

Past-paper walk-through

Data storage ■ 3.3

eXercise

Questions in this set

- 0478/11 J25 Q7 ■ 11 marks
- 0478/11 J24 Q5 ■ 11 marks
- 0478/12 J24 Q9 ■ 8 marks
- 0478/13 J24 Q4 ■ 6 marks
- 0478/13 J24 Q5 ■ 2 marks
- 0478/11 N23 Q8 ■ 8 marks
- 0478/12 N23 Q13 ■ 7 marks
- 0478/11 J23 Q3 ■ 4 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 7

0478/11 J25 ■ Q7 ■ 11 marks

A student's computer has primary storage. One example of primary storage is random access memory (RAM).

(a) Identify **one** other example of primary storage. [1]

(b) Explain why RAM is an example of primary storage and **not** secondary storage. [3]

(c) The student is editing a large video file for a project and during this process the RAM becomes full. This makes the computer crash.

Describe how virtual memory could be used in this process to stop the computer crashing. [3]

(d)(i) Give **two** features of solid-state (flash memory) storage.

1. 2. [2]

(d)(ii) Give **two** examples of solid-state (flash memory) storage.

1. 2. [2]

Solution 7

(a)

Mark scheme

- Any one from:
 - Read only memory // ROM
 - Cache

Solution 7

(b)

Mark scheme

- Any three from:
 - ■ RAM is directly accessed by the CPU.
 - ■ ... whereas secondary storage is not directly accessed by the CPU.
 - ■ All secondary storage is non-volatile storage.
 - ■ ... whereas RAM is volatile storage.

Solution 7

(c)

Mark scheme

- Any three from:
 - Virtual memory can act as an extension to the RAM .
 - The secondary storage device is partitioned to create the virtual memory.
 - Pages can be transferred from the RAM to the virtual memory ...
 - ... to stop the RAM getting full // ... when the RAM is full.

Solution 7

(d)(i) Mark scheme

- Any two from:
 - It has no moving parts.
 - It uses semiconductor chips.
 - It uses NAND/NOR/Flip-flops technology.
 - It uses cells and transistors (that are laid out in a grid).
 - It uses control gates and floating gates.
 - Stores data as electrical charges.

Solution 7

(d)(ii)

Mark scheme

- Any two from:
 - Solid-state drive // SSD
 - USB flash memory drive
 - SD card

Question 5

0478/11 J24 ■ Q5 ■ 11 marks

A computer uses both random access memory (RAM) and secondary storage.

(a) State the purpose of secondary storage.

[1]

Question 5

0478/11 J24 ■ Q5 ■ 11 marks

A computer uses both random access memory (RAM) and secondary storage.

(b) One type of secondary storage is optical.

Circle **three** examples of optical storage.

- read only memory (ROM)
- secure digital (SD) card
- compact disk (CD)
- hard disk drive (HDD)
- digital versatile disk (DVD)
- Blu-ray disk
- universal serial bus (USB) drive
- solid-state drive (SSD)

Question 5

0478/11 J24 ■ Q5 ■ 11 marks

A computer uses both random access memory (RAM) and secondary storage.

(c) Explain why a computer needs RAM.

[3]

Question 5

0478/11 J24 ■ Q5 ■ 11 marks

A computer uses both random access memory (RAM) and secondary storage.

(d) The computer processes instructions using the fetch–decode–execute (FDE) cycle. Draw and annotate a diagram to show the process of the fetch stage of the FDE cycle.

[4]

Solution 5

(a)

Mark scheme

- To store data/files/software permanently

Solution 5

(b)

Mark scheme

- Compact disk (CD)
- Digital versatile disk (DVD)
- Blu-ray disk

Solution 5

(c) Mark scheme

- Any three from:
 - ■
 - To store data temporarily
 - ■
 - To store data currently in use
 - ■
 - To store software currently in use
 - ■

Solution 5

- Data can be accessed faster (than secondary storage)
- ■
- To speed up the fetch stage (of the fetch-execute cycle)

Solution 5

(d) Worked steps

Draw the registers as labelled boxes — **PC**, **MAR**, **MDR**, **CIR**, **ACC** — with the **address bus** and **data bus** between them and **memory**, and annotate each transfer. Any four of:

- The **PC holds the address** of the next instruction.
- That address is **copied to the MAR**, and sent along the **address bus** to memory.
- The instruction at that address is **fetched into the MDR** along the **data bus**.
- The instruction is **copied from the MDR to the CIR**.
- The **PC is incremented** to point at the next instruction.
- The instruction in the CIR is **decoded** and then **executed**.

Solution 5

Name the registers by their abbreviations and show **which way each transfer goes** — the mark is for the step, so an arrow between two correctly named boxes with no label scores nothing.

The step most often missed is **incrementing the PC**, and it is worth remembering *when* it happens: after the address has been used to fetch, and before the instruction is executed — because an executed jump instruction may overwrite the PC, and it must overwrite the already-incremented value.

Keep the two buses distinct: the **address bus is one-way** from the processor to memory, the **data bus is two-way**. Drawing both as plain lines loses the distinction the diagram exists to show. [Mark scheme](#)

- Any four from:

Solution 5

- The diagram shows:
 - ■
- The registers MAR, MDR and PC
 - ■
- Address sent from PC to MAR
 - ■
- ...using address bus (award anywhere for correct use of address bus)
 - ■
- ...PC is incremented
 - ■

Solution 5

- Address sent from MAR to RAM
- ■
- Data/instruction sent from RAM to MDR
- ■
- ...using data bus (award anywhere for correct use of data bus)
- ■
- Data/instruction sent from MDR to CIR/CU
- ■
- Control unit sending control signal for any part of the process
- ■

Solution 5

- ... using control bus (award anywhere for correct use of control bus)
- Example:
 - 4
 - PC
 - MDR
 - MAR
 - Control unit
 - CIR
 - RAM
 - PC sends address to

Solution 5

- MAR then increments
- The address is sent from the MAR using the address bus
- The instruction is sent to the MDR using the data bus
- The instruction is sent to the CIR to be decoded

Question 9

0478/12 J24 ■ Q9 ■ 8 marks

A company uses both solid-state and optical secondary storage.

(a) Explain why a computer needs secondary storage. [2]

(b) Describe **three** differences between solid-state and optical storage.

1. 2. 3. [6]

Solution 9

(a) Mark scheme

- Any two from:
 - ■
 - To store data/files permanently
 - ■
 - ... otherwise, data/programs would need to be downloaded/entered/installed every time the computer was used
 - ■
 - To allow software to be installed on the computer

Solution 9

- ■
- For the creation of virtual memory

Solution 9

(b) Mark scheme

■ Any six from (Max 3 for one type only):

■ ■

■ Solid-state has no moving parts

■ ■

■ ... optical does have moving parts

■ ■

■ Solid-state is faster to access data

■ ■

Solution 9

- ... optical is slower to access data
- ■
- Solid-state uses less power to operate
- ■
- ... optical uses more power to operate
- ■
- Solid-state runs quietly
- ■
- ... optical makes more noise
- ■

Solution 9

- Solid state is more durable/robust
- ■
- ... optical is less durable/robust
- ■
- Solid state storage has a large storage capacity
- ■
- ... optical has a much smaller limit to its storage capacity
- ■
- Solid-state is more expensive per GB of data
- ■

Solution 9

- ... optical is cheaper per GB of data
- ■
- Solid-state stores data onto silicon chips/transistors using logic (floating/control/NAND/NOR) gates to control the movement of electrons
- ■
- ... optical stores data by using lasers to burning pits and lands onto a disk

Question 4

0478/13 J24 ■ Q4 ■ 6 marks

The table contains statements about types of secondary storage.

Complete the table by writing the correct type of secondary storage for each statement.

type of secondary storage	statement
	Pits and lands are created on a reflective surface.
	NAND or NOR technology is used.
	Platters are spun that are divided into tracks and sectors.
	Electromagnets are used to read and write data.
	Transistors are used as control gates and floating gates.
	A red or blue laser is used to read and write data.

Question 4

[6]

Question 4

type of secondary storage	statement
.....	Pits and lands are created on a reflective surface.
.....	NAND or NOR technology is used.
.....	Platters are spun that are divided into tracks and sectors.
.....	Electromagnets are used to read and write data.
.....	Transistors are used as control gates and floating gates.
.....	A red or blue laser is used to read and write data.

Solution 4

- One mark for each correct type of storage.
- type of secondary storage statement optical
- Pits and lands are created on a reflective surface.
- solid-state
- NAND or NOR technology is used.
- magnetic
- Platters are spun that are divided into tracks and sectors.
- magnetic

Solution 4

- Electromagnets are used to read and write data.
- solid-state
- Transistors are used as control gates and floating gates.
- optical
- A red or blue laser is used to read and write data.

Question 5

0478/13 J24 ■ Q5 ■ 2 marks

A computer uses both random access memory (RAM) and read only memory (ROM).

(a) Tick (✓) **one** box to show which statement is correct about RAM. [1]

A It is non-volatile storage.

B It stores the bootloader.

C It stores data that is currently in use.

D It is `\textbf{not}` directly accessible by the central processing unit (CPU).

(b) ROM is a type of primary storage.

State the characteristic of ROM that makes it a type of primary storage. [1]

Solution 5

- A** It is non-volatile storage.
- B** It stores the bootloader.
- C** It stores data that is currently in use. 
- D** It is `\textbf{not}` directly accessible by the central processing unit (CPU).

Answer: **C**

Question 8

0478/11 N23 ■ Q8 ■ 8 marks

- 8 Storage can be described as being magnetic, solid-state or optical.
- (a) Give **two** features of magnetic storage.

Question 8

[2]

(b) Give **three** features of solid-state storage.

Question 8

[3]

(c) Give **one** example of each type of storage.

Question 8

[3]

Solution 8

(a) Mark scheme

- Any two from:
 - —
 - Data is stored on platters
 - —
 - (Platters) are divided into tracks and sectors
 - —
 - Has components that are spun
 - —

Solution 8

- Data is read/written using a read/write arm
- —
- Data is read/written using electromagnets
- —
- Magnetic field determines the binary value
- —
- It is non-volatile
- 2

Solution 8

(b) Mark scheme

- Any three from:
- —
- Flashes data onto chips
- —
- Uses transistors
- —
- Uses NAND/NOR technology
- —

Solution 8

- Uses control gates
 - —
- Uses flow gates
 - —
- Controls the flow of electrons
 - —
- It can be volatile or non-volatile
- 3

Solution 8

(c) Mark scheme

- One mark for an example in each storage type e.g.:
- Magnetic
- —
- HDD
- —
- Magnetic tape
- —
- Floppy disk

Solution 8

- —
- Magnetic strip
- Solid state
- —
- SSD
- —
- USB drive
- —
- SD card
- —

Solution 8

- RAM
- Optical
- —
- CD
- —
- DVD
- —
- Blu-ray
- 3
- 0478/11

Solution 8

- October/November 2023

Question 13

0478/12 N23 ■ Q13 ■ 7 marks

13 Storage and memory are important components of a computer system.

(a) Primary storage is one type of storage in a computer system.

(i) Tick (✓) **one** box to show which is an example of primary storage.

A compact disk (CD)

☐

B hard disk drive (HDD)

☐

C random access memory (RAM)

☐

D solid-state drive (SSD)

☐

[1]

Question 13

(ii) Give **one** characteristic of primary storage.

Question 13

(b) Virtual memory can be created in a computer system.

Complete the description about virtual memory.

Use the terms from the list.

Some of the terms in the list will **not** be used. Some terms may be used more than once.

binary

hard disk drive (HDD)

hexadecimal

operating system

pages

random access memory (RAM)

read only memory (ROM)

Question 13

sectors

software

tracks

virtual memory

Question 13

[5]

Solution 13

(a)(i)

Mark scheme

- —
- C
- 1

Solution 13

(a)(ii)

Mark scheme

- Any one from:
 - —
 - Directly accessed by the CPU
 - —
 - Has both volatile and non-volatile storage
 - 1

Solution 13

(b) Mark scheme

- One mark for each correct term in the correct order:
- —
- Random access memory (RAM)
- —
- Hard disk drive (HDD)
- —
- Pages
- —

Solution 13

- Random access memory (RAM)
- —
- Virtual memory // Hard disk drive (HDD)
- 5

Question 3

0478/11 J23 ■ Q3 ■ 4 marks

3 Secondary storage devices are used to store data in a computer.

(a) Circle **three** components that are secondary storage devices.

central processing unit (CPU)

compact disk (CD)

hard disk drive (HDD)

random access memory (RAM)

read only memory (ROM)

register

sensor

solid-state drive (SSD)

[3]

Question 3

(b) Tick (✓) **one** box to show which statement about secondary storage is correct.

A It is directly accessed by the CPU.

☐

B It is magnetic storage only.

☐

C It is used to permanently store software and data files.

☐

D It is volatile.

☐

[1]

Solution 3

(a) Mark scheme

- One mark for each correctly circled storage device:
 - ■
 - Compact disk (CD)
 - ■
 - Solid-state drive (SSD)
 - ■
 - Hard disk drive (HDD)
- 3

Solution 3

(b)

Mark scheme

- ■
- C
- 1
- 0478/11
- May/June 2023