GRADE 9-WORKSHEET
CHAPTER-6 MEMORY AND DATA STORAGE

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MEMORY AND STORAGE DEVICES

Storage devices can be split up into three groups

Groups	TYPES OF MEMORY (STORAGE DEVICES)	STORAGE DEVICES
1	Primary	1. RAM (Random access memory) 2. ROM (Read only memory)
2	Secondary	1. Hard disk drive(HDD) ✓ Fixed hard drive 2. Solid state drive(SSD) ✓ USB memory stick, Flash drive, smart card
3	OFF-LINE (removable from a computer/device)	1. DVD, CD, DVD –RAM, Blue ray disk (Optical storage devices) 2. USB memory stick, Flash drive, SD card (solid state storage devices) 3. Removable hard drive (magnetic storage device).

1. PRIMARY STORAGE DEVICES:- Primary memory is directly accessible by CPU . Compared to secondary storage it has limited storage capacity, but high speed of access during processing.

Uses: 1) RAM:- Stores data, software, files and operating system that are currently in use.
2) ROM:-Stores BIOS (start-up instructions) that cannot be altered.

2. SECONDARY STORAGE DEVICES:- Secondary storage is the memory where the information is stored permanently, till it is explicitly deleted. These devices are not directly accessed by the CPU and they are non-volatile storage devices.

Use: stores user files and programs that cannot be deleted when the computer is turned off.

3.OFF-LINE STORAGE DEVICES:- Any device which can hold data that is not permanently connected to a computer is called off line storage devices. These devices can be removed from the computer and carried wherever required. CDs, DVDs, pen drive, memory card are the examples off-line storage devices.

Use:-Stores data such as photos, music, video, files, software that can be transferred between computers.

Describe the differences between primary and secondary storage.

PRIMARY STORAGE	SECONDARY STORAGE
RAM and ROM are two primary storage devices	HDD and SSD are two secondary storage devices
Primary is directly accessible by CPU	Secondary is not directly accessible by CPU
Primary is internal part of the computer	Secondary can be internal or external to the computer
Primary device RAM holds current working data whilst being processed and ROM stores boot up instructions	Secondary stores files and software
Primary has faster access speed	Secondary has a slower access speed
Primary has both volatile and non-volatile	Secondary is non-volatile it keeps its content when the power is switched off.

Differences between RAM and ROM

RAM (Random access memory)	**ROM (**Read only memory)
1) RAM is also called read-write memory it can read from or written to any number of times.	1) ROM is non-volatile memory that cannot be written to but can be read from any number of times. Once data has been written onto a ROM, it cannot be removed.
2) RAM is used to store the data the user is currently working on.	2) ROM is used to store the BIOS / startup instructions of a computer. (A program used to start the computer is called the 'boot program' or BIOS. It must be present when computer is switched on.)
3) RAM is volatile/temporary memory. Volatile means the contents of RAM lost when the power is turned off.	3) ROM is non-volatile /permanent memory. Data are permanently stored even if power is switched off.
4) Memory size is often larger than ROMT. The size of the RAM is typically from 3GB. The size increases, run (executes) more programs at the same time.	4) The size of ROM is typically in between 1-2 MB. The size is small because this only needs to store boot program
RAM stores: Operating system, instructions, programs and files currently in use.	ROM stores: BIOS (bootstrap software) - which boots up the computer.

Storage methods of different storage devices

- Magnetic: Mechanical parts move over the disks surface to read and write data magnetically. Eg: hard disk
- Optical: Lasers read and write data using light. Eg: CDs, DVDs
- Solid State: Data is recorded onto solid memory chips without any moving parts. Eg: SSD, pen drive, SD card etc.

SECONDARY STORAGE DEVICES

Purpose of secondary storage devices:- RAM holds the current working data, but all the data erased from computer when it switched off. Secondary storage devices ensure that data is stored permanently and can be used later.

HDD and SSD are two types of secondary storage devices.

i. Hard Disk Drives (HDD)

- ✓ A hard disk drive (HDD) is magnetic storage device in which use circular platters coated with magnetic material.
- ✓ Each platter will have two surfaces which can be used to store the data.
- ✓ Data is stored in a digital format on the magnetic surface of the disks (platter).
- ✓ HDD is very slow data access compared to RAM.
- ✓ The operating system, softwares, and most other files are stored in the hard disk drive.

ii. Solid-state Drives (SSD)

The term solid state means 'no moving parts'. These devices are based on electronic circuits with no moving parts (no spinning disks or laser lights). Solid-state storage devices store data by controlling the movement of electrons within NAND chips. By applying precise voltages to transistors, a unique pattern of 0s and 1s is stored.

Its main benefits are:

- ✓ A solid state drive has no moving parts.
- ✓ A solid state drive has faster random access.
- ✓ A solid state drive is very small and is very light in weight.
- ✓ A solid state drive consumes very little power.
- ✓ A solid state drive has a quick start up/shut down time (reduced latency).
- ✓ A solid state drive does not generate a lot of heat

Benefits of using SSD rather than HDD:

- More reliable (no moving parts to wear out)
- Considerably lighter in weight (suitable for laptops)
- Generate very little heat (compared to traditional HDDs) so device does not require additional cooling methods
- Use less power than traditional HDDs as read/write operations do not require the system to run motors to drive HDD spindles, read heads, etc.

- Very thin since no mechanical moving parts
- Data access rate faster than HDD

OPTICAL STORAGE DEVICES

OFF-LINE STORAGE DEVICES:- Any device which can hold data that is not permanently connected to a computer is called off line storage devices.

- Types: DVD (R/RW/ROM/RAM) / CD (R/RW/ROM) / DVD RAM/Blu-ray discs
- Advantages: Cheap, very easily portable, takes up little space physically
- Disadvantages:
    - Less storage capacity compared to other types
    - Easily damaged / scratched, requires a CD reader
    - Slow write speeds
- Uses: Songs, videos and other multi-media storage, backup and archiving of data
- Capacity:
    - CD-ROM – up to 720Mb
    - DVD – up to 8.4Gb, both CDs and DVDs have spiral track
    - DVD RAM-has concentric track, read and write operation takes place at the same time.storage capacity of up to 9.4 gigabytes (GB) per double-sided disc,
    - Blu-Ray – up to 50Gb, uses blue laser light.