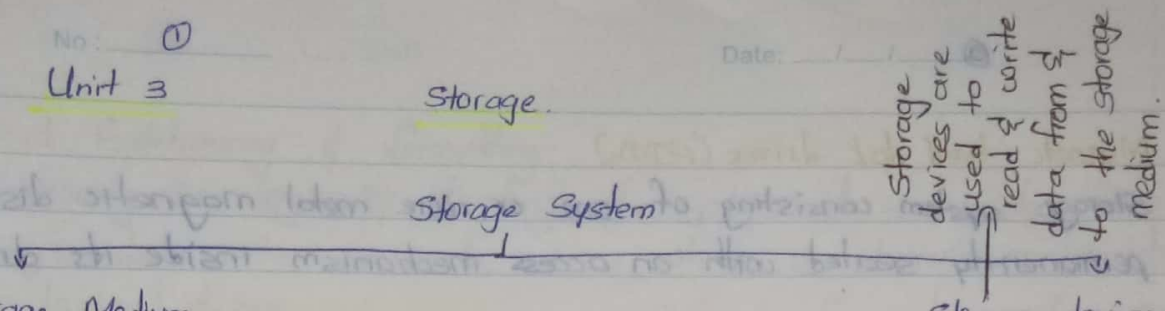
Unit 3

Storage



Storage Medium
- The hardware where data is actually stored

eg - DVD, CD, Flash memory card

Storage devices
- Inserted into its corresponding storage device in order to be read from or written to.

eg - DVD ~~Rom~~ Drive
CD Rom
Flash memory card reader

Storage Medium	Storage device.
DVD	DVD Drive
CD	CD Rom
Flash memory card	Flash memory card reader.

Storage devices are required to read & write data into the storage medium

Characteristics of Storage system

- Can be internal, external or remote
- Non volatile [No need electricity to store data; but needs electricity to read & write data]
- Usually use random access; can be sequential

Random Access
- Can directly pick the relevant files
- File allocation table (FAT) is used to seperate each file.

eg - Playing songs through computer or phone in a media player.

Sequential Access
- Can open file one after the other.
- Can't directly pick the file.

eg - Playing songs through cassette players.

In general,
Memory refers to RAM
Storage refers to HDD

Magnetic hard disk drives (HDDs)

Storage system consisting of one or more metal magnetic discs permanently sealed with an access mechanism inside its drive.

Can be internal or external

Normally 2.5 inch HDDs are used in notebook PCs

Found in most computers

Data is stored on the disks magnetically

Internal HDD - Permanently located inside the system
External HDD - Connected via an external port (USB)

Data is read & written using read/write heads

Head crashes can occur; therefore backing up is important

Currently being replaced by SSDs

Speed of HDDs is measured using RPM - Rotations per minute.

Storage device names in a PC

X:, Y:, Z: - Network storage
C:, D:, E: - Internal storage
A:, B: - Floppy disk drive.

Solid State Drives (SSD)

Use flash memory

Less power & having no moving parts

Appropriate for portable & mobile devices

Why it is better than HDDs?

- Data transferring speed is high
- Uses electronic system to read & write data
- Less power consumption
- Less weight

Disk Partitioning & formatting

Partitioning is logically dividing the physical capacity of a single drive into seperate areas, which are known as partitions or logical drives.

↓ Different file systems of HDDs.

Determines the cluster size, maximum drive size & file size.

- FAT, FAT32, NTFS (New Technology file system)

Benefits.

- Can install more than one operating system
- Can create a recovery partition
- Can create a new logical drive for data (Can easily seperate and save various data into various drives)

Optical Disc System

Stores data optically (using laser beams) instead of using magnetic system.

Uses: Movies/Song albums
Annual reports.
User manuals
- Data backups
- s/w programs

Data is written through burning the laquer coating on the disk. Therefore CD writing is known as burning.

Type	CD	DVD	Blu Ray
Capacity	0.7GB	4.7 - 17GB	25GB - 128GB
Read/write/Rewritable	Yes	Yes	Yes.
Layers	Single	Dual	Dual
Sides.	Single	Double	Dual

Flash memory systems

Is a chip based storage medium that represents data using electrons

Embedded flash memory

- Flash memory chips embedded into products such as digital cameras, digital music players, handheld PCs, smartphones, notebook PCs, etc.

Flash memory cards

A small card containing flash memory chips and metal contacts to connect the card to the device or reader.

eg - Compact Flash
- Secure Digital (SD)
- xD picture Card
- Memory stick.

Read by flash memory card reader

USB flash drives

Consist of flash memory media and a reader in a single self contained unit.

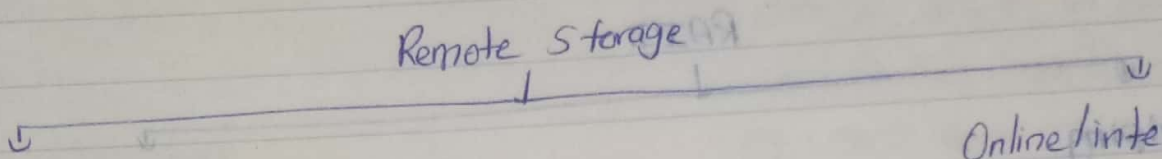
Portable devices that can be connected through a USB port.

AKA USB flash memory drives, thumb drives.

Other types of storage systems

Remote storage.

Use of a storage device that is not connected directly to the user's computer; instead the device is accessed through a local network or through the internet.



Network storage
- Using a remote storage via a local network.

Online/internet storage.
(Cloud storage)
- storage devices accessed via internet
eg - onedrive, googledrive, dropbox.

Mostly used for backup purposes.
Can obtain a huge amount of storage capacity without using physical devices.
Needs network connection to access to the storage device.

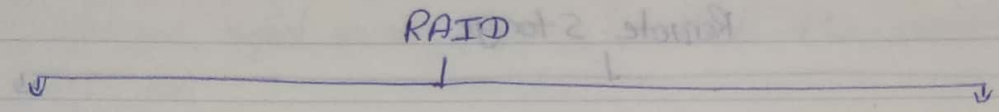
Smart Card

Credit Card sized piece of plastic that contains some computer circuitry

Stores small amount of data (64kB or less)
Mostly used to store personal information or prepaid amounts of digital cash.
Requires smart card readers to read data. Mostly they are built into or attached to a PC, keyboard, vending machine, etc.
Some smart cards have biometric data.
eg - license, student IDs, Credit cards.

RAID

- Redundant arrays of independant discs
- Method of storing data on two or more hard drives that work together to do the job of a larger drive.



Striping

- When a file is written to a RAID system using striping, it is split among multiple drives

Mirroring.

- When a file is written to RAID system using mirroring, an identical copy of the file is sent to another drive in the system.

Helps to increase fault tolerance.

Magnetic tape.

Consists of plastic tape coated with a magnetizable substance that represents the bits and bytes of digital data similar to magnetic hard disks.

Has sequential access; therefore not used much.

Used for business data archiving & backup.

Advantage - low cost per terabyte.

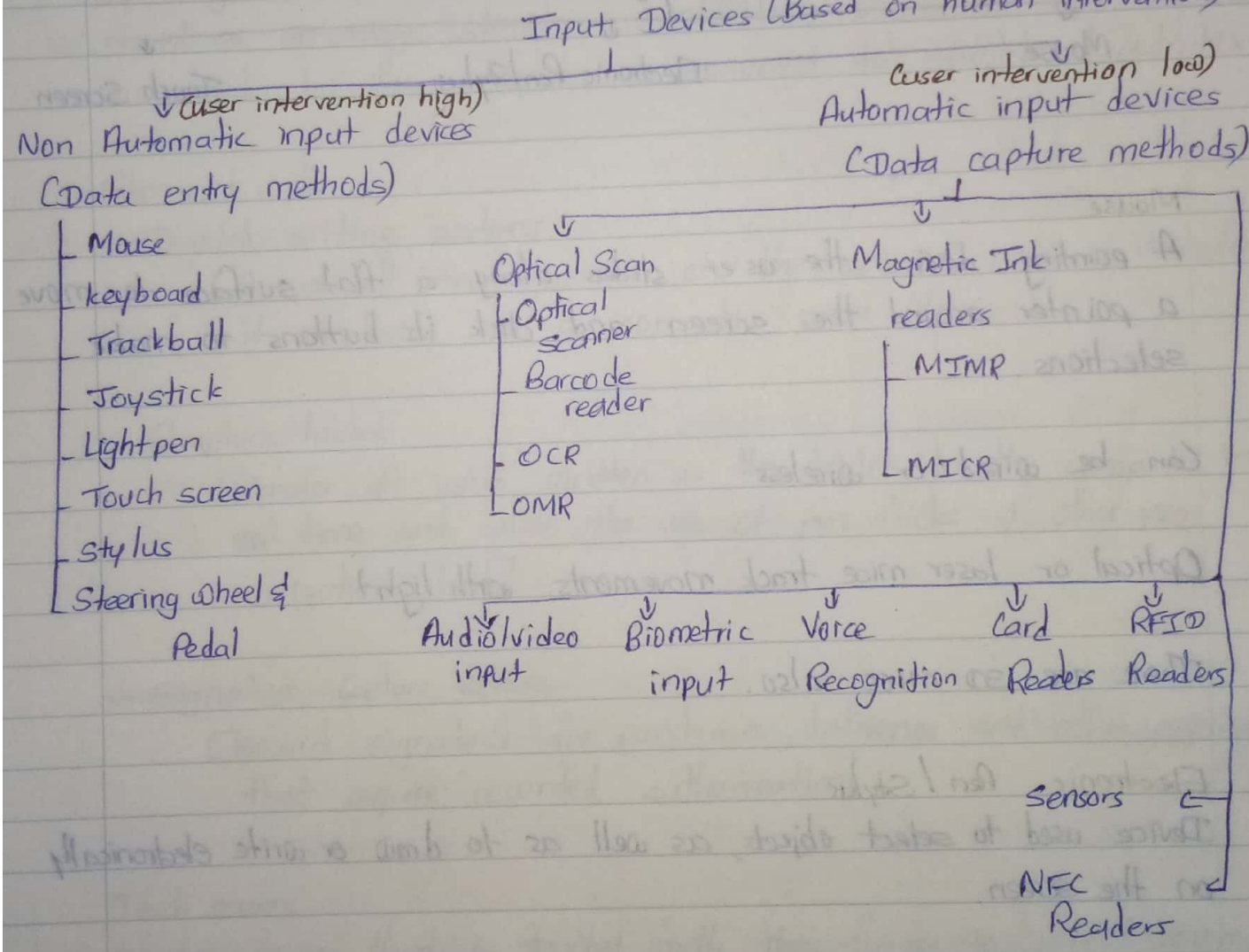
Factors considered when choosing storage systems

- Speed
- Compatibility
- storage capacity
- Convenience.
- Portability.

Unit 4 Input and Output

Input devices

Input devices are devices which convert the data & information fed by the user into the computer, into a computer understandable form.



Keyboard.

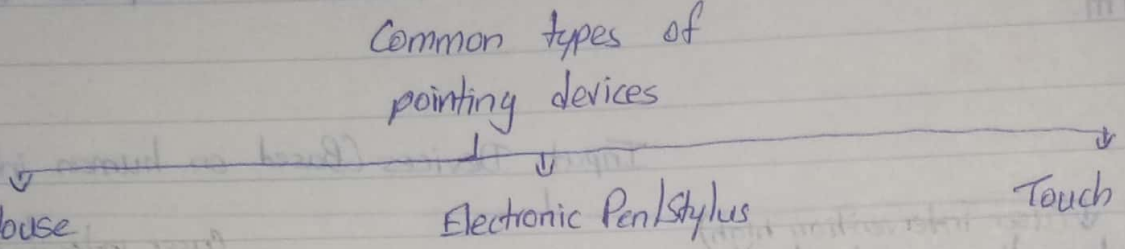
An input device containing keys, arranged in a typewriter configuration, used to input letters, numbers & other symbols

Can be wired or wireless

Portable PCs & mobile devices use
- Virtual keyboard
- keyboard dock
- Pen or touch input
- Built in or slide out keyboard.

Pointing devices

An input device that moves an onscreen pointer (arrow or insertion point) to allow the user to select objects on the screen.



Mouse.

A pointing device the user slides along a flat surface to move a pointer around the screen and click its buttons to make selections.

Can be wired or wireless

Optical or laser mice track movements with light

There are 3D mice also.

Electronic Pen / Stylus

Device used to select objects, as well as to draw or write electronically on the screen.

AkA tablet pen, digital pen, stylus

Mostly used in,

- Photography
- Graphic design
- Animation
- Industrial design
- Document processing
- Healthcare applications

Most often these are used with mobile devices & tablet computers

Can be used with desktop or notebook computer if the monitor supports pen input.

Depending on the software being used handwritten input can be stored as an image, stored as handwritten characters that can be recognized by the computer or converted to editable typed text.

Also used with

- Digital writing systems
  [Record all input written on the special paper & transfer it wirelessly to a computer upon demand.

- Graphics tablet
  [Transfer all input written on the tablet to the computer in real time and allow the use of pen flicks & other pen navigation tools]

- Signature capture devices
  [Record signatures for purchases, deliveries and other applications that require recorded authorization]

Touch screens

Display device that is touched with the finger to select commands or otherwise provide input to the computer.

Surface Computing
- A surface on which a screen is displayed & multiple people can use at a time.

Used with

- Desktop & Portable PCs
- Mobile phones & mobile devices.
- Consumer kiosks, POS systems, restaurant order systems, ATMs.
- Surface Computing

Other pointing devices:

Joystick
- Mostly used in computer gaming

Trackballs
- Takes less desk space than mouse
- Can be used for the devices which requires minimal use of pointers eg - POS

Control buttons & wheels
- Commonly found on portable digital media players and other consumer devices

Touch pads.
- The mouse pad in notebook PCs

Steering wheel & pedal - mostly used in video gaming devices.

Scanners

An input device that reads printed text and graphics and ~~reads~~ transfers them to a computer in digital form.

Can scan any flat object such as photos, documents

Data is typically input as a single image. If OCR is used text is input as editable typed text.

The scanning quality and resolution is measured in number of dots per inch (dpi), and varies with the scanner used.

Higher the resolution, higher the quality. But larger the file size.

Types of Scanners.

- Flatbed Scanner : The document is kept on a flat glass surface. The scan head moves under the glass.

- Sheetfed Scanner : Many sheets of loose paper can be fed into the tray and is faster than flatbed. But can't scan books using this.

- Handheld Scanner : Scanner that is moved by hand over the material being captured. Portable

- Drum Scanner : Used by publishing industry to capture incredibly detailed images. Photomultiplier tube (PMT) Technology is used.

- 3D Scanner : Analyses a real world object or environment to collect data on its shape and possibly its appearance.

Barcode Readers

Input devices that read barcodes

There are 2 types.

- Fixed
- Portable

A barcode is an optical code that represents data with bars of varying widths or heights.

Common types of barcode.

- UPC (Universal Product Code)
- ISBN (International Standard book number)
- QR Code (Quick response)

No: ⑥

Optical Mark readers (OMR)

Input data from special forms like ~~tickets~~ ticks, marks, other signs.

Can be used to count polls, questionnaires, MCQ Papers.

Optical Character Recognition (OCR)

Ability of a computer to recognize text characters printed on a document.

Document is read by a normal scanner & converted to editable text through this technology.

Radio Frequency identification Reader (RFID)

RFID (Radio Frequency identification) is a technology used to store and transmit data located in RFID tags.

RFID tags contains tiny chips & radio antennas. Normally attached to objects for identification purposes

Uses

- Tracking inventory & assets.
- Electronic tolls
- Tracking patients in hospital
- Ticketing application
- Security

The RFID tags doesn't have to be displayed in front of reader like the barcode reader. Instead the tags only need to be within the range of the reader.

Biometric Readers

Biometric readers are used to read biometric data about a person so that the individual identity can be verified based on a particular unique physiological characteristic (fingerprint, face, iris) or personal trait (such as voice, signature)

eg - Attendance Systems
Access Systems (unlocking doors, computers, phones)

Digital Cameras

Record images on digital storage medium

Can be either still cameras or video cameras

Typically uses flash memory, built in hard drive or DVD disc for storage.

Digital still Cameras.
- Photos can be transferred to a PC or printer
- Camera quality is measured in mega pixels.

Digital video Cameras
- Often built into portable computers & mobile devices
- There are stand alone devices too (PC cams/webcams)

Advantages compared to normal cameras.
- Can get previews of pictures
- Can erase the unnecessary images.
- Can transfer to PC

Audio Input

The process of entering audio data into the computer.

Voice input and speech recognition systems.
Spoken words are converted into digital form.

Speech recognition
- Identifying words
Voice recognition
- Identifying one individual's voice.

Speech recognition systems
- Enable the computer to recognize voice input as spoken words.
- Requires
  - Appropriate s/w (Dragon naturally speaking, windows speech recogniti
  - Microphone

Voice input systems.
- Speech recognition is a part of voice input systems
- An analog to digital converter on the sound card located inside the PC converts the spoken words to phonemes.
- The spoken words appear on the screen in the application program (word processing, emails) (google search)
- Enables to give voice commands (Siri, Google assistant)

Other Audio inputs
- Through mic
- Through CDs
- Midi equipments.

Magnetic ink readers

Devices which are used to read the characters & marks written using magnetic ink

MIMR : Magnetic Ink Mark Recognition
MICR : Magnetic Ink Character Recognition. (Cheques)

Sensors

Devices which recognize different senses such as heat, humidity, light, smoke, oxygen level etc.

eg - Fire alarms

NFC Readers

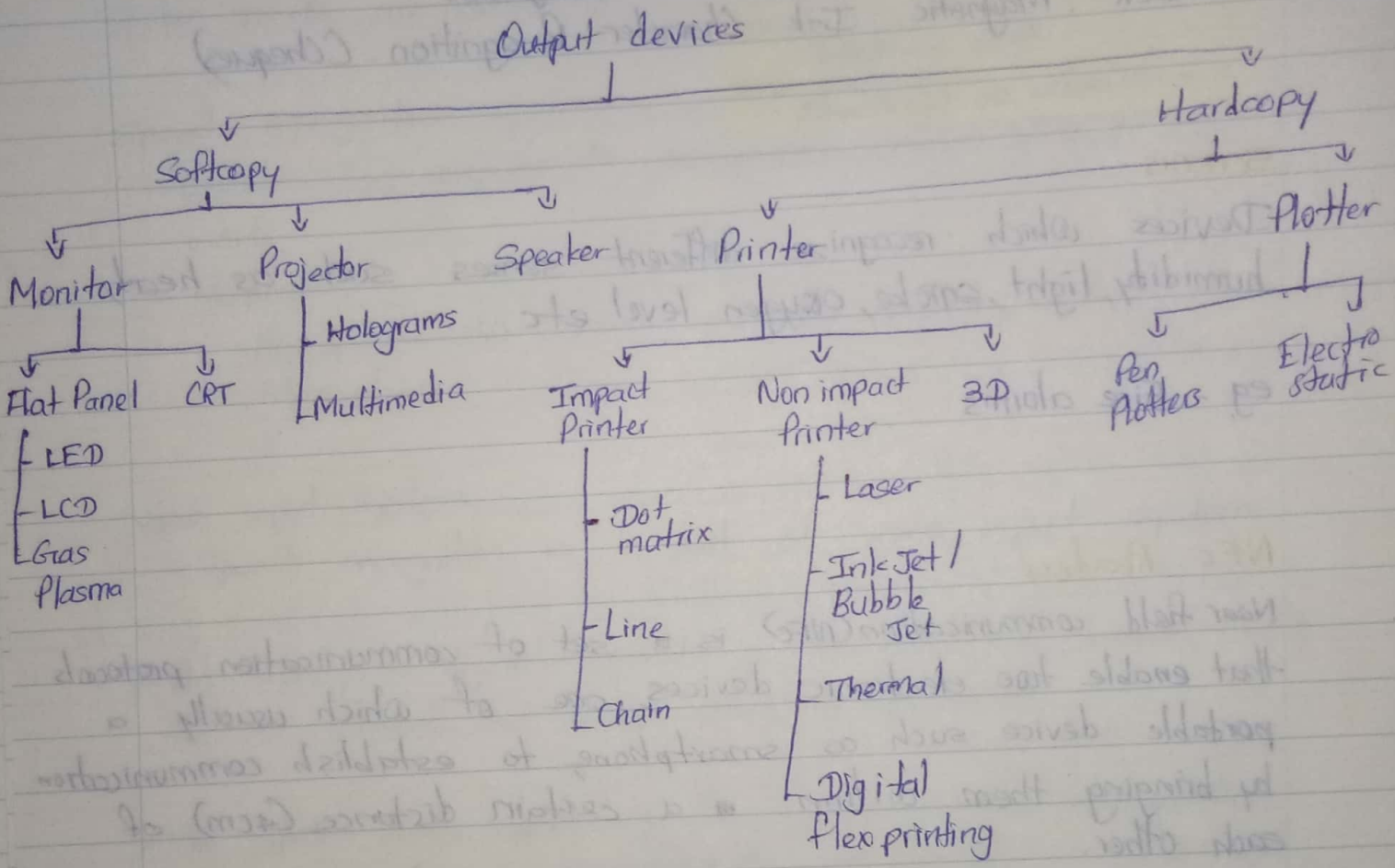
Near field communication (NFC) is a set of communication protocols that enable two electronic devices, one of which usually a portable device such as smartphone, to establish communication by bringing them within a certain distance (4cm) of each other.

eg - Credit Card payments without swiping into the credit card machine, just bringing it closer to the nfc reader
- Samsung NFC enables to share contacts, websites & images
- Touch card.

The data transfer can happen
- between 2 android powered devices or
- between an NFC tag and an android powered device.

Output devices

Output devices are devices which convey the output of the computer in a user understandable way.



Display devices

Monitor - Display device for a desktop PC

Display screen - Screen built into variety of devices
eg - Notebook & other portable computers
Mobile phones & mobile devices
Handheld gaming devices
E book readers, Digital photo frames
Digital signage systems.

Display device can be,

i) Color or Monochrome display (single colour)

ii) CRT (Cathode Ray Tube) or Flat panel display

iii) In different sizes.

iv) In different screen resolutions.
eg - 800 x 600 , 1024 x 768

v) Wired or Wireless.

vi) 2D or 3D Displays

Flat panel Display technologies.

1) LCD - Liquid Crystal Display (More thinner)

2) LED - Light emitting diode display

3) Plasma displays. (thinner than CRT & brighter than LCD)

Projector

Data projector
- Display device that projects all computer output to a wall or projection screen.

Multimedia Project
- Can display the output to a wall or projection screen with sounds.

Hologram projector
- Gives a 3D visual of a certain product, logo, etc.

Pico Projector
- Images from mobile devices are projected into any surface.

Tiled projectors - Project a single seamless image using multiple projectors.

- Projectors can be wired or wireless.
- Can be freestanding units or permanently mounted onto the ceiling

Printer
Things considered when buying a printer
- Printing technology (impact or nonimpact)
- Colour or Black & White
- Personal or network printers
- Print resolution
- Print speed
- Connection options
- Multifunction capabilities

Impact Printers
Printing is done when the print head strikes the printing material.

- Noisy - Cheap
- Can make Carbon Copies
- Printing cost is low
- low quality - low speed

Types

i) Dot matrix printers - Printing happens line by line, character by character, Needs a ribbon
eg - Bill printing at shakthi (slow, noisy)

ii) Daisy wheel printers (Needs a metal or plastic wheel which contains the characters (letters, numbers) (faster than dot matrix)

iii) Line printers (line by line rather than character by character

Non impact printers
No print head required.

Laser Printer
Uses toner powder & technology similar to photocopier to produce images on paper

Can print one entire page at a time.

faster & better quality than ink jet

Uses toner cartridges. (Toner should be refilled)

Ink Jet printers
Sprays droplets of ink to produce images on paper.

Uses ink as cartridges

Slow, lower quality than laser printers

Potential applications for the future.
- Dispensing liquid metal, aromas, computer chips & other circuitry, 'Printing' human tissues

Thermal printer
A special chemical layered papers are used.

The chemil layer is burnt through heat & characters are printed.

The printouts are not durable eg - Bus tickets.

Other special purpose printers.
photo printers - To print digital photographs.

Barcode printers - Used to print barcoded labels

Portable printers - Used to print items (such as shelf labels) while on the go.

Integrated printers - Printer doesn't use ink & is integrated into the digital camera to print instant digital images.

Wide format printers - Used to print very large sized printouts

3D Printer - Used to print things like plastic parts or models in 3D.

Plotters
Used to print vector graphics.

Draws pictures on paper using a pen

Drum plotter - Wraps the paper around a drum with a pin feed attachment. When drum turns it will be plotted

Pen plotter - A pen moves over the paper to plot the figure.

No: 15

Date: __/__/____

Audio Output

Output in the form of voice or music

eg - Computer speakers
- Headphones & headsets.
- Earphones & earbuds.

HDMI - High definition Multimedia interface

MIDI - Musical instrument digital interface.