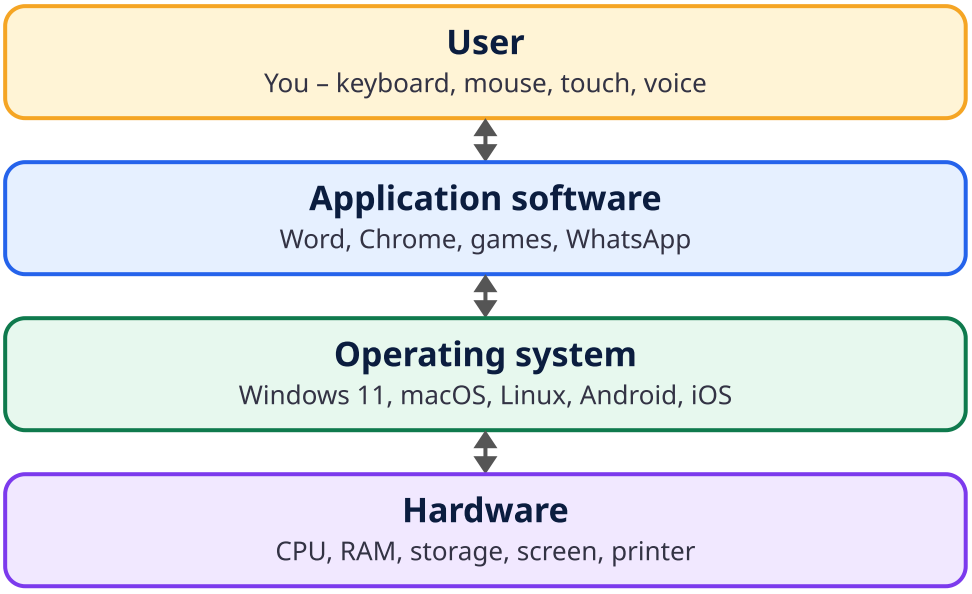
G.C.E. O/L Grade 10 ICT · Lesson 5

5.1 Operating Systems: Types, Functions and Utilities

When you switch on a computer or phone, the first big program that starts is the **operating system (OS)**. It is the manager of the computer: it lets you talk to the machine, runs your apps, and looks after the CPU, memory, files and devices. In this note you will learn what an OS is, how the way we talk to computers changed from **typing commands (CLI)** to **windows and icons (GUI)** and now **touch and voice**, the **types of operating systems**, the **main functions** of an OS, its **benefits**, and the **utility programs** for **partitioning, formatting and defragmentation**.

1. What is an operating system?

An **operating system** is **system software** that **manages the computer's hardware and software** and **provides an interface** between the **user** and the **hardware**. Without an OS, you could not open a file, run a game or print a page.



The OS sits between application software and the hardware.

💡 An OS is like the **principal of a school**: teachers (apps) and students (users) do the work, but the principal shares the classrooms (memory), the timetable (CPU time) and the equipment (devices) fairly.

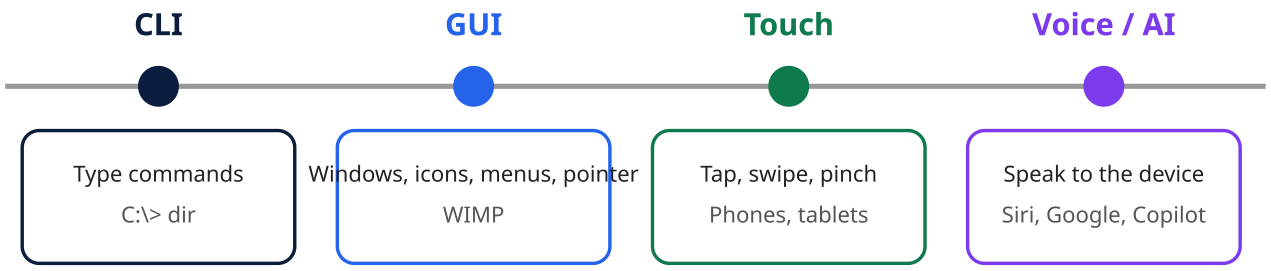
Device	Popular OS (2026)	Open source or proprietary?
Desktop / laptop	Windows 11, macOS, Linux (Ubuntu), ChromeOS	Windows, macOS = proprietary; Ubuntu = open source

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Smartphone / tablet	Android, iOS / iPadOS	Android = based on open-source Linux; iOS = proprietary
Servers	Linux, Windows Server	Most web servers use Linux
Smart watch / TV / car	watchOS, Wear OS, Android TV, Tizen	Small embedded / mobile OS

Open source OS: the source code is free to see, change and share (e.g. **Linux, Ubuntu**).
Proprietary OS: owned by a company, code is secret and you need a licence (e.g. **Windows, macOS, iOS**).

2. How the human–computer interface evolved



From typed commands to touch and voice.

Command Line Interface (CLI)
The user **types commands** with the keyboard, e.g. dir, copy, cd in **MS-DOS** (1980s). Fast for experts and uses little memory, but you must **remember commands**. Still used today: Windows Terminal / PowerShell, Linux Terminal.

Graphical User Interface (GUI)
Uses **Windows, Icons, Menus and a Pointer (WIMP)**. You click instead of typing. Easy for beginners. Examples: Windows 11, macOS, Ubuntu desktop. Needs more memory and processing power.

Touch interface
You **tap, swipe and pinch** on a touch screen. Used in **Android and iOS** phones, tablets, ATMs and self-service kiosks.

Voice / natural language
You **speak** to the device: “Hey Google, set an alarm for 6 a.m.” Voice assistants such as **Google Assistant/Gemini, Siri, Alexa** and **Copilot** in Windows 11 use AI to understand you.

Point	CLI	GUI
How you give orders	Type commands	Click icons and menus
Easy to learn?	No – must remember commands	Yes – see and click
Memory / CPU needed	Very little	More
Example	MS-DOS, Linux Terminal	Windows 11, macOS

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3. Types of operating systems

Single user
Only **one user** can use the computer at a time. Old **MS-DOS** was single user, single task. A phone is mostly used by one person.

Multi user
Many users can use one computer (often a server) **at the same time** or have **separate accounts**, each with own files and settings. Examples: **Linux, Unix, Windows Server**.

Multi tasking
Runs **many programs at once**: play music, download a file and type in Word together. The OS switches the CPU between tasks very fast. Examples: **Windows 11, macOS, Android**.

Real time
Must respond **immediately, within a fixed time**. Used where delay is dangerous: **air-bag systems, aircraft autopilot, ABS brakes, medical machines, factory robots, traffic lights**.

Distributed
Many **computers connected by a network work together** and look like **one system** to the user. The work is shared. Examples: **cloud services (Google, Microsoft Azure), bank networks**.

💡 Remember the five types with **S-M-M-R-D**: Single user, Multi user, Multi tasking, Real time, Distributed. One OS can be more than one type – Windows 11 is **multi user and multi tasking**.

4. Functions of an operating system

Provides a user interface
CLI, GUI, touch or voice, so the user can communicate with the computer.

Process (CPU) management
Decides **which program uses the CPU and for how long** (scheduling). Starts and stops processes. See it in **Task Manager** (Ctrl+Shift+Esc).

Memory management
Gives **RAM** to each program, keeps programs from using each other's memory, and frees memory when a program closes. Uses **virtual memory** on the disk when RAM is full.

File management
Creates, saves, opens, copies, moves, renames and deletes **files and folders**, and keeps track of where they are on the disk using a **file system** (NTFS, FAT32, exFAT).

Device (I/O) management
Controls input/output devices – keyboard, mouse, printer, USB drive – using small programs called **device drivers**. Plug and Play installs most drivers automatically.

Security management
User accounts and passwords / PIN / fingerprint / face unlock, file permissions, a **firewall**, built-in antivirus (**Windows Security / Microsoft Defender**) and **security updates**.

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NEW 2026 Keep your OS **updated**. Updates (Windows Update, macOS Software Update, Android/iOS system updates) bring **security patches** that close holes hackers and viruses use. An OS that no longer gets updates (e.g. **Windows 10 support ended in October 2025**) is unsafe on the internet.

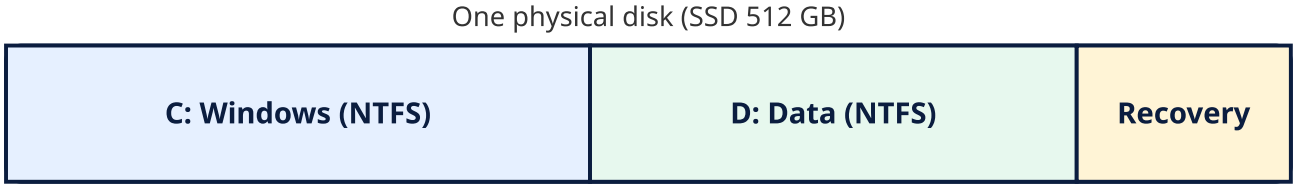
5. Benefits of an operating system

- **Easy to use** – a friendly interface; no need to know how hardware works.
- **Shares resources fairly** – CPU, memory and printers are shared between programs and users.
- **Runs many apps together** (multi tasking), saving time.
- **Organises files** in drives and folders so they are easy to find.
- **Protects data** with passwords, permissions, firewall and updates.
- **Detects errors** and shows messages, and lets the same app run on different hardware.

6. Utility software: partitioning, formatting, defragmentation

Utility programs are small system programs that help to **maintain, tune and protect** the computer. Most come with the OS. The syllabus asks for three disk utilities.

Partitioning – dividing one physical disk into **separate sections (partitions)**, each with its own **drive letter** (C:, D:). Example: C: for Windows and programs, D: for your data, so data is safe if Windows must be reinstalled. Tool: **Disk Management** in Windows.



One disk split into partitions C:, D: and a recovery partition.

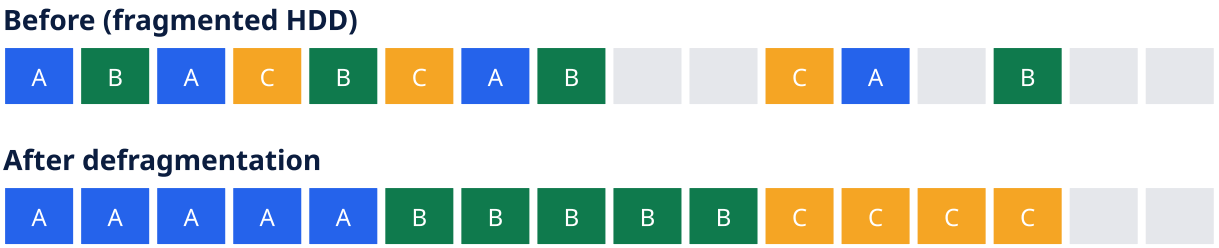
Formatting – preparing a disk or partition for use by creating a **file system** on it. ⚠ Formatting **erases everything** on that drive. **Quick format** only clears the file table; **full format** also checks for bad sectors.

File system	Used for	Note
NTFS	Windows system drive (C:)	Supports permissions, very large files
FAT32	Old / small USB drives, memory cards	Works almost everywhere, but **max file size 4 GB**
exFAT	Large USB drives, SD cards	Files bigger than 4 GB; works on Windows and macOS

Defragmentation – on a **hard disk (HDD)**, a file can be saved in many scattered pieces (**fragments**). The disk head must jump around, so the computer slows down. **Defragmenting** joins

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the pieces together so files open faster.



Defragmentation puts the pieces of each file next to each other.

NEW 2026 **Do not defragment an SSD.** SSDs have no moving parts, so fragments do not slow them, and defragmenting only wears them out. Windows 11's **"Defragment and Optimize Drives"** tool automatically **defragments HDDs** and sends **TRIM** to **optimise SSDs**. Other everyday utilities: **antivirus, Disk Cleanup / Storage Sense, backup (File History, OneDrive), file compression (.zip)**.

Key Words

Operating system (OS) – System software that manages hardware and software and provides a user interface.

CLI – Command Line Interface – the user types text commands (e.g. MS-DOS).

GUI – Graphical User Interface – windows, icons, menus and pointer (WIMP).

Multi tasking OS – An OS that runs several programs at the same time.

Multi user OS – An OS that lets many users use one computer at once or with separate accounts.

Real time OS – An OS that responds immediately within a fixed time (air bags, autopilot).

Distributed OS – Many networked computers working together as one system.

Device driver – A small program that lets the OS control a hardware device.

Partitioning – Dividing one physical disk into separate sections with drive letters.

Formatting – Preparing a disk by creating a file system; erases all data.

Defragmentation – Joining scattered pieces of files on an HDD to make it faster.

Security patch – An OS update that fixes a security weakness.

Sample Q&A

1. What is an operating system? Give two examples.

Answer: System software that manages the computer's hardware and software and provides an interface between the user and the hardware. Examples: Windows 11, Android (also macOS, Linux, iOS).

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2. Give two differences between a CLI and a GUI.

> **Answer:** CLI: type commands, must remember them, uses little memory. GUI: click icons and menus, easy to learn, needs more memory and CPU power.

3. Which type of OS is needed for an aircraft autopilot? Why?

> **Answer:** A real time OS, because it must respond immediately within a fixed time; a delay could cause an accident.

4. List four resource-management functions of an OS.

> **Answer:** Process (CPU) management, memory management, file management, device (I/O) management (and security management).

5. Why should you not defragment an SSD?

> **Answer:** An SSD has no moving parts, so fragmentation does not slow it down; defragmenting only causes extra writes that wear it out. Windows optimises SSDs with TRIM instead.

6. What happens when you format a USB drive? Which file system is best for a 64 GB pen drive used on Windows and Mac?

> **Answer:** A new file system is created and all data on it is erased. exFAT is best – it works on both and allows files bigger than 4 GB.

MCQ

1. What is an operating system?

A. System software that manages hardware and software
B. An application for typing letters
C. A type of computer virus
D. A hardware part inside the CPU

2. Which of these is an open-source operating system?

A. Windows 11
B. macOS
C. Ubuntu Linux
D. iOS

3. In which interface does the user type commands such as dir and copy?

A. GUI
B. Touch interface
C. CLI
D. Voice interface

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4. WIMP in a GUI stands for

A. Windows, Icons, Menus, Pointer
B. Wireless Internet Memory Program
C. Windows, Internet, Mouse, Printer
D. Words, Images, Music, Pictures

5. “Hey Siri, call Amma” is an example of which interface?

A. Command line interface
B. Voice (natural language) interface
C. Batch interface
D. Menu-only interface

6. Which OS type is best for a car air-bag system?

A. Multi user
B. Distributed
C. Single user
D. Real time

7. Listening to music while typing in Word and downloading a file shows a

A. single tasking OS
B. real time OS
C. multi tasking OS
D. distributed OS

8. Many networked computers working together so they look like one system is a

A. real time OS
B. distributed OS
C. single user OS
D. command line OS

9. Deciding which program uses the CPU next is called

A. process management
B. partitioning
C. file management
D. formatting

10. A small program that lets the OS control a printer is a

A. virus
B. partition
C. device driver
D. utility

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11. Which is a security function of the OS?

A. Joining file fragments
B. Giving RAM to programs
C. Showing icons on the desktop
D. User accounts with passwords

12. Dividing one hard disk into drives C: and D: is called

A. partitioning
B. defragmentation
C. formatting
D. compression

13. What does formatting a drive do?

A. Joins file fragments together
B. Creates a new file system and erases data
C. Removes only viruses
D. Makes the disk larger

14. Which file system cannot store a single 6 GB video file?

A. NTFS
B. exFAT
C. APFS
D. FAT32

15. What should Windows 11 do to keep an SSD fast?

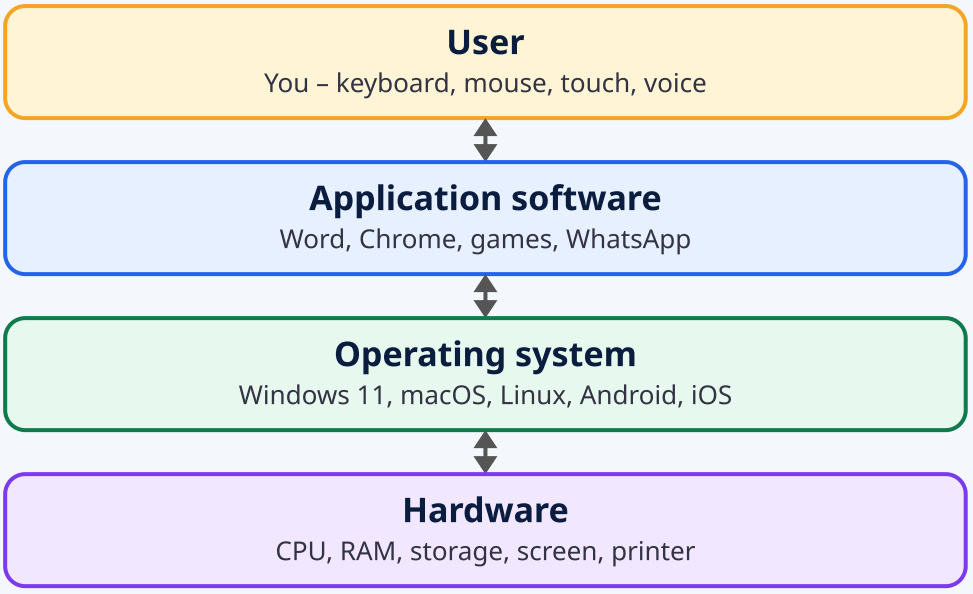
A. Format it every week
B. Optimise it with TRIM
C. Partition it into many drives
D. Defragment it every day

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Structured Questions

1. (i) Define an operating system. (2 marks)
(ii) Name one OS each for a laptop and a smartphone. (2 marks) *(4 marks)*

(i) System software that manages hardware and software and provides an interface between the user and the hardware. (ii) Laptop: Windows 11 / macOS / Ubuntu; smartphone: Android / iOS.



Model diagram: user → application → OS → hardware.

2. Put CLI, GUI, touch and voice in the order they became common, and give one example of each. *(4 marks)*

CLI (MS-DOS) → GUI (Windows 11 / macOS) → touch (Android / iOS phones) → voice (Siri, Google Assistant, Alexa, Copilot).

3. Name the OS type for each: (a) bank network spread across many cities working as one system (b) ABS brakes (c) a school server with 40 student accounts (d) a laptop running Zoom and Word together. *(4 marks)*

(a) Distributed (b) Real time (c) Multi user (d) Multi tasking.

4. Explain memory management and device management with one example each. *(4 marks)*

Memory management: the OS gives RAM to each open program and frees it when the program closes (e.g. closing Chrome frees RAM). Device management: the OS controls I/O devices using drivers (e.g. a printer driver lets you print from Word).

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5. A student's old HDD laptop is slow and has one big C: drive. (i) Which utility can speed up the HDD? (ii) Why would a D: partition help? (iii) Should the same utility be run on a new SSD? Explain. *(6 marks)*

(i) Defragmentation (Defragment and Optimize Drives). (ii) Data kept on D: stays safe if C: is formatted and Windows reinstalled; files are better organised. (iii) No – SSDs have no moving parts; defragmenting wears them. Windows uses TRIM to optimise SSDs.



Defragmentation joins scattered pieces on an HDD.

6. Give three benefits of an operating system and explain why installing OS updates is important. *(5 marks)*

Benefits: easy-to-use interface; shares CPU, memory and devices fairly; organises files; protects data; runs many apps together (any three). Updates contain security patches that fix weaknesses used by hackers and malware, plus bug fixes and new features.

Summary

- The OS is system software that manages hardware and software and gives a user interface.
- Layers: user → application software → OS → hardware.
- Interfaces evolved: CLI (MS-DOS) → GUI (WIMP) → touch → voice/AI assistants.
- OS types: single user, multi user, multi tasking, real time, distributed.
- Functions: user interface + process, memory, file, device and security management.
- Open source (Linux, Ubuntu) vs proprietary (Windows, macOS, iOS). Keep the OS updated for security patches.
- Partitioning splits a disk; formatting creates a file system (NTFS, FAT32, exFAT) and erases data.
- Defragment HDDs only; SSDs are optimised with TRIM.

MCQ answer key – 5.1

1. **A** – The OS is system software that manages the whole computer.
2. **C** – Ubuntu (Linux) code is free to see and change; the others are proprietary.
3. **C** – A Command Line Interface uses typed commands (MS-DOS).
4. **A** – WIMP = Windows, Icons, Menus, Pointer.
5. **B** – Speaking to the device is a voice interface.

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6. **D** – Air bags must open within milliseconds – real time.
7. **C** – Running several programs at the same time is multi tasking.
8. **B** – Distributed systems share work across many computers.
9. **A** – Process (CPU) management schedules programs on the CPU.
10. **C** – Device drivers connect the OS to hardware.
11. **D** – Passwords, permissions and firewalls protect data.
12. **A** – Partitioning creates separate sections with drive letters.
13. **B** – Formatting prepares the disk with a file system and erases it.
14. **D** – FAT32 has a 4 GB maximum file size.
15. **B** – SSDs are optimised with TRIM; defragmenting wears them out.

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