MODULE H · OCR J277 1.5.1, 1.5.2 (+ 1.2.1) · CAMBRIDGE 0478 4.1 (+ 3.3.4)

Software

System and application software, **the operating system**, **memory and multitasking**, **peripherals and drivers**, **users and files**, **interrupts**, **firmware** and **utilities**. **OCR J277: you need cards 02-05 and 08. Cambridge 0478: you need cards 01-07**, without the GCSE-only rows. Spec versions as checked in November 2026.

01 System vs application (H1) IGCSE only

System Provides the services the computer requires. Includes the operating system and utility software.

Application Provides the services the user requires: lets the user carry out a task.

Examples System: OS, defragmenter, compression, encryption, anti-malware, backup. Application: word processor, spreadsheet, web browser, photo editor, game.

Decide By what the program does, not who opens it. Give the reason.

02 What an OS does (H2) · both boards

OS System software that manages the hardware, software and resources; lets applications run.

Functions User interface; memory management; multitasking; peripherals and drivers; user management; file management.

GCSE only J277 lists five: memory management and multitasking count as one.

IGCSE only 0478 lists nine: adds handling interrupts, providing a platform for running applications, providing system security.

03 Memory and multitasking (H3) · both boards

Memory Loads programs from secondary storage into RAM; allocates each its own area; keeps them separate; tracks free memory; frees it on close.

Multitasking More than one program running at once. The OS shares processor time and switches very quickly, so they appear simultaneous.

Virtual memory RAM full: part of secondary storage used as extra memory. Data not in use moved out, moved back when needed. Slower than RAM.

Example 8 GB RAM, 5 GB in use: 3 GB free. A 4 GB program needs 1 GB moved to virtual memory.

GCSE only Paging and segmentation not required.

IGCSE only Pages of data move between RAM and virtual memory; the OS creates it from secondary storage. Units in GiB.

04 Peripherals, drivers, UI (H4) · both boards

Peripheral Input, output or storage device. Data transfer between devices and the processor must be managed (e.g. print queue).

Driver Software that lets the OS communicate with one specific device; translates the OS's instructions into the device's commands.

New / updated New hardware needs the correct driver. Updates fix bugs, add features, keep it compatible with a new OS.

Interface Takes input, gives output and feedback (e.g. error messages); hides the hardware. GUI: windows, icons, menus, pointer.

IGCSE only "Providing an interface" and "managing peripherals and drivers". Peripherals send interrupts (card 06).

05 Users and files (H5) · both boards

Accounts Each user gets an account with a username and password. An administrator creates accounts and sets access rights.

Access rights Which files, folders and programs each user or group can open, edit or run: read and write, read-only, no access.

Security Logins; lock the account after several wrong passwords; users' files kept private.

Files Naming, allocating to folders, moving, copying, saving, deleting; tracks where each file is stored. Move removes the original; copy keeps it.

IGCSE only "Managing user accounts" and "providing system security" are separate functions; e.g. built-in firewall, security updates.

06 Interrupts (H6) IGCSE only

Interrupt A signal to the processor that something needs its attention.

Examples Hardware: key pressed, mouse moved. Software: division by zero, two processes using the same memory location.

Handling Given a priority and queued. Checked at the end of each FDE cycle. Higher priority: task paused, register values saved.

ISR Interrupt service routine: the code that handles that interrupt. Then registers restored; task resumes where it stopped.

Result Key press: character on screen. Division by zero: error message.

07 Firmware and bootloader (H7) IGCSE only

Firmware Software stored permanently in non-volatile memory (ROM) that controls the hardware.

Bootloader Firmware. Runs on the hardware at switch-on and loads the OS into RAM. In ROM because RAM is empty at start-up.

Layers Applications run on the OS; the OS runs on the firmware; the bootloader runs on the hardware.

So Hardware, firmware and an OS are all needed to run applications. Any layer missing: the application cannot run.

08 Utility software (H8) GCSE only

Utility System software for housekeeping. Often comes with the computer; does tasks the OS may not.

Defrag Puts each file's parts together and groups free space: fewer head movements, faster reads. Not smaller. Not for SSDs.

Compression Smaller files: less storage, faster transfer. 40 MB to 28 MB at 8 Mbps: 40 s to 28 s.

Encryption Scrambles data with a key: intercepted data cannot be understood without the key. Does not stop interception.

01
Never just say "the OS manages memory". Say **how**: load into RAM, allocate, keep separate, free on close.

02
One core runs **one program at a time**: multitasking only **appears** simultaneous.

03
A driver is **software** for **one specific device**, not hardware or a cable.

04
Defrag does **not** shrink files; compression does. Encryption does **not** stop interception.