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OCR 2025 Predicted Paper 1
GCSE (9–1) Computer Science
J277/01 Computer Systems
Time allowed: 1 hour 30 minutes

Do not use a calculator

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 pages 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 12 pages.

ADVICE

- Read each question carefully before you start your answer.
- This is just a predicted paper based off previous years

1. (a) The following table has either the binary or hexadecimal value of 3 numbers. Complete the table by converting the 8-bit binary number into hexadecimal and the hexadecimal number into 8-bit binary

8-bit Binary	**Hexadecimal**
11101010	EA
01000000	40
10010100	94
00111101	3D

[4]

(b) A student opens a text file. It contains 40 characters, as shown below. Each character is represented using the ASCII character set.

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(i) Describe what is meant by the term 'character set'.

The range of numbers, letters and symbols that can be represented by a computer, each character having its own binary value

[2]

71

C - 67
:
F - 70
G - 71

(ii) The binary representation for the character 'G' is 01000111. What is the binary representation for the character 'C'?

01000011

[1]

(iii) Calculate the size of the text file in kilobytes (KB).

File size = no. of bits per character x no. of characters

8 bits = 1 byte = 8 x 40 = 320 bits

or 40 characters x 1 byte = 40bytes
40/1000 = 0.04KB

[3]

(c) Give two reasons why a programmer would prefer to use hexadecimal to represent numbers instead of binary.

1 Hexadecimal values are easier to work with than binary.

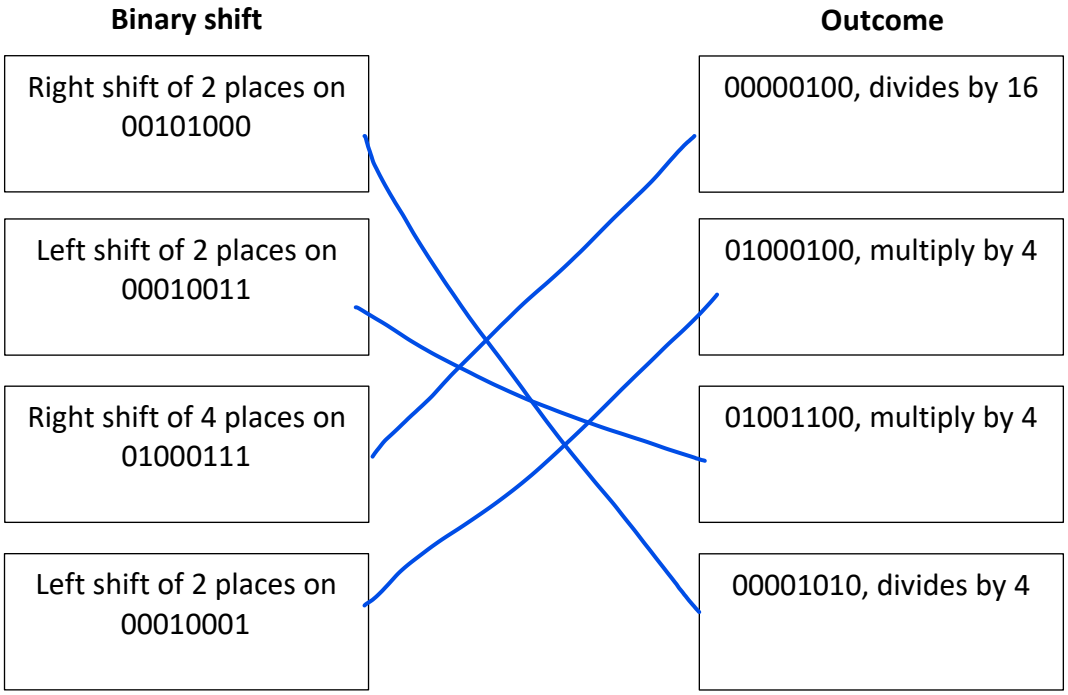
2 Hexadecimal values are shorter than binary.

Hexadecimal values are easily converted.
Hexadecimal values are less susceptible to errors

[2]

(d) Binary shifts can be used for multiplication and division.

Draw one line from each shift on the left to its correct outcome on the right.



[3]

2. A graphic designer is using their computer to perform various tasks related to managing their online portfolio.

(a) Complete the table by identifying the most appropriate protocol for each of the tasks the graphic designer is performing.

Task	Protocol
Uploading a high-resolution image to a cloud server	FTP
Viewing their online portfolio in a web browser	HTTP/HTTPS
Sending a large file to a print service	FTP
Receiving an email from a client	POP / IMAP

[4]

(b) Define what is meant by a 'network protocol'.

A set of rules for communication

[1]

(c) Some protocols have layers.
Describe one advantage of using layers to construct network protocols.

Self contained - One layer can be developed or changed without affecting other layers

[2]

(d) The graphic designer also uses Bluetooth to connect a wireless keyboard and mouse to their computer.
Describe one disadvantage of using Bluetooth technology.

Bluetooth has a short range, If the keyboard or mouse is too far from the computer or there are obstacles like walls, the connection might become weak, or even drop entirely

[2]

3. Two educational institutions are deciding which network model would suit their campuses.

Institution A	Institution B
1500 students and staff	50 students and staff
Dedicated IT department	No Dedicated IT department

(a) For each institution, tick the appropriate box to indicate whether they should use a Client-Server model or a Peer-to-Peer model.

	Institution A	Institution B
Peer to Peer		✓
Client Server	✓	

[1]

(b) Justify your choice to part(a).

Institution B has only 50 users and no dedicated IT department so P2P is appropriate simpler to set up, and doesn't require specialist staff to manage servers. Institution A has 1,500 users and a dedicated IT department, making it suitable for a Client-Server

[2]

(c) Students in both institutions use the can access the Internet and the World Wide Web.

Explain the difference between the Internet and the World Wide Web.

The Internet is the infrastructure (collection of networks), and WWW is the web pages stored on servers

[2]

(d) Explain the role of a Network Interface Card (NIC) in a campus network, and discuss why both institutions would need NICs regardless of the network model they choose.

A NIC allows a computer or device to connect to a network either wired or wirelessly. Without NICs devices cannot connect to any kind of network regardless of its model

[2]

(e) A student from Institution A says "Star networks are the same as client server networks".
Explain why the student may not be correct.

A network topology describes how devices are physically connected. A network model describes how data and resources are managed. A star topology can be used in a client-server network, but it can also be used in other types of networks, like peer-to-peer.

[2]

(f) Institution B has a higher network performance than Institution A.

Explain how each of the following can contribute to the performance of a network.

WIFI frequency 5GHz frequency can carry more data per second than a 2.4GHz

Interference Objects can limit range or even block the signal

Number of concurrent users more traffic means the same bandwidth is split

[3]

4. Sarah is an architect working on designing a series of new sustainable buildings. She has a team of hundreds of people creating models, conducting environmental impact assessments, and drafting blueprints.

Recent developments in Building Information Modelling (BIM) software mean that a computer program could perform the tasks of dozens of her team members in a much shorter time. Sarah decides to increase her use of BIM software in her projects.

Discuss the issues surrounding this decision. Consider the following in your answer:

- Ethical issues
- Legal issues
- Cultural issues

Increasing the use of Building Information Modeling (BIM) software in Sarah's architecture firm introduces several ethical, legal, and cultural impacts.

From an ethical standpoint, the shift to BIM software could result in job displacement, as software automates tasks traditionally performed by humans, potentially leading to unemployment or reduced hours for workers. This raises concerns about the fair treatment of employees and whether workers will be adequately retrained for new roles.

Regarding legal issues, the firm must address concerns over intellectual property rights, especially regarding the ownership of designs created by BIM software. There is also the matter of liability for errors eg if the software makes a mistake, it's unclear whether the responsibility lies with the software developer, the architect, or the company. Additionally, BIM software must ensure that designs meet legal standards, including building codes and environmental regulations.

Finally, from a cultural perspective, the shift towards automation might reduce the level of human interaction in the design process, potentially impacting the collaborative nature of architecture, as a whole. Employees may also resist the transition if they feel their skills are being devalued, potentially harming workplace morale. There's also the challenge of adapting to rapid technological changes, which may not be well received by all team members, particularly those less familiar with BIM.

[8]

5. (a) A computer system faces various security threats. The table contains some common threats and a description of the task each threat performs.

Complete the table by writing the names of the two missing threats and a description of the task performed by the two given threats

Threat	**Task**
Bruteforce	Attempts to guess passwords repeatedly until the correct one is found.
Spyware	logs activity and keystrokes and sed it back to the criminal
SQL Injection	Injects malicious code into a database query to manipulate or access information
Data interception	unauthorised users attempt to access or steal data while it is being transmitted over a network.

[4]

(b) Define what is meant by the term 'firewall'.

Scans incoming and outgoing traffic

[1]

(c) While managing the system, the IT team notices that the computer's hard drive is running slower than usual. They suspect that the hard disc drive is fragmented. Explain how defragmentation software could overcome the issue of the slow computer system.

Defragmentation software reorganises the files putting all the free space together and all the parts of the same file together, as a result fewer disc accesses are needed

[3]

6. Jake wants to buy a new computer, but he does not understand what the different parts of a computer do.

(a) Jake has heard of a CPU but isn't clear on what it does.

The CPU stands for
Central Processing Unit
..... .

It is the part of the computer that fetches and executes the
instructions
.....
that are stored in main memory ..... .

The CPU also contains the Arithmetic Logic Unit (ALU)

[3]

(b) One computer has 64 kilobytes of cache and the other has 512 kilobytes of cache.

Explain how the cache size can affect the performance of the CPU

Cache stores frequency used instructions that can be accessed faster than accessing from RAM therefore more cache improves the performance of the CPU

[2]

(c) Each computer has a BIOS

Tick one box in each row to identify whether each statement in the table is true or false

Statement	True	False
BIOS stands for Boot Input Output Standard		✓
The BIOS can be used to alter hardware settings, such as which storage device the computer boots from	✓	
BIOS settings are stored in RAM		✓

[3]

(d) Jake thinks his smartphone is an embedded system

State whether Jake is correct or incorrect, justifying your choice.

Choice Incorrect

Justification

A smartphone is a, multi-functional general purpose device, not limited to one specific function like an embedded system.

[3]

(e) Virtual memory is used by many devices.
Tick one box to identify the statement about virtual memory that is true.

- [ ] A section of primary storage is partitioned to act as virtual memory
- [x] VM is needed when RAM is full, or nearly full
- [ ] Data from VM is transferred back to secondary storage when needed
- [ ] Data from ROM is transferred into VM

[1]

7. A radio station uses a digital camera to take a photograph of the computer scientist for their website. The photograph is stored as a bitmap image.

(a) Describe how bitmap images are represented in binary.

A bitmap image is made up of a grid of pixels, and each pixel represents a specific colour.
For example, in a black and white image, 0 = black, 1 = white, more bits allow for more colour detail

[3]

(b) Identify three pieces of metadata that would be stored in the image

1 Colour Depth

2 Data created

3 Geographical Data

[3]

(c) The camera allows users to view and edit photos immediately after taking them. Give two examples of data that the camera could store in the RAM.

1 RAM holds the image temporarily

2 Temporary editing data, eg brightness adjustments, cropping info etc

[2]

(d) Describe what type of secondary storage the camera is likely to have, and justify the reason for this choice.

Secondary storage type Flash memory

Justification

Flash storage has no moving parts, so it's more resistant to damage from drops or movement

Flash memory is non-volatile, meaning it retains data even when the camera is turned off, which is essential for storing photos long-term
It also allows for fast read/write speeds, so photos can be saved quickly and accessed efficiently.
It is compact, lightweight, and durable, making it ideal for portable devices like cameras.

[3]

(e) The station's web developer, Alex, decides to upload the picture from his computer. Before uploading the image to the website, Alex considers compressing the file. Explain why image compression might be necessary in this situation.

Large image files can take a long time to upload to the website, especially with slower internet connections. By compressing the image, Alex can reduce the file size, allowing for faster uploads.

Compressed images load faster on the website, leading to a better user experience

Smaller image sizes take up less server storage space

[2]

(f) Identify the most suitable type of compression for the image file. Justify your choice.

Type of compression Lossy compression

Justification

Images are well-suited to lossy compression because the slight loss in quality is often not noticeable to the human eye

[3]

END OF PAPER