

ICT IGCSE Theory – Revision Presentation

3.1 Storage devices and media

- Identify storage devices, their associated media and their uses, e.g.
 - Magnetic backing storage media: fixed hard disks and drives, portable and removable hard disks, portable and removable hard drives, magnetic tape drives and magnetic tapes, memory cards
 - Optical backing storage media (CD/DVD/Blu-ray): CD ROM/DVD ROM, CD R/DVD R, CD RW/DVD RW, DVD RAM, Blu-ray discs
 - Solid state backing storage: solid state drives, flash drives (pen drive/memory stick/USB stick)
- Describe the advantages and disadvantages of the above devices

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What is Storage

- **Secondary Storage** devices ensures data is stored **permanently** so that it can be used again at a later date.
- **Storage medium** is the name given to the device that actually holds the data.
- Sometimes the **storage medium** is **fixed** i.e. magnetic coated disks build into hard drive.
- Sometimes the **storage medium** is **removable** from the device i.e. CD ROM that can be taken out of the drive.



Think about what we store:
Documents, Images, Video,
Music, Software, Games etc.

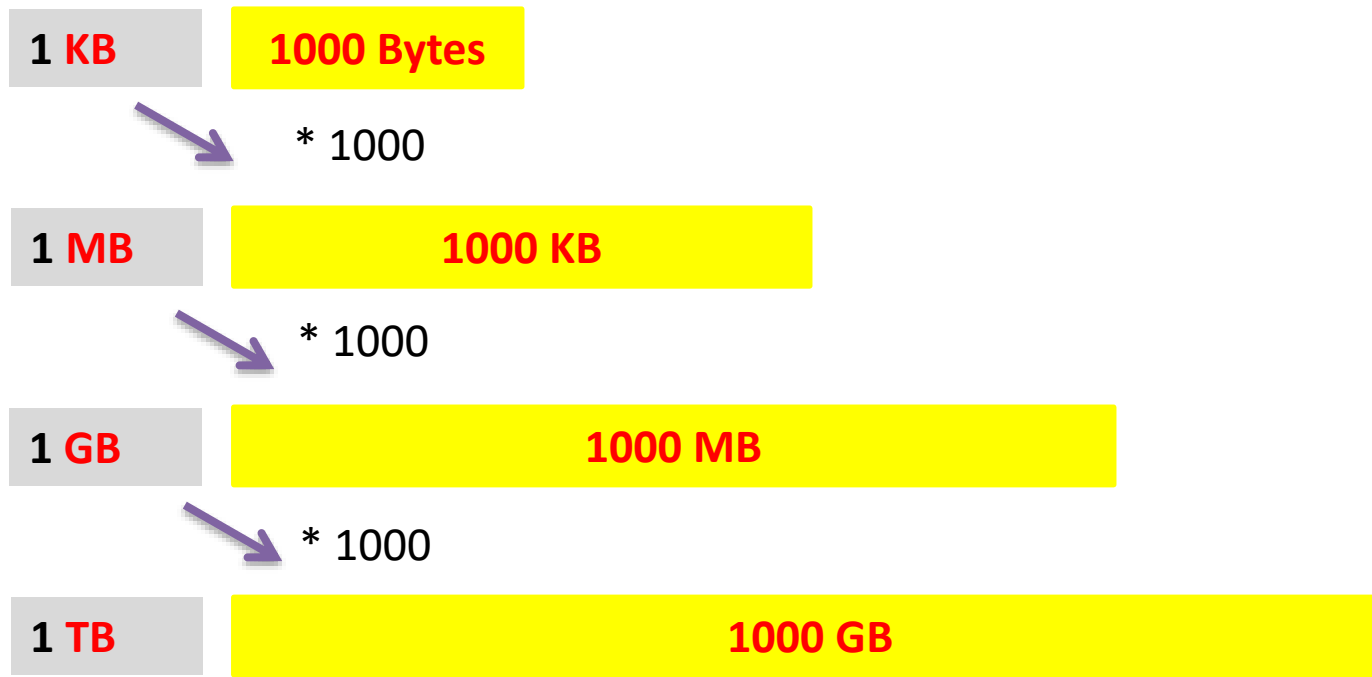


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File Sizes

Storage devices or files sizes are measured in:
Kilobytes (**KB**), Megabytes (**MB**), Gigabytes (**GB**) and Terabytes (**TB**)



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Data Storage Capacity



Floppy Disk
1.4MB



CD-ROM
700MB



DVD
4.7GB



Blu-Ray
25 GB – 128GB



Hard Drive
8 TB



Magnetic Tape
Up to 185 TB

Data storage devices have very different capacities. Over time the capacity has increased which has allowed for more data to be stored:

**Increase in
storage capacity**

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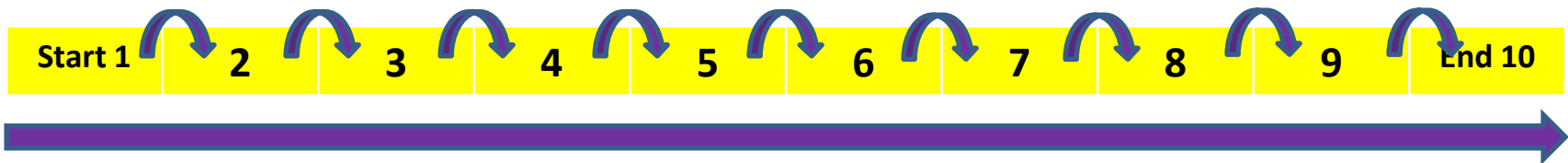
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Type of Access

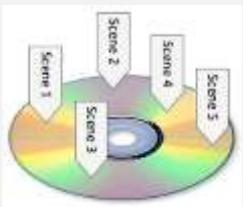
Serial (sequential Access)



- Files are stored **one by one** in a sequence
- Must search through the files one by one until you get to the one you want.
- Example: VHS tape, Cassette Tape, Magnetic Tape**



Direct (Random Access)



- Stores files so that they can **instantly** be accessed
- No need to search through files to get to the one you want
- Example: DVD, CD ROM, Blu-ray, external hard drive, flash drive**



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Main Memory Vs Backing Storage

Main Memory



- Sometimes known as **Internal Memory** or **primary memory**.
- Includes **RAM** and **ROM**
- Usually used to **store data temporarily** (in the case of RAM).
- Usually used to store data while it is **being processed by the CPU**.
- Is **volatile** – means data will be **lost** if computer is turned off.

Backing Storage



- **Backing storage** some known as **secondary storage**.
- Name for all other **storage devices** which are part of a computer like hard drive.
- Usually used to **store data over a long time**.
- Usually used to store application software, operating system software, files etc.
- Is **Non-volatile** - Means data will **not be lost** if computer is turned off.

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Magnetic Storage Devices

- Use:** Main backing storage device used by all computers to store:
- Operating Systems & System Files
 - Applications
 - Files (Documents, Images, videos, audio etc.)

Access Type: Direct (Random Access)

Advantages:	Disadvantages
<ul style="list-style-type: none"> • Less likely to break as fixed. • High storage capacities compared to external drives. • Fast data transfer rate. 	<ul style="list-style-type: none"> • More moving parts compared to solid state drives. • Incorrect shut down procedure could cause hard drive to malfunction.

Fixed Internal Hard Drive



- Magnetic storage media devices store data in the form of **tiny magnetised dots**.
- These dots are created, read and erased using magnetic fields created by very tiny electromagnets.

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Magnetic Storage Devices

- Use:** This device connects to the computer using the USB Port. External Hard drives are used to store:
- Personal backup data.
 - Transfer files between computers/devices

Access Type: Direct (Random Access)

Advantages:	Disadvantages
<ul style="list-style-type: none"> • Portable – transfer files between computers. • High Storage capacity compared to optical disks. 	<ul style="list-style-type: none"> • More prone to errors than fixed hard drive. • Could be damaged if incorrectly ejected from computer.

Portable Hard Drive



- Magnetic storage media devices store data in the form of **tiny magnetised dots**.
- These dots are created, read and erased using magnetic fields created by very tiny electromagnets.

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Magnetic Storage Devices

- Use:**
- Large organisations make daily backups of their networks on to Magnetic Tapes
 - Long-term archiving of data.



Access Type: Serial

Advantages:	Disadvantages
<ul style="list-style-type: none"> • Huge storage capacity compared to fixed and portable hard drives. • Stored away in a fire proof safe. • Robust – last for long time 	<ul style="list-style-type: none"> • Slower Access Tape reader has to start at the beginning of the tape and continue fast forwarding until it gets to the piece of data that needed.

Magnetic Tapes

- Magnetic storage media devices store data in the form of **tiny magnetised dots**.
- These dots are created, read and erased using magnetic fields created by very tiny electromagnets.

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Optical Media

- Use:** CD-ROM disks are read-only. CD-ROMs are normally used to store:
- Audio CDs
 - Software Applications
 - Device Drivers

Access Type: Direct

Advantages:	Disadvantages
<ul style="list-style-type: none"> • Hold more data than floppy disks. • Cheaper than hard drives and USBs. • Compatible with audio systems. 	<ul style="list-style-type: none"> • Data transfer rate is slower compared to other storage medium. • Not Robust - easily be damaged or scratched.

CD-ROM



- Optical storage devices save data as **patterns or dots**.
- Data is read by **bouncing the laser beam off the surface** off the medium.

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Optical Media

- Use:** DVD-ROMs disks are read-only. DVD-ROMs are normally used to store:
- DVD Movies
 - Software Applications
 - Computer Games

Access Type: Direct

Advantages:	Disadvantages
<ul style="list-style-type: none"> • Hold more data than CD-ROMS. <ul style="list-style-type: none"> • Can store larger applications. • Videos is higher resolutions. 	<ul style="list-style-type: none"> • Data transfer rate is slower compared to other storage medium. • Have to buy a separate DVD player.

DVD-Rom



- Optical storage devices save data as **patterns** or **dots**.
- Data is read by **bouncing the laser beam off the surface** off the medium.

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Optical Media

- Use:** Blu-Ray disks use a blue laser instead of the red laser used with CD/DVD ROMs. Blu-Ray disks are normally used to store:
- HD Movies
 - Large Software/Game Applications
 - In camcorders in cartridge form.

Access Type: Direct

Advantages:	Disadvantages
<ul style="list-style-type: none"> • Large storage capacity used to store HD video content. • Access Speeds are greater than other optical medium. • Secure Encryption System to minimise chance of copyright. 	<ul style="list-style-type: none"> • More expensive compared to other optical media. • Separate player required – more expensive. • Not all movie titles available on Blu-Ray.

Blu-Ray



- Optical storage devices save data as **patterns or dots**.
- Data is read by **bouncing the laser beam off the surface** of the medium.


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Optical Media

R – Write once only

RW – Can be written to or read many times.

	CD-R and DVD-R	CD-RW and DVD-RW	DVD RAM
Overview 	CD-R and DVD-R are only recordable once . Once the process has been finalised then the disks become Read Only . <ul style="list-style-type: none"> • Backup of data • Audio CDS 	CD-RW and DVD-RW allows for data to be written, erased and rewritten many times . <ul style="list-style-type: none"> • Used in CCTV • Record television programs 	DVD RAMS are used when data constantly needs to be re-written . DVD RAMS can hold up to 10GB of data and commonly used in recording equipment .
Advantages	<ul style="list-style-type: none"> • Cheaper than RW disks. 	<ul style="list-style-type: none"> • Can be reused many times. 	Long life, large capacity, and can be rewritten many times.
Disadvantages	<ul style="list-style-type: none"> • Not compatible with all players. • If disk has a burn error it can not be used again. 	<ul style="list-style-type: none"> • Can be expensive. • Data could be overwritten. 	Not compatible with all playback formats. Can be expensive.

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Describe the differences between DVD-R, DVD-RW, DVD RAM and DVD ROM?

Key Words: Read only, Recordable once, Re-writable, Constantly re-written, capacity, recording equipment.



Exam Question

DVD-R are only **recordable once**. Once the process has been finalised then the disks become **Read Only**. DVD-RW allows for data to be **written, erased and rewritten many times**. DVD-ROM are **Read Only** and typically contain software, movies and games. **DVD RAMs** are used when data **constantly needs to be re-written**. DVD RAMS can hold up to 10GB of data (**higher capacity**) and commonly used in **recording equipment**. DVD RAM will **typically last longer** than the DVD-R, DVD-RW and the DVD-ROM as it is **more durable**. However it will be more **expensive**.

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Compare and contrast the use of optical discs and the use of fixed magnetic disks to store data.



Exam Question

Optical discs such as CDs DVDs and Blu-ray discs are read from and written to using a laser beam. Magnetic disks are read from and written to using read/write heads. Both have direct access however more time would be taken to write to an optical disc compared to a magnetic disc due to slower access and transfer rates. Optical discs are more portable and cheaper to buy. However they are more prone to damage as they can easily be scratched or broken. Magnetic disks however have a higher capacity to store more information. Optical discs are used to store videos, music, software in contrasts magnetic disks store installed applications, system and user files.

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Solid 'state'

- Solid-state storage devices are based on electronic circuits with **no moving parts**.
- Solid-state storage devices store data using a special **type of memory called flash memory**.
- **USB/Memory Cards use Direct Access**



Examples	USB Memory Stick	Memory Card
Uses:	Used to transfer files/backup (work) between computers.	Used to store files on digital cameras, mobile phones and mp3 players.
Advantages	<ul style="list-style-type: none"> • Portable & Small • Robust • large capacities • No need for additional drivers/software 	<ul style="list-style-type: none"> • Very small and can be removed and placed in other devices. • Robust
Disadvantages	<ul style="list-style-type: none"> • Easy to loose • USB could be damaged if not ejected correctly. 	<ul style="list-style-type: none"> • Smaller storage capacities. • Quite expensive.

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Compare and contrast the use of a Fixed Hard drive, portable hard drive and a USB?



Exam Question

A fixed hard drive is the **primary storage device** found in a computer system. **Application and system software will be installed** on to the fixed hard disk. It is **less prone to damage** because it is fixed into the computer whereas the portable hard drive and the USB drive could be **damaged when ejecting**. In addition the fixed hard drive will have a **higher capacity** compared to the portable and USB storage. **Files can be easily transferred** between computers when using a portable hard drive and a USB drive. However the USB drive will be **more portable** than the portable hard drive. Both the portable and the USB drive is use to back up files however the portable hard drive will be used to **typically back up larger files**.

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Discuss why you use a USB to backup data compared to optical disks?

Key Words: larger capacity, more portable, more robust, accessibility to USB ports



Exam Question

A USB drive is more suitable to backup data compared to an optical disk because it tends to have a **higher storage capacity**. In addition it is **much quicker to copy files** to a USB Drive rather than burning files onto an optical disk. Furthermore the USB drive is **more portable** and **robust**. Finally not all computers **would have an optical disk drive** however many have **accessibility to USB ports**.

Discuss the advantages and disadvantages of solid state storage devices?

Key Words: portable, smaller, expensive, robust, capacity, lost, damage

Solid state devices do not have any moving parts and can be referred to as flash memory. A **USB drive or memory cards** are examples of solid state storage devices. They are **typically smaller** and very **portable**. They are quite **expensive** to buy and can **be easily lost or damaged** if not correctly ejected from the computer. The devices are available in different **capacity** and are **more robust** compared to optical disks.

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Backup

Backup means making one or more copies of your data in a **different storage medium**.

Why?

- You could delete a file by accident
- Your computer could break down
- Your computer could get infected by a virus which could edit data
- Your laptop is stolen or becomes damaged.
- Data could be corrupted by hackers.



- Most businesses use computers to store very important data (customer records, financial information, designs for products, etc.)
- If this data is lost, then this would cause disruption to the business. Backing-up business data is essential.

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How are Backups created

Personal Backups:

- Burning files to a **CD-R**
- Copying files to an **external hard-drive**
- Copying files to a **USB**
- Copying the files to **another computer** on a network



Business Backups:

- Making copies of data **very regularly (daily)**.
- Using large-capacity media such as **magnetic tape**
- Keeping **old copies** of backups, just in case.
- **Automating** the system so that nobody forgets to do it!
- Keeping backup media **off-site** (in case of fire or theft)



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Describe what is meant by backup?

Key Words: File, Copy, Storage medium



Exam Question

Backup means making **one or more copies** of **your data/file** in a **different storage medium**.

Discuss why you would have to make a backup?

Key Words: File, Delete, Corrupted, edited, stolen, encrypted, breakdown

The reason for making a backup is that you could **delete a file** by accident. Also the computer may **breakdown** which would mean you would lose all of your files. In addition if your computer is infected by a **virus** then the data could be **edited**, **corrupted** or **encrypted**. Furthermore your laptop could also be **stolen** or **damaged** which would result in losing your original files.