Operating systems

3.2.1 · Computers · revision notes

The operating system (OS) is the software that manages a computer's hardware and software and lets application programs run. The specification lists four functions: file management, process management, peripheral management and user management. Paper 1 asks you to state and describe these functions, often in a context such as a school network or a smartphone.

Key facts

- OS: manages hardware and software; a platform for applications; provides the user interface
- File management: folders (hierarchy), naming, saving, finding, access rights
- Peripheral management: device drivers, print queues, handling input and output
- Device driver: software that translates OS commands for one specific device
- Four functions: file, process, peripheral and user management
- Process management: scheduling time slices, multitasking, priorities, allocating memory
- User management: accounts, authentication, access rights, profiles
- Multitasking: switching quickly between processes so they seem to run at once

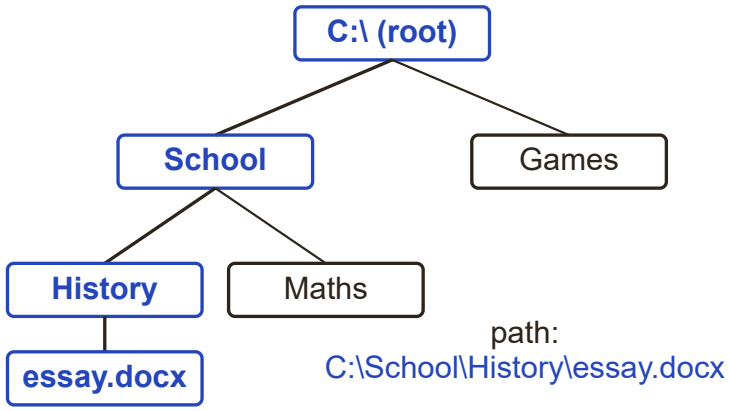
Notes

What an operating system is for

- The **operating system** manages the computer's hardware (processor, memory, storage and devices) and software.
- It provides a **platform** for application software to run on, and a **user interface** so that people can use the computer.
- Examples: Windows, macOS, Linux, Android and iOS.

File management

- Organises files into a **hierarchy** of folders (directories), starting from a root folder.
- Lets users and programs create, name, save, open, copy, move, rename and delete files.
- Keeps track of where each file is stored on secondary storage. Each file has a unique **path**, e.g. C:\School\History\essay.docx.

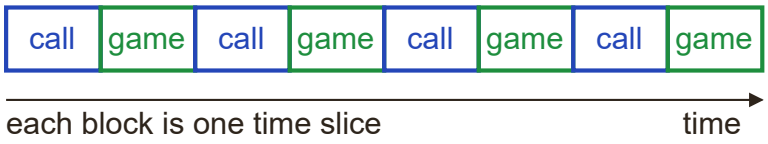


Files are organised in a hierarchy of folders. The path lists the folders from the root down to the file

- Sets **access rights** (permissions), such as read-only, and stops two people editing the same file at once.

Process management

- A **process** is a program that is running.
- A processor can only run one process at any moment. The OS **schedules** processes, giving each a short **time slice** in turn and switching so fast that they seem to run at the same time. This is **multitasking**.



One processor, two processes: the OS switches between them so fast that both seem to run at once

- Important processes can be given a higher **priority**, so they get the processor first or more often.
- The OS gives each process its own area of main memory, stops processes interfering with each other, and frees the memory when a process ends.

Peripheral management

- Peripherals are devices connected to the computer, such as keyboards, printers, webcams and external drives.
- The OS uses a **device driver** for each one: software that translates the OS's general commands into commands that the particular device understands.



The driver is the translator between the OS and one particular device

- It manages input and output, e.g. queuing print jobs so you can carry on working, and reporting problems such as a paper jam.

User management

- Each person has a **user account**, and logs in with a username and password, PIN or fingerprint (**authentication**).
- **Access rights** control which files, programs and settings each user can use.
- Each user has their own profile, settings and storage area. An administrator can create and delete accounts and reset passwords.
- The OS can record who logged in and when.

How to answer each type of question

Identify the function of an operating system 1 mark **Grade 3**

1. Look for the clue in the question: a device → peripheral; passwords or log-ins → user; running programs → process; folders or saving → file.
2. Tick or give exactly one answer.

Example. Identify the function of an operating system that makes sure a newly connected webcam can be used by the computer. (1)
A File management
B Peripheral management
C Process management
D User management

Model answer. B Peripheral management (1)

Describe a function in a context

2 to 4 marks | Grade 5

1. Name the function you are describing.
2. Give one separate point per mark: what the OS does and why.
3. Use the people and devices in the scenario.

Example. A family shares one laptop.
Describe how the operating system's user management could be used on this laptop. (3)

Model answer. Any three from: each family member has their own user account (1); protected by a password or PIN, so only that person can log in to it (1); access rights stop some users, e.g. the children, from installing software or changing settings (1); each account keeps its own files and settings separate from the others (1); a parent can be the administrator who creates accounts and resets passwords (1).

Explain the need for a device driver

2 marks | Grade 5

1. Say that different devices (even different models) understand different commands.
2. Say that the driver translates the OS's general instructions into commands for that particular device.

Example. Explain why an operating system needs a device driver before it can use a new printer. (2)

Model answer. Each model of printer understands its own set of commands (1). The driver translates the operating system's general print instructions into the commands this particular printer understands (1).

Explain how multitasking works

3 to 4 marks | Grade 6

1. Say that the processor can only run one process at any moment.
2. Describe time slices given to each process in turn.
3. Say that switching is so fast that the programs appear to run at the same time.
4. If there is a context, mention priority for the process that must not be delayed.

Example. Sam's computer has one processor. Sam is on a video call while a game downloads an update in the background.
Explain how the operating system allows both programs to run at the same time. (3)

Model answer. Any three from: each running program is a process managed by the operating system (1); the processor can only run one process at any moment, so the OS gives each process a short time slice in turn (1); it switches between them so quickly that they appear to run at the same time (1); it can give the video call a higher priority so that the picture and sound do not freeze (1).

Don’t lose marks

- Writing 'the OS controls the computer' with no detail. Say which function and what it actually does.
- Saying that programs run at exactly the same time on one processor. The OS switches between them very quickly.
- Saying that a device driver is a piece of hardware. It is software.
- Listing utility software, such as backup or defragmentation, when asked for the four operating system functions.
- Giving permissions without saying who they apply to, e.g. 'students have read-only access to the Staff folder'.

More tips

Memory tricks

- Four functions: **F**iles, **P**rocesses, **P**eripherals, **U**sers. 'Fish Prefer Ponds Usually.'
- One keyword each: files → folders; processes → time slices; peripherals → drivers; users → accounts.
- Clues in the question: printer, keyboard or webcam → peripheral management; password or log-in → user management; several programs at once → process management; folders or saving → file management.

Exam technique

- Name the function first, then describe what it does, e.g. 'Peripheral management: the OS uses a driver to…'.
- Use the scenario's details: the school network, the phone, the shared printer.
- A 3-mark 'Describe' needs three separate points. An example only earns a mark if it adds something new.
- Learn at least two tasks for each of the four functions.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **State the purpose of an operating system**
It manages the hardware and software, and provides a platform for applications and an interface for the user.

Grade 3 — **Name the four functions of an operating system**
File management, process management, peripheral management and user management.

Grade 4 — **Describe what file management does**
It organises files in folders, lets them be saved, named, moved and deleted, and controls who can access them.

Grade 5 — **Explain the role of a device driver**
It translates the operating system's general commands into commands that one particular device understands.

Grade 5 — **Describe how user management protects a computer**
Accounts, passwords and access rights control who can log in and what each user is allowed to do.

Grade 6 — **Explain how multitasking works on one processor**
The OS gives each process a short time slice in turn, switching so fast that they seem to run at the same time.

Grade 7

Apply the four functions to a scenario

Work out which function each part of a scenario needs, and describe it using the scenario's details.

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