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CANDIDATE NAME

CENTRE NUMBER

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8668230326

COMPUTER SCIENCE **0478/12**

Paper 1 Computer Systems **May/June 2026**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **16** pages. Any blank pages are indicated.

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1 A smartwatch has a built-in microphone that allows a person to use voice commands to control the smartwatch.

(a) Tick (✓) **one** box to show whether a microphone is an input, output, process or storage device.

A input ☐

B output ☐

C process ☐

D storage ☐

[1]

(b) The smartwatch stores data that is displayed for the user.

Identify the smallest unit of data that is stored by the smartwatch.

..... [1]

(c) One item of data displayed on the smartwatch is the current outdoor temperature. The temperature is stored in a register as a two's complement binary integer.

(i) Tick (✓) **one** box to show whether two's complement is a base 2, base 8, base 10 or base 16 number system.

A base 2 ☐

B base 8 ☐

C base 10 ☐

D base 16 ☐

[1]

(ii) Give the two's complement 8-bit binary integer that would be stored for the temperature of 32 degrees Celsius.

..... [1]

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(iii) Give the two's complement 8-bit binary integer that would be stored for the temperature of –14 degrees Celsius.

..... [1]

working space

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(d) Identify **one** example of a sensor that would be built into the smartwatch.

..... [1]

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2 A computer has a central processing unit (CPU).

(a) State the role of the CPU.

.....

..... [1]

(b) The memory address register (MAR) and the memory data register (MDR) are two registers built into the CPU.

Give **two** other registers that are built into the CPU.

1 .....

2 .....
[2]

(c) A value is fetched from random access memory (RAM) to the CPU.

Explain how the MAR and MDR are used in this process.

.....

.....

.....

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..... [3]

(d) The CPU has a clock speed of 3 GHz.

Describe what is meant by a 3 GHz clock speed.

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..... [2]

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3 A video streaming service uses hexadecimal to display error codes when problems occur with their videos.

(a) Tick (✓) **one** box to show which statement is incorrect about why hexadecimal is used to display the error codes.

A Hexadecimal is easier to debug than binary. ☐

B Hexadecimal is easier to read than binary. ☐

C Hexadecimal uses less screen space than binary. ☐

D Hexadecimal uses less storage space than binary. ☐

[1]

(b) There is a problem with streaming a video and the error codes 152 and 30F are displayed.

Convert the **two** hexadecimal error codes to binary numbers.

152 .....

30F .....

[2]

working space

.....

.....

.....

(c) The binary numbers 010001110101 and 101011101000 are stored.

Convert the **two** binary numbers to the hexadecimal error codes that would be displayed.

010001110101 .....

101011101000 .....

[2]

working space

.....

.....

.....

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(d) Hexadecimal numbers can also be converted to denary numbers.

Convert the **two** hexadecimal error codes 0A2 and 104 to denary numbers.

0A2 .....

104 .....

[2]

working space

.....

.....

.....

(e) The videos are stored on a web server.

The data for the videos is sent from the web server to a user's computer using packet switching.

(i) Each packet of data is divided into three parts. One part is the payload.

Give the names of the **two** other parts of a packet of data.

1 .....

2 .....

[2]

(ii) Explain the role of a router in packet switching.

.....

.....

.....

.....

.....

..... [3]

(f) The web server uses magnetic storage.

(i) One feature of magnetic storage is that it has moving parts.

Give **two** other features of magnetic storage.

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2 .....

[2]

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(ii) The video streaming service wants faster read and write speeds for their videos than is provided by magnetic storage.

State which type of storage they should use.

..... [1]

(g) The video streaming service compresses their videos using lossless compression.

(i) Give **two** reasons why the video streaming service chose lossless compression instead of lossy compression.

1 .....

.....

2 .....

.....

[2]

(ii) Give **one** advantage to the video streaming service of choosing lossy compression instead of lossless compression to compress the videos.

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..... [1]

(iii) Explain how the videos are compressed using lossless compression.

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..... [4]

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4 An odd parity byte check is used to check for errors in data that is transmitted from a computer to a printer.

(a) Three bytes of data need to be transmitted.

Give the correct parity bit that would be added to each byte of data for an odd parity byte check.

parity bit	byte of data
.....	0 1 0 1 1 1 0
.....	1 1 1 0 1 1 1
.....	1 0 0 0 1 0 0

[3]

(b) There is an error in the data after transmission. This error is **not** detected by the parity byte check.

(i) Explain why the error may **not** be detected by a parity byte check.

.....

.....

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..... [2]

(ii) Give **two** other error detection methods that could be used.

1 .....

2 .....

[2]

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(c) The data that is transmitted is encrypted.

(i) Give **one** method of encryption that could be used.

..... [1]

(ii) State what is meant by an encryption key.

.....

..... [1]

(iii) State the name given to the encrypted data.

..... [1]

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5 Cyber security threats are a problem when using the internet.

(a) Complete the table by writing the missing terms and descriptions about cyber security threats.

Each term and description must be different.

term	description
....	An attack where a third party repeatedly tries to crack a password by entering different combinations.
hacking	....
....	An attack where multiple computers send a large number of requests to a web server with the aim of crashing it.
spyware	....
....	A security threat where software is used to analyse data packets during transmission. Any packets that look useful are sent to a malicious third party.

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(b) Explain how access levels are used to help prevent a cyber security attack being successful.

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..... [5]

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6 A student has an application (app) on their smartphone that can be used to identify the name of a flower.

The student opens the app and takes a photograph of a flower. The photograph is stored as an image.

The app searches its database for similar images to find the name of the flower.

(a) Explain how the image is converted to binary for processing by the smartphone.

.....

.....

.....

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.....

..... [3]

(b) The app uses artificial intelligence (AI) to identify the name of the flower.

Explain how the app can use AI to improve its ability to identify the correct name of the flower.

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..... [4]

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(c) The app uses data stored in cloud storage.

(i) Give **one** advantage to the user of the app storing data in cloud storage instead of locally on the smartphone.

.....

..... [1]

(ii) Give **two** disadvantages to the user of the app storing data in cloud storage instead of locally on the smartphone.

1 .....

.....

2 .....

..... [2]

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7 A programmer uses a low-level language to write a program for a vending machine.

(a) State what is meant by a low-level language.

.....

..... [1]

(b) Identify **two** examples of a low-level language.

1 .....

2 .....

[2]

(c) Give an example of a translator that can be used for a low-level language.

..... [1]

(d) State **two** reasons why the programmer chose a low-level language instead of a high-level language to write the program.

1 .....

.....

2 .....

.....

[2]

(e) The programmer uses an integrated development environment (IDE) to write the program.

Identify **three** terms from the given list that are functions of an IDE.

auto-correction	binary converter
internet protocol (IP) address	media access control (MAC) address
machine independence	prettyprint
protocol identifier	run-time environment

1 .....

2 .....

3 .....

[3]

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