

Wednesday 13 May 2026 – Afternoon

GCSE (9–1) Computer Science

J277/01 Computer Systems

Time allowed: 1 hour 30 minutes

Do not use:

- a calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

Last name

INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined page at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

INFORMATION

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets [].
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **16** pages.

ADVICE

- Read each question carefully before you start your answer.



1 Computers store data in binary.

(a) Tick (✓) **one** box to identify the statement that is **false**.

☐

1000 gigabytes is equivalent to 1 petabyte

☐

1000 megabytes is equivalent to 1 gigabyte

☐

2 nibbles is equivalent to 1 byte

☐

1000 bytes is equivalent to 1 kilobyte

[1]

(b) Convert the binary number 11001010 into denary.

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.....

.....[1]

(c)

(i) Convert the denary number 64 into hexadecimal.

.....

.....

.....

.....[1]

(ii) Give the smallest 1-digit hexadecimal value **and** the largest 1-digit hexadecimal value.

Smallest

Largest

[2]

(d) Identify the binary shift that will multiply the binary value 00011001 by 4.

.....

.....[2]

(e) State why computers represent data in binary.

.....

.....[1]

- (f) Complete the binary addition. Show your working.

$$\begin{array}{r}
 1 \ 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \\
 + \ 0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 1 \ 1 \\
 \hline
 \\
 \hline
 \end{array}$$

[2]

- 2 A hospital has three separate buildings that are in different locations within a city. The hospital has a network with hundreds of computers that are located in the three buildings.

- (a) The network is a WAN (Wide Area Network).

Explain the reasons why the network is a WAN and not a LAN (Local Area Network).

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.....

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.....[2]

- (b) One of the buildings has wired access to the network using Ethernet. Ethernet is an example of a standard.

State the purpose of a standard.

.....

.....[1]

- (c) Some of the data being transferred over the network is confidential.

Explain how encryption can be used to secure the data from unauthorised access during transmission.

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.....

.....

- (d) Data about the hospital, staff and patients is stored centrally on a server that can be accessed from any authorised device.

Describe the role of a client and the server when a doctor makes a request for patient data from a computer.

Client

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.....

.....

Server

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.....

.....

[4]

- (e) The WAN allows access to the internet.

Complete the table by stating the purpose of each protocol used over the internet.

Protocol	Purpose
POP (Post Office Protocol)	
HTTP (Hypertext Transfer Protocol)	
IMAP (Internet Message Access Protocol)	

[3]

3 A computer stores characters using a character set.

(a) Define the term character set.

.....
[1]

(b) Part of the ASCII character set is given:

Character	Denary value
A	65
B	66
C	67
D	68
a	97
b	98
c	99
d	100

Give the denary values that will be stored for the word 'Bed'.

.....[2]

(c) A document stores characters using 8-bits for each character. The character set is changed to one that uses 16-bits for each character.

Give **two** effects of increasing the number of bits for each character.

1

.....

2

.....[2]

4 A computer has a Central Processing Unit (CPU).

(a) Complete the description and function of the components within the CPU using the given terms. Not all terms are used.

Accumulator	Arithmetic Logic Unit (ALU)	Billion	Cache
Control Bus	Control Unit (CU)	Eight	Four
Higher	Inputs	Lower	
Memory Data Register (MDR)	Million	Operations	Outputs
Program Counter (PC)	Thousand	Trillion	Two

The performs the mathematical operations within the CPU, for example adding numbers together. The result of each calculation is stored in a register called the

The sends signals on each clock pulse.

The signals are used to synchronise within the computer.

The clock sends a pulse a set number of times each second. This is known as the clock speed. A clock speed of 2GHz sends 2 pulses each second. The the clock speed, the more fetch-execute cycles can be completed each second.

A computer can have multiple cores, for example a quad core processor has cores.

[7]

(b) The computer has primary storage.

(i) Primary storage includes RAM and ROM.

Give **two** differences between RAM and ROM.

- 1
-
- 2
-

[2]

(ii) Complete the description by filling in the missing word.

Data from RAM is moved to secondary storage when RAM is full. The data is moved back to RAM when it is needed by the CPU.

This memory is called

[1]

(c) The computer comes with utility software.

(i) Tick (✓) **one** box to identify the purpose of utility software.

☐

To allow the user to perform useful tasks

☐

To increase the speed of the processor

☐

To perform housekeeping and maintenance tasks

☐

To start up the computer

[1]

(ii) Describe the purpose of defragmentation software in a computer.

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.....

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.....

[2]

5 A tablet computer has secondary storage.

(a) Give **one** reason why a computer needs secondary storage.

.....
[1]

(b) The tablet computer has a solid state secondary storage device.

(i) Describe **two** reasons why solid state storage is the most appropriate type of secondary storage for the tablet computer.

1

 2

[4]

(ii) Identify **two** other types of secondary storage.

1
 2

[2]

6 A student creates a bitmap image using a computer.

(a) The image file includes metadata. One item of metadata is the resolution.

Identify **two other** items of metadata that could be included in the image file.

- 1
-
- 2
-

[2]

(b) The bitmap image is compressed.

(i) Give **two** reasons why an image file might be compressed.

- 1
-
- 2
-

[2]

(ii) Describe **one** advantage of compressing the image using lossless compression instead of lossy compression.

-
-
-
-[2]

(c) The student stores the image on the cloud.

(i) State what is meant by the cloud.

-
-[1]

(ii) Give **one** benefit of the student storing the image on the cloud.

-
-[1]

7 Smart devices are found within homes.

(a) A smart speaker responds to spoken commands. The smart speaker records and analyses the sound it detects to identify the words spoken and match these to a command.

(i) Describe a privacy issue of smart speakers in homes.

.....

.....

.....

.....[2]

(ii) Describe a cultural issue of smart speakers in homes.

.....

.....

.....

.....[2]

(b) A smart light bulb allows the light bulb to be controlled remotely. The light can be turned on, turned off and the colour of the light can be changed.

Give **two** reasons why a smart light bulb can be considered an embedded system.

1

.....

2

.....[2]

11
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- 8*** A digital media company is setting up a new office network. The office has 10 fixed wired desktop computers and 10 tablet computers that connect to the network wirelessly.

The company needs to choose between a star topology and a mesh topology.

Discuss the choice of topology for this network including:

- how star and mesh topologies work
- the benefits and drawbacks of star and mesh topologies
- a recommendation of which topology should be used with justification.

[8]

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- 9 A microphone is used to record a podcast on a computer.

The podcast is recorded with a sample rate of 44 000 Hz, a bit depth of 2-bytes and is 100 seconds long.

- (a) Calculate an estimate of the file size of the podcast recording in KB. Show your working.

Working

.....

.....

.....

Answer: KB

[2]

- (b) The podcast is edited. The sample rate is changed to 10 000 Hz. The bit-depth is changed to 4 bits.

Describe **two** impacts of these changes on the recording and the file.

1

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.....

..... 2

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[4]

10 Identify the legislation that is being broken for each scenario in the table.

Scenario	Legislation being broken
A company that runs a social media site refuses to give a user the information they have stored about them and their online activities.	
A student guesses a teacher's password and logs on to their laptop.	
A teacher finds an old external hard disk drive that has personal data about ex-students.	
An individual creates a copy of their favourite music tracks and sells it to their friends.	

[4]

END OF QUESTION PAPER

This image shows a blank sheet of white paper designed for handwriting practice. It features a series of evenly spaced horizontal blue lines across its entire width. A single vertical red line runs down the left side, creating a narrow margin. The paper is otherwise empty, with no text or markings.



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