turned off and is usually referred to as volatile storage. For example when you create a file and you do not save it, it is stored in the RAM. When a computer goes off abruptly, the file is lost because the storage was temporary. Primary storage devices store data that is directly accessible by the computer's CPU.

NOTE: Always save your files immediately after creating them.

Secondary storage devices store data permanently until it is deleted or erased or overwritten by the user. Secondary storage devices are commonly known as non-volatile storage. Example include; the hard disk, flash disk, and optical disks. Key differences between primary and secondary storages are summarized below.

Differences between primary and secondary storage devices

Primary storage	**Secondary storage**
Primary storage is closely connected to the CPU and is mainly used for temporary storage of data and instructions during processing.	Secondary storage is relatively permanent but "further away" from the CPU.
Primary storage is faster to access than secondary storage	Secondary storage is relatively slower to access than primary storage.
Primary storage is mainly volatile (i.e. RAM contents are common when the power is turned off).	Secondary storage is non-volatile.
Primary storage is based on electronic technology	Secondary storage is usually based magnetic (e.g. hard disk), optical(e.g. CD)and mechanical technologies.

1. The purpose of primary storage or RAM in a computer.
   - Ram temporarily stores data while it is being processed (working area).
   - Part or ram is used by the operating system to control computer operations.
   - Part of ram is used to store all application programs being used by the users.
   - Ram is an output area where results of processing are output before stored permanently.
2. The teacher will provide the learners with available storage devices which may include; a hard disk, flash memory, DVD-R, blue ray disk, etc. these devices can be categorized in three main groups, as shown below.

Optical disk	**Magnetic disk**	**Solid state drive(SSD)**
DVD-R	Hard drive	Flash memory
Blue-ray disk	Magnetic tapes	Flash disk.

The reason for categorizing the storage devices as shown in the table above is that each category stores data differently as;

- Data on optical disks is stored using laser beams (laser light) and becomes read only.
- Data on magnetic disks is stored using different patterns of magnetization.
- Data on solid state drive (SSD) disks is stored using integrated circuit assemblies.

Computer peripheral tools

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A computer is capable of a variety of accessories or peripherals, ranging from, digital cameras, microphones, and speakers to printers and other sophisticated devices.

Some examples of peripheral tools connected to the computer

Port	Symbol	Used for connecting
Parallel		Printers, joystick and other peripherals. This port is almost phased out for USB ports but appears on old computers for use by old printers.
USB		Printers, scanners and keyboards and several other devices with USB interface. A connectivity specification is currently at version 3 called high speeds USB.
Ps/2- mouse		Mouse to system unit. Comes with all desktop computers and some laptop computers. It was phased out for USB ports but still used on old PCs.

4. You or the lab attendant will guide learners in connecting available peripherals.

2.3 Computer system assembly and start-up

Assembling means to put together different components of something. This could be car parts, computer parts, bicycle parts, etc. have you ever assembled something in your life? While technical people can assemble all parts inside system unit, you will use a pre-assembled system unit and connect [assemble] it with other parts of the computer. It is important to understand the importance of each part of the computer that you'll connect and the port where it is being connected. Port is a technical word that means an opening on the system unit where you can connect a peripheral device to work with the computer. Look behind the system units that are in the school computer lab.

NOTE: Ensure that you connect the devices when the computer is powered off.

Some of the parts you may need to assemble to enable the computer to function include the following; mouse, keyboard, monitor, power cables, system unit and uninterruptible Power Supply (UPS).

Booting

Imagine you have been told to start a computer by your teacher, can do it correctly? The action of re-starting the computer and it becomes ready for use is known as **booting.**

Booting can either be cold or warm booting.

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Activity

1. State the items they think need to check for proper connections before switching on the desktop computer.
2. Start a computer using the following guidelines:
   a) Switch on the wall socket (power source)
   b) Switch on the power extension cable, power stabilizer and UPS in the same order. Assuming the devices are connected for use.
   c) Switch on the monitor.
   d) Switch on the printer.
   e) Lastly switch on the system unit.
3. Explain the difference between warm booting and cold booting.
4. Discuss the reasons why they would restart a computer that is working.
5. Use the following procedure to turn off the computers correctly:
   a) Close all the active programs that are running.
   b) Click the start button and select the power button.
   c) Select shut down (Turn off) from the menu. The computer will automatically turn off if there are no issues to resolve.
   d) Share their finding with other groups.

NOTE:

3 The procedures for turning off the computer may differ slightly depending on the Operating system you are using.

Suggested responses for activity 2.19

1. Below are the things learners need to check before switching on their computers:
   - Check whether the power cables are connected properly and well insulated. The first power cable for the printer, the second for the system unit, the third for the monitor, should be fixed well in their male sockets and firmly on respective devices.
   - Check the VGA cable or video cable or signal cable (this cable links the monitor to the system unit) should be connected correctly to enable the display of information from the system unit.
   - Check that any external device (peripheral) is connected and powered on, if necessary. This should a printer or scanner.
   - Finally switch on their PCs using the correct procedures.
2. You will guide the learners to start computers correctly as follows:
   - Switch on the power source (this can be the wall socket or power switch). Then switch on the power extension cable. At this stage, you should know that the power is on and reaches the UPS and the printer.
   - Switch UPS (uninterruptible power supply), if available.
   - Switch on the screen/ monitor.
   - Switch on the peripheral such as the printer. In case where there is no printer for use, always jump this step.
   - Lastly switch on the system unit using the switch button on front in the lower/upper middle right (the switch location may depend on the manufacturer of the system unit).
3. Cold booting is the type of booting which takes place when you use the switch or power button to start or restart a computer. The POST (power on self-test) process must take place, which ensures that the hardware and software are tested before the computer user can use them.

Warm booting is the action of restarting the computer without actually turning its power off and is done when the computer is running, by using either the mouse or keyboard. Warm booting does not run the POST process.

4. the reasons for making a warm boot(restarting could be:

- **The computer has got an interruption error.**
- **The computer memory is low and has frozen.**
- **You have installed a program that it requires a warm boot to complete installation.**

5. The teacher will guide the learners to correctly turn off the computers. This will depend on the operating system being used.

Below is the procedure for shutting down a computer using windows 10

- **First, close all programs that are running (close active windows). The close button is located in the upper right hand corner of the open window.**
- **Click the windows button (or start button) to get system menu.**

The system menu showing options for managing your computer e.g. shut down option.

- **On the system menu, click, power button.**
- **Select shut down. The computer will display the screen, preparing to shut down. The computer will finally switch, turn off the system unit.**
- **Switch of the monitor.**
- **Switch off the power source (i.e. the UPS, power extension cable and wall switch).**

Sample Activity of Integration (2periods)

Item 1

Kampala secondary school is planning to have a careers day to sensitize s.1 students about the importance of vocational subjects. The 100 students of s.1 will assemble in the main hall, which has a power supply. The careers, teacher will share pictures and videos showing areas where various subjects are applicable. Some students may request some pictures and videos to show their parents.

Task

Advise the careers teacher regarding which computer hardware devices will be needed and how they work to support the presentation to the students.

Item 2

The Uganda Communications Commission (UCC) is planning to set up a computer center in your village with 30 networked computers.

Task

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You have been asked by the local council to prepare for them a report on what hardware devices they should expect form the UCC and any other component that would the computers to function very well and then explain how each device would be used by the community.

Suggested responses for Sample activity of integration

1. Advice to the careers teacher on the hardware needed to support a presentation on careers day and may vary from one learner to another. The following are specific types of hardware they may be used to organize for the presentation to run:
   - System unit: the teacher will use this hardware to create and store the presentation.
   - Mouse: This device will be used to point at the screen item needed when the presentation is being created or being displayed to the students.
   - Keyboard: This device shall be used to create text and enter commands when presentation is being created or run.
   - Monitor: this device will to verify the computer image before it is projected for learner to see.
   - VGA cable: These cables connect the system unit to projector and the monitor.
   - Projector: This displays a wide computer image for all lear5ner to see.
   - Electric/power cables: These transmit from the source to the system unit, monitor, projector and amplifier.
   - Loudspeakers: These devices will be connected to generate sound/voice for all learners to listen and comprehend.
   - Microphones: these devices shall be used for voice input (to speak through) into the system and later the voice is amplified for the learners to listen.
   - UPS: this device will enable the system unit and monitor or projector to draw uninterruptible power for continuity of the presentation in case of abrupt power offs.
   - Power stabilizer: this device will connect supply stable power to the projector, UPS, and other devices that may need power.
   - Power extension cable: this device will be used to extend power from the wall socket or another source to where other devices are placed for the presentation to be held.
   - Amplifier: this device shall be used to connect the speakers and microphone and computer system unit to generate amplified sound for every member of the audience to hear.
2. The hardware devices expected by the local council form the Uganda Communications Commission may include, but not limited to the following;
   - 30 computer system units.
   - 30 mice.
   - 30 keyboards.
   - 30 monitors.
   - 31 VGA cables (including one for the projector).
   - 1 projector (including 1 VGA cable and power cable)

- 60 cables (each pair works for one computer set).
- 30 table microphones (1 for each computer set).
- 30 UPS (uninterruptible power supply)
- 1 power regulator
- Power extension cables
- Speakers
- Printers
- Network switch
- Network cables.
- A report or document form the UCC to confirm receipt of the devices

The teacher shall access leaners presentation depending on the device presented and explanation on how the community shall use each device.

File and folder management

Introduction to file and folder management

A collection of related files can be stored in what is known as a folder for access by the users.

Just imagine files containing the results for math's, others for chemistry and others for geography for all learners in your school form S1 to S4 and you want to search for math's results for one S2 student, Nantale Joana! It may not be an easy task if the files are not arranged according to class and subject.

It is therefore, important to organize files and folders so that less time is taken while searching for them.

Meaning of files and folders

A file is a digital container that stores information, such as text, images, videos, or any other type of data. Think of it like a digital folder or document. Examples of files are,

- **Text files (.txt)**: Contains plain text.
- **Image files (.jpg, .png)**: Stores pictures or graphics.
- **Video files (.mp4, .avi)**: Contains video content.
- **Audio files (.mp3, .wav)**: Stores sound or music.
- **Executable files (.exe)**: Files that run programs on your computer.

Everything, be it a document or software, saved on a computer is stored as a file. A file is the basic unit of storage in a computer, identified by a unique name. A computer can hold tens, hundreds, thousands and even millions of files. Therefore, it is important to group files together in folders to make it easy to find, manage and use them.

In some cases, a folder can be inserted in another folder,

NOTE: A file system is a method used to control how data is stored and retrieve
NOTE: The files and folders on a computer work in a way similar to the physical files and folders in offices.

All the information you create and store (save) on your computer is recognized and kept as files on storage disk, flash disk or a CD. Files can then be stored in folders. It is also possible to store a folder (sub-folder) in another folder. For example, folder **FL studio** is one of the sub-folders in the important folder. After creating files and folders, a computer user needs to organize them for easy access and management. Files, folders, and storage devices are represented by icons on a computer.

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Icons showing files, folders and sub-folders

Note: "small image or pictures" that represent an application, a device, a file or folder on a computer are called icons.

Activity 3.2: identifying files and folders on a storage media.

Ask the learners to work in pairs or groups.
In this activity, they will use the knowledge obtained from the figure above to locate similar folders on their computers. Guide the learners to:

1. Go to the desktop or start menu and open (double click) the 'This PC 'icon (windows 7). A window similar to the one above we have opened.

When you **right-click the desktop**, the short-cut menu that displays may appear with slight changes compared to the one that displays in the folder such as documents, but the sub-menu at **new** remains the same.

Creating and saving a file using a program.

Creating a file

A file can be created using any program the computer user chooses. Take an example of a simple program called notepad. One can start learning how to type text using notepad and later use the other text editors like word pad and Microsoft word.

Let us learn how to create and save a simple text file using a simple program called notepad.

Saving the file

When saving files, the file location that the computer will select for you automatically is my Documents on the computer's hard disk. However, you can change the media location and folder when necessary. It is important to create a folder when you can always store and locate your files each time you are using the computer.

NOTE: after learning how to create and modify or delete files, you should avoid deleting other learner's files from the computer.

Activity 3.5: creating and saving a simple file.

Guide the learners to work in pairs or groups.

1. Open the notepad program and use it to save a simple file.
2. Type a list of members that they sit with at the desk, and at least 7 other members in the class.
3. Save their files in a location of their choice, using a desired name. (See procedures for saving file below).
4. Type a list of teachers that they know in their school, just below the learners names. Save copy of the file on the desktop and name it **my teachers.**
5. Share their output with other pairs.

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NOTE: ***Save*** and ***save as*** commands are both used to save files. ***Save as*** is used when saving for the first time in a given location or saving an existing file in a new location. ***Save*** is used to save new information in an already existing file

Procedure for saving a file.

1. After typing the name or any other information, locate the **menu bar** in the open notepad and click on **file.** A new window similar to the one below appears.

2. On the menu list that displays in the figure above, select the **save as** command (alternatively use your keyboard and press **ctrl + s**). The save as dialog box will appear as shown below.

NOTE; save and **save as** commands behave the same way while saving for the first time. When you click ***save as*** (for save), the computer automatically selects the documents folder as shown below.

Save as dialog box for notepad.

Type the file name and click save as guided in the figure.

Renaming and deleting files and folders.

Now that we can create a file and a folder, learn to rename and delete a file folder using the activity shown below. To rename an item is to give it a new name and t delete is to discard an item you no longer nee to a specific place. In computers, deleted items are stored in the recycle bin. However, the computer will not allow you to rename or delete most files and others because this causes malfunction. Practice renaming and deleting using your own folder or file.

Activity 3.6: renaming and deleting files and folders

Guide learners to work in pairs or individually.

In this activity, learners are going to rename or delete files and folders. Guide them to:

1. Double-click on the folder or drive containing the file/ folder you want to rename.
2. Right-click your file or folder.
3. Select rename from the shortcut menu as below.

4. Type a new name and press the enter key on the keyboard.
5. Repeat 1 and 2 and select “delete “to delete a file.
6. Share their findings with other pairs.

NOTE; avoid deleting files or folders belonging to other users. Learn to restore files or folders which are accidentally deleted.

File Extension

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A file extension is a set of three or four letters after the dot in a file name. The file extension indicates the type or kind of file. For example the file created below is a file extension.txt. This means that it is a text (txt) file. Some common file extensions are summarized below.

File extension	File type and uses
.doc	Microsoft word 97-2003 document
.docx	Microsoft word document 2007 (and above)
.rtf	Rich text format file
.txt	Plain text file, for notepad.
.xls	Microsoft excel 97-2003 spreadsheet
.xlsx	Microsoft excel 2007 spreadsheet (and above)
.ppt	Microsoft power point 97-2003
.pptx	Microsoft power point presentation 2007 and above.

Example of file and extension, HELLO**.docx**

One way to identify the file extension of a given file is to right –click the file and select properties from the shortcut menu. In the file properties dialog box (see example below), locate the file name and its extension.

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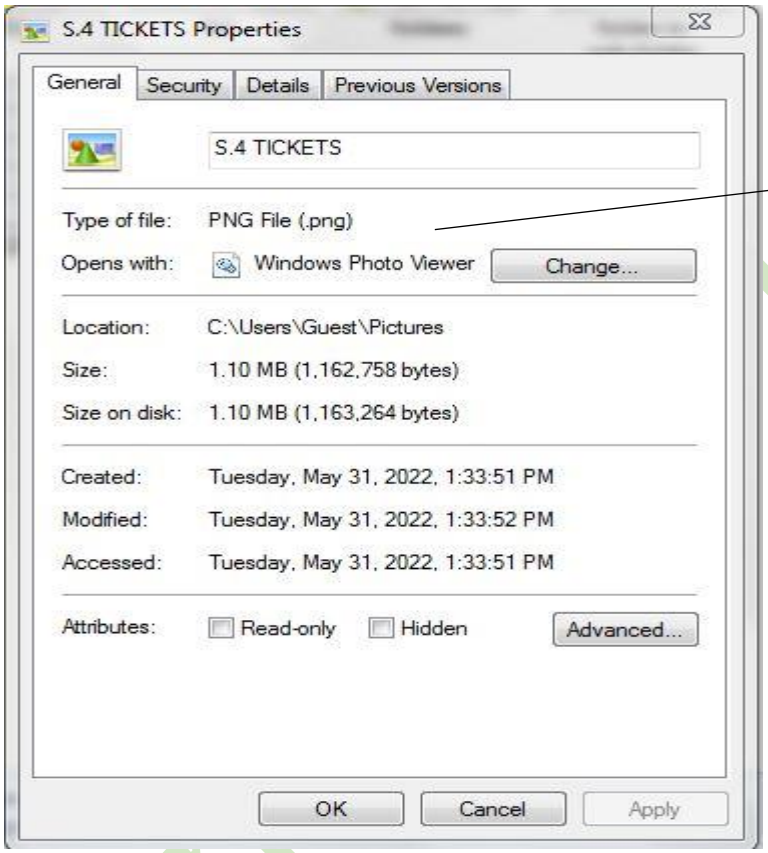
Ask the learners to work I pairs or individually.

In this activity, learners are going to identify file name and their extensions. Guide the learners to;

1. Go to any location in a computer, say desktop and identify a file of their interest. They should find out its file extension.
2. Repeat no. 3 above for three different locations on their computer.
3. Study the fig. below properly;
   a) Identify the file and file extension.
   b) Name the folder where the file is located.
4. Share their finding in class.



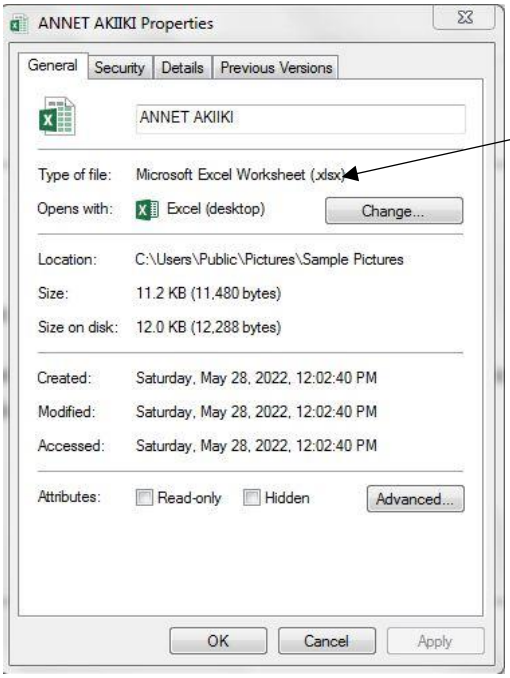
File extension

Activity 3.7:Identifying file extensions

Ask the learners to work in pairs or individually.

In this activity, learners are going to identify file names and their extensions guide the learners to;

1. Go to any location in computer, say desktop and identify a file of their interest. They should find out its extension.
2. Repeat number one above for three different files in different locations on their computer.
3. Study the figure below closely;
   a) Identify the file name and the file extension.
   b) Name the folder where the file is located.
4. Share their findings in class.



The file extension is .xlsx

Note: allow learners to study and clearly understand such a window for file properties and learn how to use it.

File path

This is an address guide to location of a file on a disk or network drive. The path tells the computer and the user where the file is actually located. In windows, the back slash (\) is often used to separate parts of the file path. The syntax (arrangement) for writing the file path is **path\filename.extension.** e.g. **E:\Critical data\My notes\ICT notes.dox.**

The file path or directory path is often typed in the run dialog box.

Activity 3.8: using file path.

Ask the learners to work in pairs or individually.
In this activity, learners are going to learn how file path works. Guide the learners to;

1. Use the file path in the text above and identify the name of the file that is being represented.
2. Identify the number of folders in the file path.
3. Identify the subfolders in the file path.
4. Create the file ICT Notes. dox having the following file path C: critical data\My Notes\.
5. Share their finding in class.

Today, there several ways that can be used to move data from one hard drive, storage disk or computer to another (see the figure below) for example in:

1. Connecting a USB external device, e.g. flash disk, external hard drive, or optical drive to the computer.
2. Using a transfer cable, data can be transferred from a computer to any device.
3. Using One Drive, Google drive or another cloud service to transfer data.

Through using **copy and paste** functions, files or folders can be moved from one storage media to another or from one location to another on the same device. **Drag and drop** can also be used, especially when the folder or file icons are on the same screen. **It all begins with locating your file(s).**

Note: when saving a file from a computer to the cloud, files are uploaded. To get the files form the cloud, they are downloaded.

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Activity 3.9: transferring files between different drives.

Ask the learners to work in pairs or groups:

In this activity, learners are going to transfer files from one drive, e.g. external hard drive or flash disk. Guide the **learners** to:

1. Connect the external drive to the computer (e.g. flash disk or optical disk or external hard disk).
2. Navigate to the folder containing the files for transfer, i.e. Open **This PC,** (or computer), then open the folder or drive, e.g. D, E, F, etc. CONTAINING the files they want to transfer. A window similar to the one below may appear.
3. Select files(s) or folder(s) you want to transfer.

Note: to select the files or folders, press **ctrl + A**

5. Open the drive where the folder (file) is to be moved.
6. Create a new folder on the drive where they want to transfer the files.
7. Paste the files in the new folder on the drive.
8. Share their finding with other pairs or groups.

Note: if you don't know the actual folder where file(s) you want to transfer are located on the computer, type the name of the file(s) in the search bar on the start button. When the name appears, right-click and select "**open location**"

Now that you learnt to transfer a file (s), let us learn to save files on a variety of storage media. Through using **copy and paste**, files can be moved or transferred or saved on different storage media e.g. hard drive (on computer) to flash disk or to CD.

Locate the file you created (that you want to save in another location or to transfer). There are several methods you can use to locate and save this file to another location or transfer file(s) to and from computer, which include; burning data on disc, pasting data to the media, etc.

Activity 3.10: ***Transferring the file(s) to removable storage media***

Ask the learners to work in groups

In this activity, learners are going to transfer files from their computers to removable disks. Guide the learners to;

1. Connect their USB flash disk or external drive in the USB port on their computers.
2. Open the program the program that created their file, e.g. notepad.
3. Click on the FILE menu and select the OPEN command for (or quickly press the **ctrl +o** on the keyboard).
4. In the open dialog box that displays (see the picture below) find your file.

5. **Right-click** on their files.
6. In the shortcut menu that displays point to send to.
7. Select the name of the removable media (their file will be copied to the media automatically).
8. Share finding with the class.

Note: if you have more than one file that you need to transfer, do the following;

a) On your keyboard, hold down the **control key** without releasing.

b) Click on each and every file you want to copy or transfer to the flash disk or another removable media.

c) Release the **control key** and then right click the selected file(s).

d) In the shortcut menu that displays, point to send to.

e) Select the name of the removable media (your files will be copied to your media automatically)

Burning data to a disc

In your computer includes a CD/DVD writer, you can use this to copy files and folders to writeable discs. This process is called burning. Windows comes with a preinstalled application that can burn most data files on your computer. If you have to make a disc that will play in a music or video player, you should burn using a music or video program.

There are different types of optical discs among which are:

a) CD-R and DVD-R: These disc type allow data to be written but the data cannot be physically erased.

b) CD-RW and DVD-RW: These discs allow data to be written and erased from them.

Activity 3.11: Burning or transferring a file on an optical storage.

Ask the learners to work in pairs or groups:

In this activity learners are going to burn files on a CD or DVD using the steps given below;

1. Insert a blank DVD-R OR CD-R in their optical drive. **A burn wizard** appears. Close it. If they have discs containing data they can still add more data as long as there is still some space.
2. Locate their file by opening **"This PC"** or **"computer"** folder, (this folder displays all the contents of the computer, i.e. all drives and folder as shown below.)

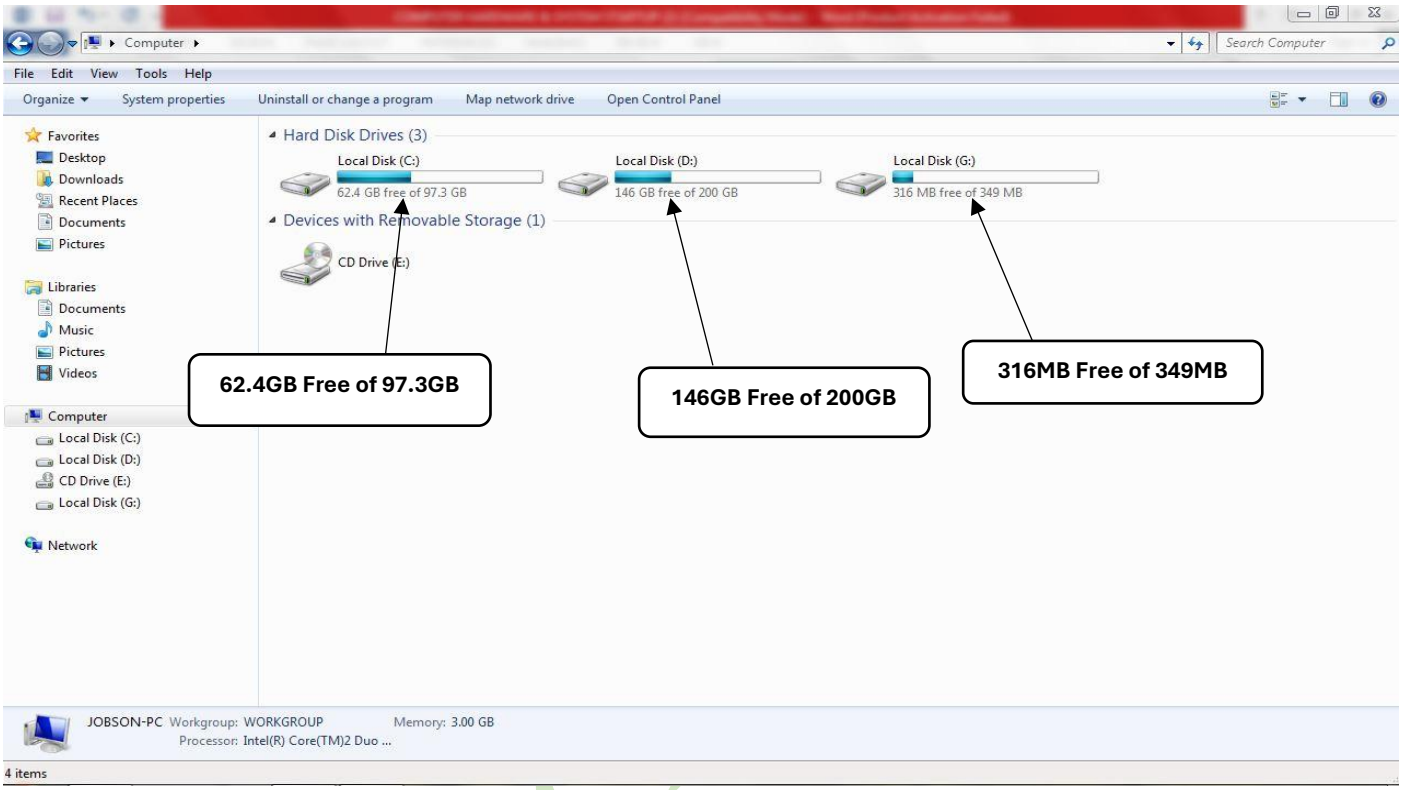
Note: to write or burn large files of specific category containing multimedia information such as audio and video, you may special burning software such as NTI,A shampoo or NERO to help burn those files netter and faster.

Each learner or pair can be provided with a re-writable or recordable CD (CD-RW/CD-R) or DVD (DVD-R), whichever is good. Ensure that you inform learners about the differences between various optical media and that some burning errors/failures and power interruptions during the burning process on an optical disc can make the disc unusable.

Note: when CD-R or DVD-R is written to, it becomes read inly and cannot be erased. When CD-RW or DVD-RW is written to, you can erase it and store/burn new data on it using special software such as Ashampoo, Mero, MT, etc.

Measurement of computer memory (2 periods)

Have you ever used a memory card or flash disc and found out how much data it can store? These storage devices and many others have labels on them that indicate their storage capacities in MBs (Mega Bytes) and GBs (Giga Bytes). The standard unit of computer memory and computer peripherals is a byte. The figure below shows local discs C, D and G with their storage units.



Units of computer memory

One byte is able to store one character, e.g. f, g, 7, 9 in binary form/code. A single space between words also holds one byte. A bit is made up of 8 bits of information a bit is a binary digit represented by either 0 or 1. All the data that is in the form or 0s and 1s is binary data or digital data, and is easily manipulated by the computer.

- 2^{10} or **kilobyte** (KB) is equal to 1,024 bytes or approximately 1000 bytes and can store about 1000 characters (to be exact 1,024 characters).
- 2^{20} or **megabyte** (MB) is equal to 1,048,576 bytes or approximately 1000 KB and can store around one million characters.
- 2^{30} or **gigabyte** (GB) is equal to 1,024 MB or approximately 1000 MB and can store around one billion characters.
- 2^{40} or **terabyte** (TB) is equal to 1024 GB or approximately 1000 GB and can store around one trillion characters.

Note: you can get to know about the amount of installed memory and other system properties on your PC when you right-click This PC (or Computer) icon and select properties.

Activity 3.12: **converting from one measurement to another**

Ask the learners to work in groups or pairs:

In this activity, learners are going to learn about storage measurement through performing calculations.

1. A computer's hard discs has a storage capacity of 320GB. How many DVD'S each 4.7GB can be used to provide the same storage for critical data in business?
2. Namanda used 12 floppy disks each of 1.44MBs to back up her essential data and securely kept them for the last 10 years. Her fear is that the data may soon become unreadable due to outdated floppy discs technology. She wants to transfer this data to the flash disc of 1GB. What percentage of space shall be used on the flash disc for this data?
3. Mugisha bought 32GB flash drive for use t transfer data from one computer to another. The data to be transferred is 125GB. How many times will Mugisha copy on his flash disc to have all the data transferred to another computer?

Suggested responses for activity 3.12

1. A simple text of 6,555 in terms of kilobytes
    - 1 kilobyte=1,024 bytes
    - 6,555 bytes=6,555/1,024=6.401 kilobytes.
2. A hard disc of storage capacity 320GB, how many DVDs
    - Each DVD has a storage capacity of 4.7GB
    - 320GB/4.7GB=61.8DVDs. **It requires 69 DVDs.**
3. 12 floppy discs of essential data to be kept on a flash disc of 1GB. The percentage of space on a flash disc...
    - Each floppy disc has a storage of 1.44MB
    - Therefore, data on 12 floppy discs requires a space of 12*1.44=17.28MB
    - Only 17.28MB shall be used on any flash disc of 1GB (1024MB) Namanda is having.
    - The percentage of apace used on the flash disc is (17.28/1024)*100=1.6875≈1.7%.
4. The number of times a 32GB flash drive can be used to transfer data of 125GB from one computer to another:
    - 125GB/32GB=3.9 times. Therefore Mugisa will copy data to the flash disc **4 times.**

Storage devices can be compared in terms of speed of access, portability and storage capacity, among others, as summarized in the table **below**.

Storage device	Access speed	Portability
Flash disc	Faster access	More portable
Hard disc(including external hard disc)	Faster access	Bulky
Compact disc(CD)	Fast access	Portable
Digital Versatile Disc(DVD)	Fast access	Portable

Magnetic tape	Slowest access	Very bulky

Activity 3.2: Knowing about your computer

Ask the learners to work in groups

In this activity, learners are going to learn about the basic information about their computers. Guide the learners to:

1. Start their computers and find out their total used space and free space on the hard drive(s), in bytes.
   Follow the procedure below
   a) Right click on This PC (or the Computer) icon on the desktop and then select properties.
   b) The resulting screen displays as shown in the figure below. Right click Local Disc C: and select properties. In the local disc properties, dialogue box, take the reading in the bytes.
   c) Repeat step b) for the rest of the local drives.
2. Find out the following information about their computers:
   a) The storage capacity of their computers (add storage space on all local discs) in bytes.
   b) The amount of memory capacity (RAM) installed on their computers.
   c) The speed of the processor
   d) The type of operating system running on their computers.
3. Insert an external storage device e.g. flash disc or CD and establish its storage capacity.
4. Compute the percentage of the used space in the device used in 3) above.
5. Discuss the function of the following folders to the user:
   a) Recycle bin
   b) Network
6. Share their findings in class.

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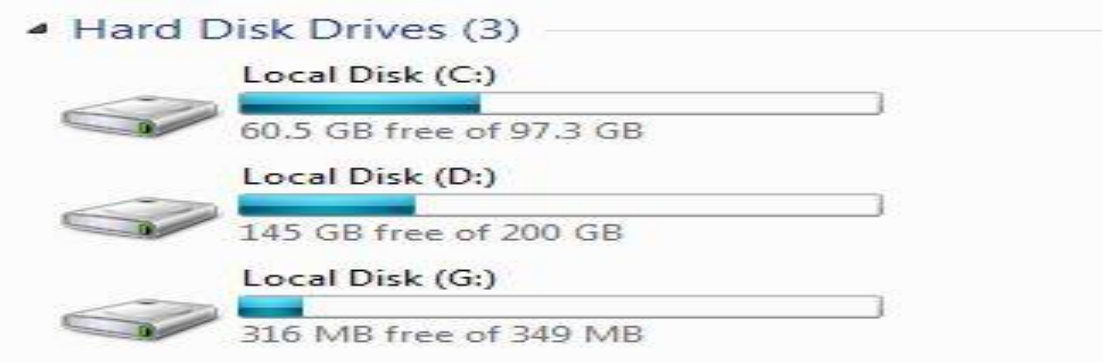
1. Steps
   - Open **Computer** or **This PC** icon.
   - The windows/file explorer will open, showing all hard drives with total used space and free space as shown below.



   - **Right-click** on each of the local discs and select properties. Take reading in bytes for the disc **capacity** on each local disc.

Note: when the color of used space changes from blue to red, it implies that your hard disc is almost full and requires you to remove some files and store them somewhere else, e.g. on cloud.

2. Storage capacity of computer in bytes.
   Open computer or This PC then add all the space in bytes by doing the following:
   (i) Right-click on each local disc an then click on properties. A window similar to the one below

Suggested responses for activity 3.13

Displays. Read the storage capacity on each disc and then together in bytes.

(ii). The amount of memory capacity (RAM) installed on your computer.

- Right-click on My Computer or This PC
- Click on properties.

(iii). Processor speed

- Right-click on My Computer or This PC
- Click on properties.
- Under the system section, read the processor:

(iv). Type the operating system running in your computer

- Right-click on My Computer or This PC
- Click on properties.
- Under the windows edition section, read the operating system e.g. windows 10 enterprise.

3. The teacher will guide the learners on how to check on the capacity.
4. The teacher will guide the learners in calculations using previous knowledge and skills.

Sample activity of integration (2 periods)

Context

Senior one students of Kapeket Secondary School recently went for a geography trip to Queen Elizabeth National Park and took very may photos using their class teacher's digital camera.

Support material

Tasks

Upon returning to school, the students transferred all their photos from the camera to one to one of the desktops in the computer lab. The photos were saved in a folder with a size of 5GB. The student's class monitor later shared all their photos with one of their classmates who currently lives in Ghana.

a) Explain how the photos were sent to the former classmate in Ghana starting with transferring them from the camera.

b) Students were given 12 new CDs each 700MB by their teacher by which to save all their trip photos.

   i) Describe how the trip photos were transferred from the hard disc to the CDs provided by the teacher.

   ii) How many CDs full of data do you think the students used? Give reasons for your answer.

Suggested responses for sample activity of integration

a) Photos captured during the tour on digital camera were transferred to computer in a folder of 5GB (total space occupied by the photos). Possible guidelines for accessing how the photos were copied by the class monitor to the computer and shared to a friend living in Ghana.

Copying photos to the computer, steps;

- Turn on the computer
- Create a compressed folder and approximately rename the folder where photos are to be stored.
- Connect the digital camera to the computer using its USB interface.
- Check to ensure the computer reads the camera.
- Open **This PC or Computer icon** on the desktop computer.
- Open camera icon.
- Select desired images and copy them with right-click method
- Paste the photos in the destination folder on computer.

Sending photos to Ghana

There are a number of technologies that can be used to share information such as photos with a person in a distant place, e.g. email, One Drive, Google Drive, etc. the class monitor will decide which method to use and explain along that line. For instance, if email is used, the following guidelines may be followed for assessment;

- Open a suitable web browser (a program to access internet).
- Open your email account.

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- Create a new message
- Attach the compressed or desired photos to the email
- Click the 'send' button to dent the photos to the destination,
- Wait for the display note showing 'message sent'.
- Log off your email account, close the browser and turn off the computer.

b) (i) The method used to transfer the trip photos from the hard disc to CDs may vary depending on the software the learners have decided to use. Learners can use Windows burning software or a commercial program such as NERO or A shampoo. In basic terms, when the learners use Windows, the steps below can be adopted;

(i) Obtain a blank CD and insert it in the DVD/CD Writer.

(ii) Open This PC or Computer icon and then DVD RW Drive.

(iii) Select the CD/DVD

(iv) Provide a suitable name for the CD.

(v) Click on burn. Wait until the burning process completes.

(vi) When the drive releases a completed CD, remove it.

(vii) Repeat (i) and (iv) for the rest of the CDs.

(ii) All the trip photos are said to occupy a maximum storage of 5GB. The CD of 700MB can accommodate a maximum of 680MB. The possible calculation for number of CDs to be used is:

5GB/680M B= (5x1024/680MB) = 5120/680MB = 7-52941176

The number of CDs full of f=data will be 7CDs and the maximum number of CDs that will be required to store all the photos will be 8CDs because the calculated figure has decimal an the decimal is approximated to a whole number.

Chapter summery

In this chapter, learners have learnt about;

1. Using different types of storage media to create, save and transfer files.
2. Converting units of data storage.

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