OxfordAQA International GCSE
Computer Science (9210)

Example responses (9210/2)

For teaching from September 2017 onwards
For International GCSE exams from May/June 2019 onwards

The international exam board *that puts fairness first*

Contents

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Introduction

This guide includes students' responses to questions from the June 2022 International GCSE paper 9210/2.

Assessment Objectives

The exams will measure how students have achieved the following assessment objectives:

- AO1: Demonstrate knowledge and understanding of the key concepts and principles of computer science.

- AO2: Apply knowledge and understanding of key concepts and principles of computer science.

- AO3: Analyse problems in computational terms in order to develop and test programmed solutions and demonstrate an understanding of programming concepts.

Example responses

Question number 1

Question number 1 was an AO2 skills-based question about various aspects of number systems.

Question number part 1.1

| 0 | 1 |

Figure 1 shows the contents of a byte of memory in **binary**.

Figure 1

| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |

| 0 | 1 |.| 1 | Convert the contents of the byte in **Figure 1** to **hexadecimal**.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
01	1	C9	1 AO2=1

Response A

0 1 **Figure 1** shows the contents of a byte of memory in **binary**.

Figure 1

0 1 . 1 Convert the contents of the byte in **Figure 1** to **hexadecimal**.

[1 mark]

Commentary

This response received **1 mark**. The student has converted directly from binary to hexadecimal using groups of 4 bits, which is the simplest way to tackle this type of conversion.

Response B

0 1 **Figure 1** shows the contents of a byte of memory in **binary**.

Figure 1

0 1 . 1 Convert the contents of the byte in **Figure 1** to **hexadecimal**.

[1 mark]

Commentary

This response received **0 marks**. The student has converted to B9 instead of C9, equating the decimal value 12 with B instead of C. It can be helpful for students to write out all of the decimal/letter conversions eg 10=A, 11=B etc at the side of the question to reduce the likelihood of making this type of error.

Question number part 1.2

| 0 | 1 |.| 2 | How many different hexadecimal numbers can be represented using one byte?
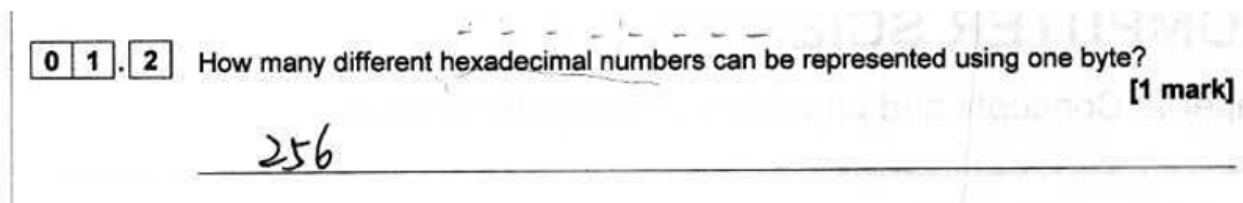
[1 mark]

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
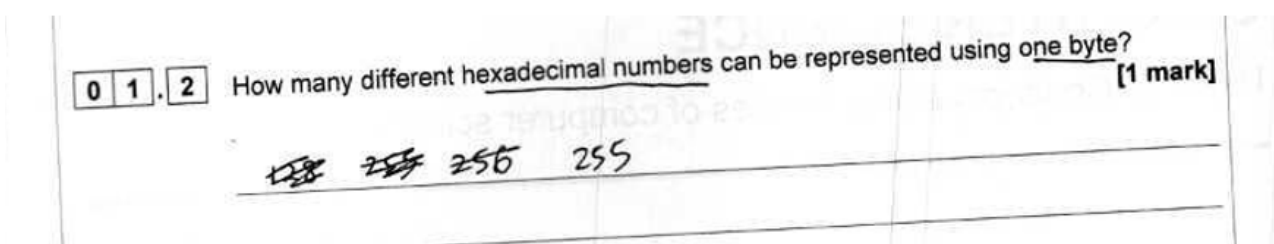| 01 | 2 | 256 // 2^8; | 1

AO2=1 |

Response A

| 0 | 1 |.| 2 | How many different hexadecimal numbers can be represented using one byte?

[1 mark]

256

Commentary

This response received **1 mark**. It is correct.

Response B

| 0 | 1 |.| 2 | How many different hexadecimal numbers can be represented using one byte?

[1 mark]

~~128~~ ~~257~~ ~~256~~ 255

Commentary

This response received **0 marks**. The student has given the highest value that can be represented in one byte instead of the number of different hexadecimal numbers that can be represented in one byte. Their crossings out indicate that they were uncertain about this, and it is a common mistake to give the highest value instead of the number of values. As 0 is a

valid value, the number of values that can be represented is always one higher than the highest value.

Question number part 1.3

| 0 | 1 | . | 3 | How many different decimal numbers can be represented using one byte?

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
01	3	256 // 2^8;	1 AO2=1

Response A

| 0 | 1 | . | 3 | How many different decimal numbers can be represented using one byte?

[1 mark]

256 numbers
(0 -255)

Commentary

This response received **1 mark**. It is correct. The student has also stated the range, which was not asked for and did not affect the awarding of the mark.

Response B

| 0 | 1 | . | 3 | How many different decimal numbers can be represented using one byte?

[1 mark]

= 254

Commentary

This response received **0 marks**. The student looks to have some idea of what they needed to do but has made a conversion error.

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Question number part 1.4

| 0 | 1 | . | 4 |

Represent the decimal number 88 in **binary** using one byte.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
01	4	01011000; **R.** if answer does not use one byte	1 AO2=1

Response A

| 0 | 1 | . | 4 | Represent the decimal number 88 in **binary** using one byte.

[1 mark]

01011000

Commentary

This response received **1 mark**. The student showed their working, which is not necessary for one-mark questions, but it is a good idea to show working if a question is worth more than one mark.

Response B

| 0 | 1 | . | 4 | Represent the decimal number 88 in **binary** using one byte.

[1 mark]

1011000

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Commentary

This response received 0 marks. The student converted the decimal number to binary but gave their response in 7 bits. If a question states that the answer must use 8 bits or one byte then marks will not be awarded for responses that do not use 8 bits.

Question number 2

Question number 2 tested various aspects of understanding about how images are represented. The first two question parts required students to show AO1 knowledge and understanding of the topic and the last two question parts covered the application of AO2 skills to this area.

Question number part 2.1

| 0 | 2 | Bitmaps are one way of representing images in a computer's memory.
A bitmapped image consists of pixels. |

| 0 | 2 | . | 1 | Explain what a pixel is.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
02	1	A single dot of colour **A**. A square/block/unit of colour // The smallest part of an image **NE**. Part of an image // A single point in a graphical image;	1 AO1=1

Response A

| 0 | 2 | Bitmaps are one way of representing images in a computer's memory.
A bitmapped image consists of pixels. |

| 0 | 2 | . | 1 | Explain what a pixel is.

[1 mark]

A pixel is a square that has a colour value.

Commentary

This response received **1 mark**. It would be better to explain that a pixel is the smallest part of an image, that cannot be subdivided any further, as a square in an image could cover multiple pixels, but the concept that a pixel is a square of colour was considered markworthy

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at GCSE level as this is how most students will see a pixel when, for example, enlarging an image.

Response B

| 0 | 2 | | Bitmaps are one way of representing images in a computer's memory. A bitmapped image consists of pixels. |

| 0 | 2 | . | 1 | Explain what a pixel is. | **[1 mark]** |

Pixels are tiny little bits that make up a picture or an image

Commentary

This response received **0 marks**. "Tiny little bits" was considered too vague, it did not convey the concept that a pixel was a single dot of colour or that a pixel was indivisible.

Question number part 2.2

| 0 2 . 2 | Increasing the colour depth of a bitmapped image means that more colours can be represented. |

State **one** disadvantage of increasing the colour depth.

[1 mark]

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks

| 02 | 2 | Larger file size **NE.** larger/bigger if could apply to image dimensions
 //
 Will use more storage (space)/memory
 //
 Take longer to download/transmit; | 1

 AO1=1 |

Response A

| 0 2 . 2 | Increasing the colour depth of a bitmapped image means that more colours can be represented. |

State **one** disadvantage of increasing the colour depth.

[1 mark]

Take Need more storage to store it.

Commentary

This response received **1 mark**. it closely matched the wording of oen of the mark scheme responses.

Response B

| 0 | 2 |.| 2 | Increasing the colour depth of a bitmapped image means that more colours can be represented.

State **one** disadvantage of increasing the colour depth.

[1 mark]

requires more space than normal.

Commentary

This response received **0 marks**. Whilst "more space" was referenced, it was thought to be too vague as the student did not make clear that they meant storage space and the phrase "than normal" further confused the response as it was not clear what "normal" meant.

Question number part 2.3

| 0 | 2 | . | 3 | How many colours can be represented if a bitmapped image has a colour depth of three?

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
02	3	8 // 2^3;	1 AO2=1

Response A

8

Commentary

This response received **1 mark**. Unless otherwise stated on the question paper, if a question requires a calculation to be performed and is only worth one mark then it is not necessary to show working.

Response B

| 0 2 . 3 | How many colours can be represented if a bitmapped image has a colour depth of three?

[1 mark]

~~15~~

$2^3 - 1 = 7$ colours

Commentary

This response received **0 marks**. The student has made one of the most common errors on this type of question. They have calculated the highest number that can be represented in 3 bits instead of the number of different bit patterns that can be represented in 3 bits. It is important to remember that the bit pattern that is all zeros can represent a colour. The maximum number of colours that can be represented in n bits can be worked out by writing out n 1s, converting this binary number to decimal and adding 1 to the result.

Question number part 2.4

| 0 | 2 |.| 4 | **Table 1** shows five different bitmapped images.

Complete the second column of **Table 1** by writing yes or no to indicate if the bitmapped image in the first column could be represented by the bit pattern `01101111`

[3 marks]

Table 1

Image	Represented using bit pattern? (Yes/No)

Mark scheme

Question	Part	Marking guidance	Total marks

| 02 | 4 | | 3 AO2=3 |

Image	Represented using bit pattern? (Yes/No)
	Yes
	Yes
	No
	Yes
	Yes

Mark as follows:

1 mark: Any three rows correct
2 marks: Any four rows correct
3 marks: All rows correct
A. Other symbols that could indicate yes/no eg tick/cross
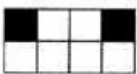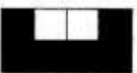
Response A
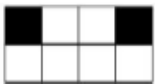
0 2 . 4 **Table 1** shows five different bitmapped images.

Complete the second column of **Table 1** by writing yes or no to indicate if the bitmapped image in the first column could be represented by the bit pattern
01101111

[3 marks]

Table 1

Image	Represented using bit pattern? (Yes/No)
	Yes
	No
	No
	No
	Yes

Commentary

This response received **1 mark** for identifying three rows correctly (rows 1, 3 and 5). The student did not recognise that the eight bits 01101111 could represent the four pixel image in row 4 if the colour depth was 2 bits, which was a common mistake. More unusually, this student did not recognise that the image in row 2 could be represented by the bit pattern. This was unusual as the image in row 2 is the inverse of the image in row 1, which the student did realise could be represented by the bit pattern.
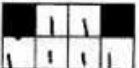
Response B

0 2 . 4 **Table 1** shows five different bitmapped images.

Complete the second column of **Table 1** by writing yes or no to indicate if the bitmapped image in the first column could be represented by the bit pattern 01101111

[3 marks]

Table 1

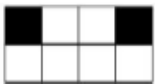| Image	Represented using bit pattern? (Yes/No)
	Yes
	Yes
	~~Yes~~ ~~No.~~ No
	Yes
	Yes

Commentary

This response received **3 marks**. The student has correctly recognised that the bit pattern could represent the image in row 4 if the colour depth is 2 bits.

Question number 3

Question number 3 tested a number of aspects of AO1 understanding about programming languages and translation.

Question number part 3.3

| 0 | 3 |.| 3 | Explain the differences between low-level and high-level languages.

[4 marks]

_____

_____

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
03	3	The table below lists differences. **For rows marked with a #: 1 mark** can be awarded for each side of the difference as one does not directly imply the other. If both sides are stated then **2 marks** should be awarded. **For rows without a #:** award **1 mark** for the statement of either side of the difference, but **do not award 2 marks** for stating both sides. (see table below)	4 AO1=4

	HLL	LLL
#	HLL commands are more powerful than LLL commands // one HLL command is equivalent to many LLL commands	LLL commands are for primitive operations (**A.** examples eg ADD, STORE)
#	In HLL keywords are meaningful (**A.** expressed in English)	In LLL keywords are expressed in mnemonics/short codes (**NE.** binary)
#	HLL code always needs to be translated (before it can be executed)	LLL commands directly map to commands the processor can execute // commands written in <u>machine code</u> can be executed directly by the processor (**A.** "understood" or "read" for "executed" as BOD) // <u>machine code</u> commands

				do not need to be translated (to be executed) // machine code can be executed more quickly (as no translation required)	
		HLL provides support for subroutines	(Some) LLLs do not support subroutines	
		HLL has built-in data structures A. examples eg list, array	LLLs do not provide data structures	
		HLL has wide range of built-in functions/libraries	Built-in functions and libraries not provided/limited	
		HLL directly supports iteration / loops	Writing code for a loop in LLL more complex	
		HLL does not provide direct access to hardware NE. computer	LLL provides direct access to hardware	
		HLL code is easier to understand, debug, read	LLL code is harder to understand, debug, read	
		HLL facilitates faster development of programs	LLL program development is slow	

Response A

0 3 . 3 Explain the differences between low-level and high-level languages.

[4 marks]

High level languages are easier for human programmers to understand and low level language is easier for computers to understand. Low level languages can be executed quicker since it is already in a language that the computer understand so execution is more efficient. However, high-level language lets user use structured variables like arrays and list ~~[struck out]~~ whereas low level language does not understand that. High level languages like python also allow the usage of ~~[struck out]~~ loops which makes the code more advanced.

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Commentary

This was a good response which received **3 marks**. The student explained that high-level languages are easer to understand and provide additional data structures like arrays and programming structures like loops. The point about code in a low-level language being understood by a computer and so quicker to execute was not markworthy and was a common misunderstanding. Whilst machine code can be directly executed by a computer, students need to be aware that assembly language is also a low-level language and this must be translated before it can be executed. Therefore, it is not correct to say that computers can "understand" low-level languages.

Response B

> **0 3 . 3** Explain the differences between low-level and high-level languages.
>
> **[4 marks]**
>
> Low-level language, 3 letters in most of time. Control the computer directly. Hard to read and write.
> high-level language: Easily to read and write. Need translater to excute it.

Commentary

This response received **2 marks**. As with response A, the student has made some points which are not markworthy because they are true of one type of low-level language but not all types. In this case, the student has stated that low-level languages are represented using 3-letters, which is often the case for mnemonics in assembly language but is not the case for machine code. Marks were awarded for the correct statements that high-level languages are easier to read and write and that a translator is needed to execute high-level language code. The point that low-level languages can "control the computer directly" was not enough to award a third mark for. It is true that low-level languages typically provide more direct control over hardware, but all types of language allow for the computer to be controlled. The insertion of the word "hardware" into the response would have allowed a third mark to be awarded.

Question number 4

Question number 4 was an AO2 skills-based question in which students had to show how a merge sort would be performed on some data in a list. The question was not well tackled, with many students not attempting it or giving responses that were not markworthy.

| 0 | 4 |

Figure 2 shows how the list 87, 34, 2, 17, 63, 9, 30 has been broken down into shorter lists as part of the merge sort process.
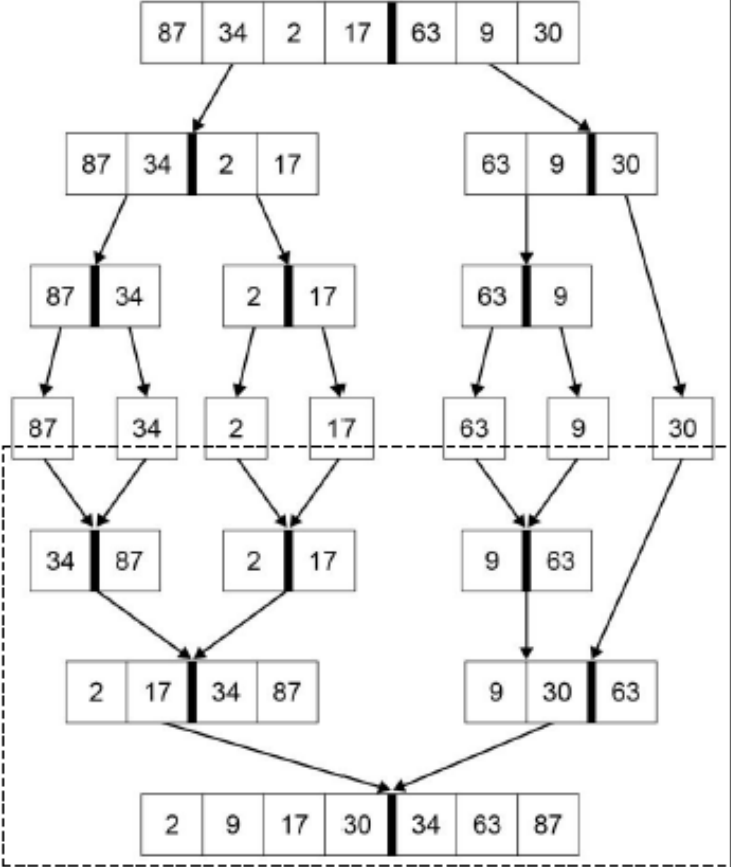
Complete **Figure 2** to show how the one-item lists would be merged to produce the sorted list.

[3 marks]

Figure 2

Mark scheme

Question	Part	Marking guidance	Total marks
04		**1 mark:** Lists are combined firstly into three two-item lists then into a four-item and a three-item list. Award this mark even if the values combined are incorrect. A. 30 shown again as a one-item list at this stage **1 mark:** The first set of lists combined are [34, 87], [2, 17] and [9, 63]. A. 30 shown again as a one-item list at this stage **1 mark:** The final two sets of lists combined are [2, 17, 34, 87] and [9, 30, 63] and the final list is the correct sorted list [2, 9, 17, 30, 34, 63, 87]. **Max 2** if any combinations or values are incorrect. **DPT** if a student changes a value eg 34 to 31, as long as it is clear that this is what has happened. 	3 AO2=3

Response A

0 4   **Figure 2** shows how the list 87, 34, 2, 17, 63, 9, 30 has been broken down into shorter lists as part of the merge sort process.

Complete **Figure 2** to show how the one-item lists would be merged to produce the sorted list.

[3 marks]

Figure 2
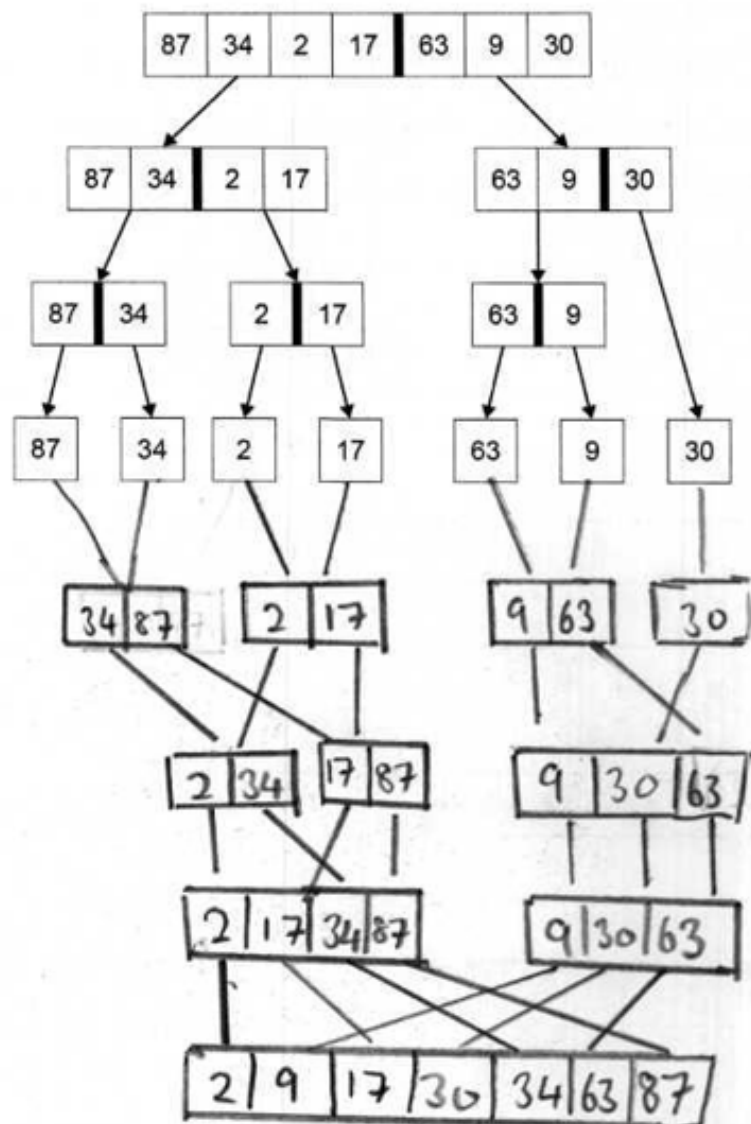
Commentary

This response received **2 marks**. These marks were for combining the lists correctly initially and combining the lists correctly at the end. The third mark was not awarded as the student has combined the lists one time too many in the second row of their response.

Response B

0 | 4

Figure 2 shows how the list 87, 34, 2, 17, 63, 9, 30 has been broken down into shorter lists as part of the merge sort process.

Complete **Figure 2** to show how the one-item lists would be merged to produce the sorted list.

[3 marks]

Figure 2
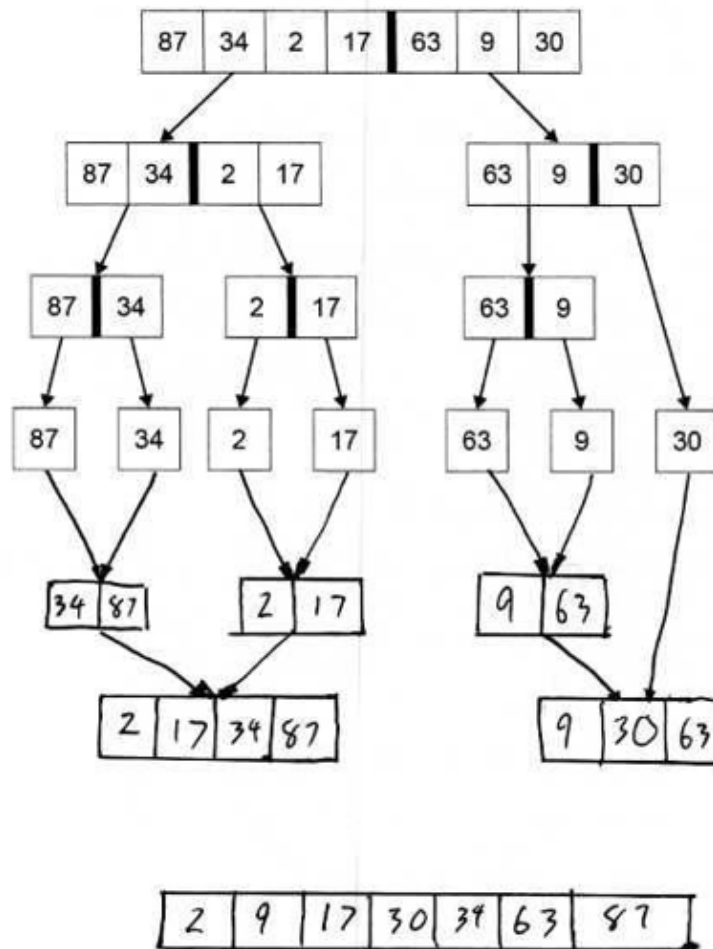
Commentary

This response received **3 marks**. The student has not shown arrows going into the bottom row, but the order in which the lists have been combined is clear so, so all three marks can be awarded.

Question number 5

Question number 5 tested understanding of sampling sound and the skill of performing a calculation relating to sound file size.

Question number part 5.1

| 0 | 5 | . | 1 | Explain why sound must be sampled before it can be stored and played back by a computer.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks

| 05 | 1 | Sound is analogue / continuously variable;

 Computers cannot process analogue / continuously variable data;

 Computers can only represent / process data that is discrete/digital/binary;
 A. only discrete/digital/binary data can be represented / processed
 A. "0s and 1s" for "binary"
 A. "read" or "understand" for "represent"
 NE. sound must be converted to digital/binary values

 Max 1 | 1

 AO1=1 |

Response A

| 0 | 5 | . | 1 | Explain why sound must be sampled before it can be stored and played back by a computer.

[1 mark]

Because sound is a analogue quantity.

Commentary

This response received **1 mark**. The student stated that sound is an analogue quantity. Stating this or that computers can only process and store digital values was enough for a mark to be awarded.

Response B

0 5 . 1	Explain why sound must be sampled before it can be stored and played back by a computer.

[1 mark]

Because computer can be only understand 1 and 0

Commentary

This response received **1 mark**. It is weaker than response A, but "understand 1 and 0" was just enough to convey that a computer stored data in binary, which is a digital number system.

Question number part 5.2

0 5 . 2 | A recording has been made of a sound and stored in a file. The sample resolution used was 16 bits and the sample rate was 10 000Hz. The file, which contains only the samples of the sound, is 1 megabyte in size.

What is the length of the recording in seconds?

Show your working.

[3 marks]

Recording length (seconds) _____

Mark scheme

Question	Part	Marking guidance	Total marks
05	2	**3 marks** for correct answer 50 If incorrect then award up to **2 method marks** for each of: • Converting the file size to bits: writing 1000 x 1000 x 8, 1000000 x 8 or 8000000 somewhere in the working **OR** converting the file size to bytes: writing 1000 x 1000 or 1000000 somewhere in the working. • Calculating how many bits used per second: writing 16 x 10000 or 160000 somewhere in the working **OR** calculating how many bytes used per second: writing 2 x 10000 or 20000 somewhere in the working. • Writing out an equation to equate to the file size in bits: 16 x 10000 x number of seconds = 1000 x 1000 x 8 **OR** writing out an equation to equate to the file size in bytes: 2 x 10000 x number of seconds = 1000 x 1000 • Rearranging equation to calculate number of seconds (using bits): number of seconds = 1000 x 1000 x 8 / 16 / 10000 **OR** rearranging equation to calculate number of seconds (using bytes): number of seconds = 1000 x 1000 / 2 / 10000	3 AO2=3

Response A

| 0 5 . 2 | A recording has been made of a sound and stored in a file. The sample resolution used was 16 bits and the sample rate was 10 000Hz. The file, which contains only the samples of the sound, is 1 megabyte in size. |

What is the length of the recording in seconds?

Show your working.   So   file size = sample rate × bit rate

[3 marks]

file size = sample rate × bit rate × length

1,000,000 bytes = 2 bytes × 10,000 Hz × (y)

$$1,000,000 \text{ bytes} = 2 \text{ bytes} \times \frac{20,000 \text{ y}}{20,000}$$
20,000

$$y = \frac{1,000,000}{20,000}$$

$$y = \frac{1000}{2}$$

$$y = 500 \text{ seconds}$$

Recording length (seconds) _____ 500

Commentary

This response received **2 marks**. The student has given 500 for the final answer, which is incorrect (it should be 50). They have made a mistake when cancelling 1,000,000 / 20,000 near to the end of their working. However, the student has shown their working which contains sufficient evidence of the correct process being followed (1,000,000 and 20,000 in the working) for two marks to be awarded. Students should always show working in case they make arithmetic errors like this one.

Response B

| 0 | 5 | . | 2 |

A recording has been made of a sound and stored in a file. The sample resolution used was 16 bits and the sample rate was 10 000Hz. The file, which contains only the samples of the sound, is 1 megabyte in size.

mb

What is the length of the recording in seconds?

Show your working.

[3 marks]

(×1000×1000 ÷8)

16 bits × 8 × 10000Hz ÷ MB = 0.16

Recording length (seconds) ___0.16___

Commentary

This response received **1 mark**. Whilst the student has not got very close to the correct final answer, they have multiplied together the sample rate and sample resolution so have received one working mark.

Question number 6

Question number 6 tested knowledge and understanding (AO1) of why secondary storage is necessary and how optical discs store data.

Question number part 6.1

| 0 | 6 | . | 1 | Explain why computer systems need secondary storage.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
06	1	To store programs/data/files while the computer/power is turned off; **A.** For long-term storage **A.** To transfer files between computers **A.** To install programs/software from // to distribute software **NE.** It is non-volatile **NE.** Main memory / RAM loses its contents when computer/power turned off	1 AO1=1

Response A

| 0 | 6 | . | 1 | Explain why computer systems need secondary storage.

[1 mark]

To store non-volatile data

Commentary

This response received **0 marks**. The student has stated that the data is non-volatile, which is incorrect. Non-volatile is a term applied to storage devices, not data.

Response B

| 0 6 . 1 | Explain why computer systems need secondary storage. | [1 mark] |

Use it to store things you want & don't want to lose .

Commentary

This response received **0 marks**. The student has stated that secondary storage stores data "that you don't want to lose" but has not made it clear that the data will be retained when the power is turned off, which was required for a mark to be awarded.

Question number part 6.2

| 0 | 6 | . | 2 | Explain how an optical disc, such as a DVD-ROM, represents data and how this can be read from the disc.

[4 marks]

Mark scheme

Question	Part	Marking guidance	Total marks
06	2	**How represented (Max 3):** Reflective/non-reflective areas represent 1/0 (**A.** 0/1) // transition between reflective and non-reflective areas represents 1 and continuation represents 0; Reflective and non-reflective areas known as bumps/ lands and pits // 1/0 represented by bump/land and other binary value represented by pit; Data stored in one single track // a spiral track; Discs can be double-sided // double-layered; **How read (Max 3):** Read/write head moves to correct position; Laser shines at disc; Light is reflected; (Amount of) <u>reflected</u> light measured by sensor;	4 AO1=4

Response A

| 0 | 6 |.| 2 | Explain how an optical disc, such as a DVD-ROM, represents data and how this can be read from the disc.

[4 marks]

there are small pits on DVD-ROM and when light on it, there will be different shadows that refe because of the reflection of light and that means different intervals.

Commentary

This response was very limited and received **1 mark**. The mark was awarded for the idea that the light was reflected. All of the other points lacked enough detail for marks to be awarded. It was not clear that the light was a laser, and the concept of the light causing different shadows in pits was too vague to be markworthy.

Response B

| 0 | 6 |.| 2 | Explain how an optical disc, such as a DVD-ROM, represents data and how this can be read from the disc.

[4 marks]

- *Make DVD-ROM full of dig and land that each of them represents 0 or 1.*
- *The laser shine the DVD-ROM to form reflected ray.*
- *The light senor detect the reflected ray.*
- *The reflected ray represent 0 or 1.*
- *so convert to the binary number.*

Commentary

This response received **3 marks**. These marks were awarded for the concepts that a laser shines at the disc and then a sensor measures the amount of reflected light. Marks were not awarded for the first bullet point as the incorrect technical term (dig) was used. Marks were

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also not awarded for the fourth bullet point as it was not clear how the reflection represented a 0 or 1. Linking the 0s and 1s to bumps/lands and pits would have allowed the award of a fourth mark.

Question number 7

Question number 7 was an AO2 skills-based question for which students had to complete a trace table for an algorithm and identify the purpose of the algorithm. Whilst most students achieved some marks for this question, relatively few achieved full marks.

Question number part 7.1

| 0 | 7 |

Figure 3 shows an algorithm expressed using pseudocode.

The algorithm operates on an array called `List`. The current contents of the array `List` are shown in **Figure 4**.

Figure 3

```
Result ← 0
Num ← USERINPUT
FOR Count ← 0 TO LEN(List) - 1
  IF Num > List[Count] THEN
    Temp ← Num - List[Count]
  ELSE
    Temp ← List[Count] - Num
  ENDIF
  IF Temp > Result THEN
    Result ← Temp
  ENDIF
ENDFOR
```

Figure 4

Index	[0]	[1]	[2]
Contents	4	9	6

| 0 | 7 |.| 1 |

Complete the trace table below to show the execution of the algorithm in **Figure 3** on the array contents in **Figure 4**. Assume that the user enters the number 5

You may not need to write in all of the rows of the table.

[5 marks]

Result	Count	Temp

Mark scheme

Question	Part	Marking guidance	Total marks
07	1	 **Mark as follows:** **1 mark:** 1st value in Result column is 0 **1 mark:** Count set to 0, then 1, then 2 and then does not change **1 mark:** 1st value in Temp column is 1 **1 mark:** 2nd value in Temp column is 4, 3rd value in Temp column is 1 and then does not get changed **1 mark:** 2nd value in Result column is 1 and 3rd value in Result column is 4 and then does not get changed **A.** alternative values for 2nd and 3rd values if match 1st and 2nd values in Temp column **Max 4** if any incorrect values in table	5 AO2=5

Response A

> 0 7 . 1   Complete the trace table below to show the execution of the algorithm in **Figure 3** on the array contents in **Figure 4**. Assume that the user enters the number 5
>
> You may not need to write in all of the rows of the table.
>
> [5 marks]

Commentary

This response received **4 marks**. The first value in the Temp column is incorrect, preventing the fifth mark being awarded. One of the values in the Result column is incorrect but the mark was still awarded for this column as these values have been correctly copied from the Temp column.

Response B

0 7 . 1 Complete the trace table below to show the execution of the algorithm in **Figure 3** on the array contents in **Figure 4**. Assume that the user enters the number 5

You may not need to write in all of the rows of the table.

[5 marks]

Result	Count	Temp
0	0	1
1	1	4
4	2	1
4	0	

Commentary

This response received **5 marks**. The values in the table are all correct. The 4 has been repeated unnecessarily at the bottom of the Result column, but this does not make it incorrect.

Question number part 7.2

| 0 | 7 | . | 2 | What is the purpose of the algorithm shown in **Figure 3**?

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
07	2	Find the biggest difference between the number entered by the user and the numbers in the `List`; **A.** 5 instead of number entered by user **NE.** find the highest value of `Temp`	1 AO2=1

Response A

| 0 | 7 | . | 2 | What is the purpose of the algorithm shown in **Figure 3**?

[1 mark]

To find out which value in list is most different from the number entered and the difference between them.

Commentary

This response received **1 mark**. The first part of the response is incorrect, but in the second part the student correctly stated that the algorithm would identify the biggest difference so the mark was awarded.

Response B

| 0 | 7 | . | 2 | What is the purpose of the algorithm shown in **Figure 3**?

[1 mark]

To find out the difference between the user's entered number and each number in the pre set list.

Commentary

This response received **0 marks**. The student correctly explained that the algorithm would find out the difference between each number in the list and the entered number but did not state that it would find the biggest of these differences, which was required for the mark to be awarded.

Question number 8

Question number 8 tested the skills of developing a web page using HTML and CSS (AO2) and also knowledge of HTML5 (AO1).

Question number part 8.1

| 0 | 8 |

Figure 5 shows a web page displayed in a web browser window.

The web page has been written in HTML only. No CSS has been used.

Figure 5
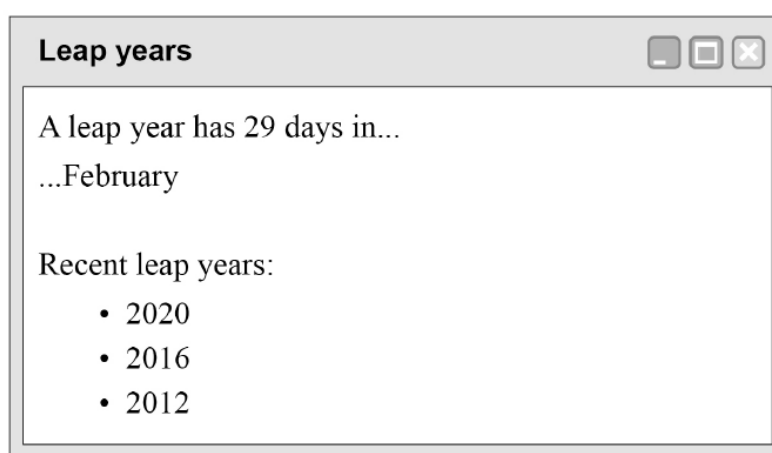
| 0 | 8 |.| 1 | The HTML code used to produce the web page is shown below. Some code has been missed out.

Fill in the gaps to complete the HTML code.

[3 marks]

```
<html>
  <head>
    <title>Leap years<_____>
  </head>
  <body>
    <p>A leap year has 29 days in...<_____>
...February</p>
    <p>Recent leap years:</p>
    <_____>
      <li>2020</li>
      <li>2016</li>
      <li>2012</li>
    <_____>
  </body>
</html>
```

Mark scheme

Question	Part	Marking guidance	Total marks
08	1	**1 mark: /title** in the correct place **1 mark: br /** in the correct place **A.** br **A.** br/ **1 mark: ul** and **/ul** in the correct places `<html>` `<head>` `<title>Leap years</title>` `</head>` `<body>` `<p>A leap year has 29 days in...  ...February</p>` `<p>Recent leap years:</p>` `<ul>` `<li>2020</li>` `<li>2016</li>` `<li>2012</li>` `</ul>` `</body>` `</html>`	3 AO2=3

Response A


```
0 8 . 1    The HTML code used to produce the web page is shown below.  Some code has
           been missed out.

           Fill in the gaps to complete the HTML code.
                                                                        [3 marks]

           <html>
             <head>
                <title>Leap years< /title   >
             </head>
             <body>
                <p>A leap year has 29 days in...< /br     >
           ...February</p>
                <p>Recent leap years:</p>
                <     ol   >
                  <li>2020</li>
                  <li>2016</li>
                  <li>2012</li>
                <   /ol   >
             </body>
           </html>
```

Commentary

This response received **1 mark** for `</title>`. The student made a common mistake of confusing the tag for a bulleted list `<ul>` with that for a numbered list `<ol>`. The tag for a line break is almost correct. Either `<br>` or `<br />` would be accepted but `</br>` is incorrect.

Response B

0 8 . 1 The HTML code used to produce the web page is shown below. Some code has been missed out.

Fill in the gaps to complete the HTML code.

[3 marks]

```
<html>
  <head>
    <title>Leap years< /title >
  </head>
  <body>
    <p>A leap year has 29 days in...< br/ >
...February</p>
    <p>Recent leap years:</p>
    < ul >
      <li>2020</li>
      <li>2016</li>
      <li>2012</li>
    < /ul >
  </body>
</html>
```

Commentary

This was a very good response which received **3 marks**. The type of list was correctly identified, and the line break was achieved using an appropriate tag – this could have been achieved in more than one way.

Question number part 8.2

0 8 . 2 The web page is to be changed so that 29 appears in bold blue text on a yellow background. This will be achieved by using a CSS style rule.

The HTML code for the line in the web page that includes 29 has been changed but some code has been missed out.

Fill in the gaps to complete the CSS code.

[2 marks]

```
<p>A leap year has <span style = "background-color:
yellow; _____ : blue; _____ : bold
">29</span> days in...
```

Mark scheme

Question	Part	Marking guidance	Total marks

08	2	**1 mark:** `color` **R.** `colour`
		1 mark: `font-weight`
		
		`<p>A leap year has <span style =`
		`"background-color: yellow; `**`color`**`: blue;`
		`font-weight``: bold">29</span> days in...`
			2
			
			AO2=2

Response A

0 8 . 2 The web page is to be changed so that 29 appears in bold blue text on a yellow background. This will be achieved by using a CSS style rule.

The HTML code for the line in the web page that includes 29 has been changed but some code has been missed out.

Fill in the gaps to complete the CSS code.

[2 marks]

```
<p>A leap year has <span style = "background-color:
yellow; ~~colour~~ color : blue; ~~font-family~~ : bold
">29</span> days in...
```

font-style

Commentary

This response received **1 mark** for `color`. Whilst `font-style` can be used for italic/oblique text, it cannot be used to make text bold.

Response B


```
0 8 . 2   The web page is to be changed so that 29 appears in bold blue text on a yellow
          background.  This will be achieved by using a CSS style rule.

          The HTML code for the line in the web page that includes 29 has been changed but
          some code has been missed out.

          Fill in the gaps to complete the CSS code.                              [2 marks]

          <p>A leap year has <span style = "background-color:

          yellow; ___font - colour___ : blue; ___font - family___ : bold

          ">29</span> days in...
```

Commentary

This response received **0 marks**. It illustrates two of the most common mistakes that students made. The first was to spell colour using the English spelling instead of the American spelling. We do not normally penalise spelling mistakes in responses, but as this is program code it is important that the word `color` is spelt in the way required by the language. It is also common for students to incorrectly add a word such as `font` or `text` before the word `color` when setting the font colour.

Question number 9

Question number 9 tested various aspects of understanding of the CPU (AO1) and also applying skills to logic circuits (AO2).

Question number part 9.1

| 0 | 9 |

The control unit, Arithmetic Logic Unit (ALU) and buses are components of a computer.

| 0 | 9 | . | 1 |

Explain the role of the control unit.

[1 mark]

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
09	1	Manage the execution of instructions // manage the fetch-execute cycle; **NE.** execute instructions Decode instructions; Control what other components should do when executing an instruction; **Max 1**	1 AO1=1

Response A

| 0 | 9 |

The control unit, Arithmetic Logic Unit (ALU) and buses are components of a computer.

| 0 | 9 | . | 1 |

Explain the role of the control unit.

[1 mark]

to control each components
work regularly and ~~send~~ electrical
~~send to them~~ decode the instructions.

Commentary

This was a clear response which receive **1 mark**. The student has correctly identified that the CPU is responsible for decoding instructions.

Response B

| 0 | 9 | The control unit, Arithmetic Logic Unit (ALU) and buses are components of a computer. |

| 0 | 9 | . | 1 | Explain the role of the control unit. | [1 mark] |

To control the ~~speed~~ rate that the CPU ~~got~~ gives signals and work.

Commentary

This response received **0 marks**. The language used was not precise enough for a mark to be awarded.

Question number part 9.2

| 0 | 9 | . | 2 | Explain the role of a bus.

[1 mark]

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
09	2	Transfer data/signals/bit patterns (from one component to another); **A.** transfer addresses **A.** specific components named in response	1 AO1=1

Response A

| 0 | 9 | . | 2 | Explain the role of a bus.

[1 mark]

The wire to connect connect connect each computer.

Commentary

This response received **0 marks**. Whilst the student has correctly recognised that a bus could be wires used to connect the components of a computer, they have not really addressed the question about what the role of a bus is. Good responses identified that the bus would be used to transfer data between the components.

Response B

| 0 | 9 | . | 2 | Explain the role of a bus.

[1 mark]

> connects with the ^main^ memory ad secandary ad send/transmt data to them.

Commentary

This response was enough for **1 mark**. The student has referred to a specific use of a bus (between main memory and secondary storage) but has captured the general role of transferring data in their response, so received a mark.

Question number part 9.3

The ALU contains logic circuits that are used to complete logical and arithmetic operations. A logic circuit is shown in **Figure 6**.

Figure 6
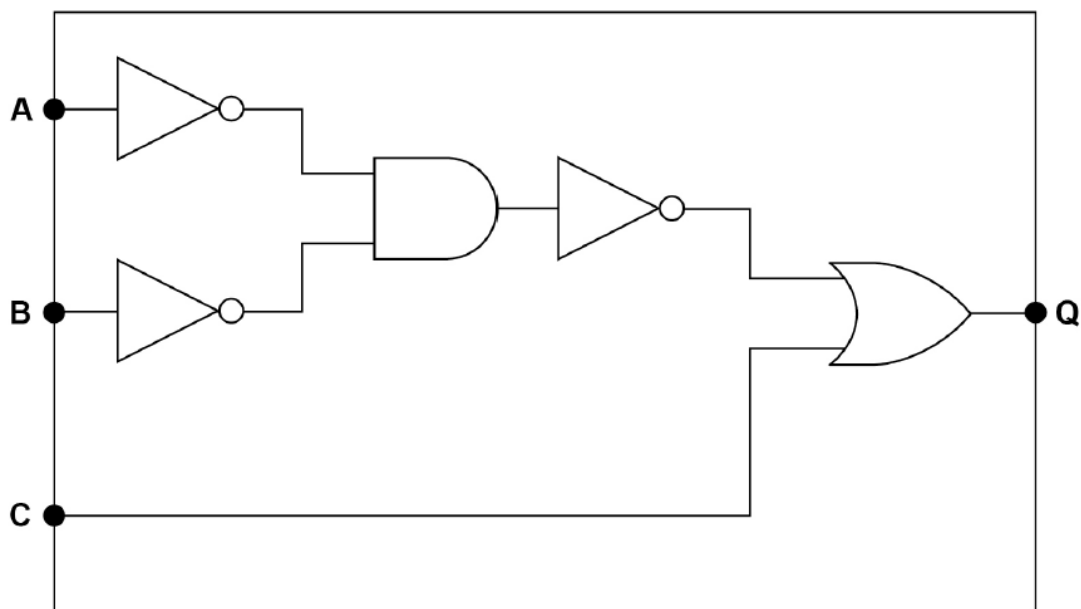
| 0 | 9 |.| 3 | Complete the Boolean expression below so that it is equivalent to the logic circuit in **Figure 6**:

[3 marks]

$$Q = \overline{A}.B$$

Mark scheme

Question	Part	Marking guidance	Total marks
09	3	**1 mark:** NOT bar above B **1 mark:** NOT bar above NOT A AND NOT B **A.** NOT above A, AND gate and right hand side of AND gate **1 mark:** + C **A.** if underneath a NOT bar that extends too far Ignore the inclusion of brackets that would not affect the order of evaluation. $$Q = \overline{\overline{A}.\overline{B}} + C$$ **Max 2 marks if any errors**	3 AO2=3

Response A

09.3 Complete the Boolean expression below so that it is equivalent to the logic circuit in **Figure 6**:

[3 marks]

$$Q = \overline{\overline{A}.B} + C$$

Commentary

This response received **2 marks**. The response is just missing a NOT bar over the B, which prevented the award of all three marks.

Response B

09.3 Complete the Boolean expression below so that it is equivalent to the logic circuit in **Figure 6**:

[3 marks]

$$Q = \overline{(\overline{A}.\overline{B})} + C$$

Commentary

This response received all **3 marks**. The student has added some unnecessary brackets to their response, but as these do not affect the order of evaluation this does not affect the mark awarded.

Question number part 9.4

0 9 . 4   Complete the **Output** column of the truth table below for the logic circuit shown in **Figure 6**. Four rows have been completed for you.

[2 marks]

Inputs			Output
A	**B**	**C**	**Q**
0	0	0	
0	0	1	
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	
1	1	1	

Mark scheme

Question	Part	Marking guidance	Total marks
09	4	**1 mark:** two rows correct **2 marks:** all four rows correct	2 AO2=2

Inputs			Output
A	**B**	**C**	**Q**
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

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Response A

0 9 . 4 Complete the **Output** column of the truth table below for the logic circuit shown in **Figure 6**. Four rows have been completed for you.

[2 marks]

Inputs			Output
A	B	C	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Commentary

This response is fully correct so received **2 marks**.

Response B

0 9 . 4 Complete the **Output** column of the truth table below for the logic circuit shown in **Figure 6**. Four rows have been completed for you.

[2 marks]

Inputs			Output
A	B	C	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

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Commentary

This response received **1 mark** as the student wrote the correct values on three of the four rows.

Question number part 9.5

Part of the logic circuit from **Figure 6**, and the equivalent truth table, are shown again in **Figure 7**.

Figure 7
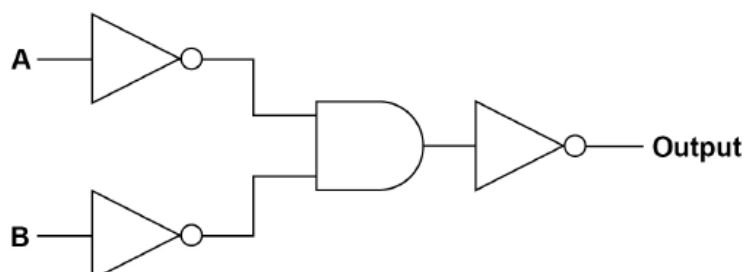
Inputs		Output
A	B	
0	0	0
0	1	1
1	0	1
1	1	1

0 9 . 5 Which **one** logic gate could have been used instead of the entire logic circuit shown in **Figure 7**?

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
09	5	OR; A. correct drawing of an OR gate	1 AO1=1

Response A

| 0 | 9 |.| 5 | Which **one** logic gate could have been used instead of the entire logic circuit shown in **Figure 7**?

[1 mark]

OR

Commentary

This response is correct so received **1 mark**.

Response B

| 0 | 9 |.| 5 | Which **one** logic gate could have been used instead of the entire logic circuit shown in **Figure 7**?

[1 mark]

A (OR) B = Output

Commentary

This student wrote a Boolean expression instead of just giving the name of the gate.
However, it is clear that they know that the gate is an OR gate so **1 mark** was awarded.

Question number part 9.6

A logic circuit in the ALU may be replaced with another circuit that produces exactly the same outputs but uses fewer logic gates. Doing this will improve the performance of the CPU as any instructions that use that circuit will execute faster.

Two other ways of improving CPU performance are to increase the number of cores and to increase the size of the cache memory.

| 0 | 9 | . | 6 | Explain why increasing the number of cores can improve the performance of the CPU.
[2 marks]

Mark scheme

Question	Part	Marking guidance	Total marks
09	6	A core/processor can execute one instruction at a time // each core can process instructions independently; **A.** each core can work independently Multiple cores means multiple instructions can be executed at the same time; **NE.** the computer can multi-task **A.** tasks/processes/programs for instructions	2 AO1=2

Response A

| 0 | 9 | . | 6 | Explain why increasing the number of cores can improve the performance of the CPU.
[2 marks]

Because each core can work independently.
Increasing the number of cores means that more instruction can be run ~~paralott~~. That will be more efficient. porellal.

Commentary

This was a good response, which received **2 marks**. The student has recognised that the cores operate independently, and that as a result more instructions can be executed in parallel.

Response B

| 0 | 9 | . | 6 | Explain why increasing the number of cores can improve the performance of the CPU. |

[2 marks]

① each core can process tasks independently.

② more cores means the processing will be faster.

Commentary

This response received **1 mark**. The student has recognised that the cores operate independently but has not developed this point further to explain that instructions can be executed simultaneously. The level of understanding show is not as good as for the student who wrote response A.

Question number part 9.7

| 0 | 9 | . | 7 | Explain why increasing the size of the cache memory can improve the performance of the CPU.

[2 marks]

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
09	7	Cache memory is faster (to access) than main memory/RAM;

Larger cache memory means main memory/RAM needs to be accessed less frequently // there is a higher probability that data required will be in the cache; | 2

AO1=2 |

Response A

| 0 | 9 | . | 7 | Explain why increasing the size of the cache memory can improve the performance of the CPU.

[2 marks]

higher chance of data/instruction searched for ~~to be~~ to be
in cache. Higher chance of hits. More frequently used data can
be stored* Data is is retrieved faster from cache then
main memory as it is closer ~~the~~ to the control unit.
~~However~~ However, if cache too big then this could be a downside
as the whole cache always has to be searched though every
new cycle ~~instruction~~ and the data in the cache is stored at ~~random~~ random.

*in the cache.

Commentary

This was a very good response which received **2 marks**. The student has provided a clear explanation, recognising both that cache memory can be accessed faster than main memory and that increasing the amount of cache memory would increase the likelihood that a particular item of data would be found in the cache. Many responses to this question recognised that cache memory could be accessed faster than main memory but did not develop this point further to achieve a second mark.

Response B

0 9 . 7 Explain why increasing the size of the cache memory can improve the performance of the CPU.

[2 marks]

The bigger the size of the cache memory, the faster the computer can access the data stored in it.

Commentary

This response received **0 marks**. The student has used the word faster, but their explanation that cache memory can be accessed more quickly if there is more of it is not correct. An explanation that cache memory could be accessed more quickly than main memory would, by itself, have been worth 1 mark.

Question number 10

Question number 10 was an AO1 question that tested knowledge of what a computer network is and understanding of the risks and benefits of computer networks.

Question number part 10.1

| 1 | 0 |.| 1 | Explain what a computer network is.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
10	1	(Two or more) computers/devices connected/wired/linked so that they can communicate/pass data between them;	1 AO1=1

Response A

| 1 | 0 |.| 1 | Explain what a computer network is.

~~and so~~

[1 mark]

Network is a structure connect computers together. and let them Communication.

Commentary

This response achieved **1 mark**. The student has recognised that the computers would be connected together and that this was in order to facilitate communication. Both of these points were needed for a mark to be awarded.

Response B

1 0 . 1 Explain what a computer network is.

[1 mark]

Multiple computer joined together either wired wirelessly or with wires.

Commentary

This response fell short of the threshold required for the mark to be awarded so received **0 marks**. The student has recognised that computers would be connected together but has not explained that this would be to enable them to communicate.

Question number part 10.2

| 1 | 0 | . | 2 | Describe the benefits and risks of computer networks.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

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Mark scheme

Question	Part	Marking guidance	Total marks
10	2	**Benefits (Max 3)** Expensive/hardware resources can be shared; **A.** examples eg printer, Internet connection Files/documents (stored on a server) (**R.** the network) can be accessed from any computer/workstation; **NE.** data can be shared between devices Files/documents can be shared (by multiple users) // collaborative working is facilitated // access to shared data files/databases; Email/alternative services can be used for communication; **NE.** easier communication Centralised management of security // common login system can apply to entire network; Easier to backup files stored centrally / on; Centralised installation of software updates; **Risks (Max 3)** Failure of a network cable/network device/switch/the network/a server may mean files/resources cannot be accessed; **NE.** whole network will go down Performance may be slowed by accessing data over the network; **A.** examples eg files may load more slowly Virus/malware/worm may be spread across the network / spread faster; **A.** other security threats eg phishing **NE.** virus might attack the computer Hackers might use the network to hack a computer from another location // transmissions could be intercepted; **A.** hacking can occur **Max 4**	4 AO1=4

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Response A

| 1 | 0 | . | 2 | Describe the benefits and risks of computer networks.

[4 marks]

benefits = can use and update data
Can control computers and transform
message easier.

risk: not privacy
not safe

Commentary

This response received **0 marks**. The most significant problem with the response is that the question asked students to describe benefits and risks and the statements given are not descriptions. The brevity of the points also resulted in some being incorrect. For example, whilst it is true that there are increased security risks associated with connecting a computer to a network, this does not mean that a network is "not safe".

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Response B

10.2 Describe the benefits and risks of computer networks.

[4 marks]

One benefit is that a network can allow users to share ~~resources~~ files and resources such as printers. A computer network also allows hot desking as any user can log into a system with their credentials and can access their data. It also allows homeworking. However, a risk is that malware can spread faster if all computer systems are connected with each other. The cost of network infrastructure is also setting up high. It can be expensive for admins to control and monitor networks. The data is also less secure on some networks as hackers can intercept transmission signals.

Commentary

This was an excellent response which received **4 marks**. A range of points are made and are well described. For example, the student has recognised that the network would allow viruses to spread more quickly – they haven't simply stated that viruses are a risk of being connected to a network.

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Response C

10.2 Describe the benefits and risks of computer networks.

[4 marks]

Computer networks allow for ease of information exchange between two different devices.

Computer networks allow devices to connect together eg. a printer

Computer networks open up room for unwanted malware to enter your system. without a network connection the only access point is your system its self but once connected more doors are open. Open up to many different social engineering methods how people could obtain personal information.

Commentary

This response received **1 mark**. Whilst a range of points were made, they were often not well developed enough to be markworthy as a description. For example, stating that "networks allow devices to connect together eg a printer" did not sufficiently convey the fact that a printer could be shared by many computers to receive a mark. The second paragraph about increased security risks was better developed and was markworthy.

Question number 11

Question number 11 tested AO1 knowledge of what a protocol is together with knowledge of common protocols.

Question number part 11.1

| 1 | 1 | . | 1 | Explain what a protocol is.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
11	1	A set of rules (to determine how devices communicate); **NE**. set of instructions	1 AO1=1

Response A

| 1 | 1 | . | 1 | Explain what a protocol is.

[1 mark]

A set of rules within a computer system.

Commentary

This response received **1 mark**. As the question was only worth one mark, it was not necessary to state that the rules were to control communication between computers.

Response B

1 1 . 1 Explain what a protocol is.

[1 mark]

Protocol is the ~~agreme~~ agreements that make we can use the network ~~proper~~ ~~correctly~~ more convienently.

Commentary

This response received **0 marks**. The response was did not make clear that protocols were rules.

Question number part 11.2

1 1 . 2 State what each of these protocols would be used for.

[2 marks]

SMTP _____

_____

_____

_____

_____

HTTPS _____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks

11	2	**SMTP:** Transmit email (to/between email servers) // send (and receive) email;
		R. receive email
		
		HTTPS: To make secure web transactions (**A.** examples) // to access web pages securely // to access web pages over an encrypted connection;
		NE. it is safer/more secure than HTTP
			2
			
			AO1=2

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Response A

1 1 . 2	State what each of these protocols would be used for.

[2 marks]

SMTP It's a send ~~emile~~ information ~~to~~ from ~~emit~~ email.

HTTPS It's a more safe ~~website~~ websit.

Commentary

This response received **1 mark**. The student has correctly identified that SMTP is for sending email. For HTTPS, it was not enough to state that HTTPS made a website safer. The purpose of the protocol is to access webpage securely.

Response B

1 1 . 2	State what each of these protocols would be used for.

[2 marks]

SMTP Send ing messages to another ~~one~~ device. a message Could be an email

HTTPS Secure comunication between a device and the server. Used when paying online.

Commentary

This response received **2 marks**. The description of HTTP would have been clearer if the student had stated that HTTPS made accessing a web server more secure, but the mark was awarded as the example of paying online helped to convey the idea that HTTPS was used for secure transactions.

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Question number 12

Question number 12 was an AO1 question which tested knowledge and understanding of various aspects of TCP/IP.

Question number part 12.1

| 1 | 2 |

Figure 8 is an incomplete diagram of the TCP/IP model. The name of one of the layers has been replaced by the letter **A**.

Figure 8

```
┌─────────────┐
│ Application  │
└─────────────┘
       │
┌─────────────┐
│  Transport   │
└─────────────┘
       │
┌─────────────┐
│   Network    │
└─────────────┘
       │
┌─────────────┐
│      A       │
└─────────────┘
```
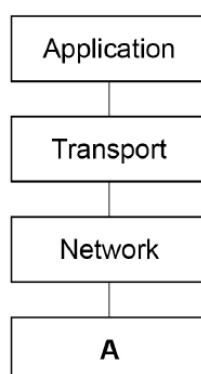
| 1 | 2 |.| 1 | State the name of the TCP/IP layer that is labelled **A** in **Figure 8**.

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks

| 12 | 1 | Link;
A. Network Interface, Data Link | 1

AO1=1 |

Response A

| 1 | 2 |.| 1 | State the name of the TCP/IP layer that is labelled **A** in **Figure 8**.

[1 mark]

IP

Commentary

The response received **0 marks**. IP is not the correct name of the layer.

Response B

> 1 2 . 1 State the name of the TCP/IP layer that is labelled **A** in **Figure 8**.
>
> [1 mark]
>
> link

Commentary

This response received **1 mark**. The name given is correct.

Question number part 12.2

| 1 | 2 | . | 2 | Describe the main function of the network layer.

[1 mark]

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
12	2	Route packets across the network // select path that packets are sent across network on // address and package data for transmission; **A.** adds (source/destination) IP addresses **NE.** sends data across the network	1 AO1=1

Response A

| 1 | 2 | . | 2 | Describe the main function of the network layer.

package   [1 mark]

To ~~transpo~~ send over the data ↑ from one
computer to another.

Commentary

The response received **0 marks**. Sending data packages was not enough for a mark to be awarded for routing packets. It could be argued that all of the layers are involved in sending packets. To receive a mark for routing, a response needed to either use the word routing or describe what routing means.

Response B

1 2 . 2 Describe the main function of the network layer.

[1 mark]

to give each packet an Ip adress of the recipent and find the best route to travel along.

Commentary

This was an excellent response which received **1 mark**. The student has referred to routing and adding IP addresses to packets, either of which would have been markworthy on its own.

Question number part 12.3

| 1 | 2 | . | 3 | The TCP and UDP protocols both operate at the transport layer.

Explain **one** difference between these two protocols **and** give an example of an application for which UDP might be chosen instead of TCP.

[2 marks]

Mark scheme

Question	Part	Marking guidance	Total marks
12	3	**Difference (1 mark)** Award **1 mark** for the statement of either side of a difference from the table. <table><tr><td>**TCP**</td><td>**UDP**</td></tr><tr><td>TCP is connection-oriented</td><td>UDP is connectionless</td></tr><tr><td>TCP provides a reliable connection</td><td>UDP does not guarantee that packets will arrive (in order) // best effort protocol</td></tr><tr><td>TCP performs error recovery // packets received with errors are retransmitted</td><td>UDP does not perform error recovery // packets with errors are just discarded</td></tr><tr><td>TCP server maintains state</td><td>UDP is stateless</td></tr><tr><td>TCP has slower (effective) transmission speeds (because of error correction overhead)</td><td>UDP has faster (effective) transmission speeds (as errors not corrected)</td></tr></table> **Example Application (1 mark)** Streaming // gaming // (most) DNS requests/responses; **A.** any other example for which either speed is vital or reliability is relatively unimportant **R.** if more than one example given and any of the examples would not use UDP	2 AO1=2

Response A

1 2 . 3 The TCP and UDP protocols both operate at the transport layer.

Explain **one** difference between these two protocols **and** give an example of an application for which UDP might be chosen instead of TCP.

[2 marks]

TCP and UDP is all from the transport layer.
TCP is more ~~safe and faster~~ safe. than UDP.
but UDP is faster than TCP.

Commentary

This response received **1 mark**. The student has correctly identified that UDP transmits data faster than TCP but has not addressed the second part of the question by giving an example use of UDP.

Response B

1 2 . 3   The TCP and UDP protocols both operate at the transport layer.

Explain **one** difference between these two protocols **and** give an example of an application for which UDP might be chosen instead of TCP.

[2 marks]

UDP may be chosen for ~~vidooga~~ video gaming and video conferencing ~~watching~~ instead of TCP. UDP will transfer all the packets and not check ~~for any~~ for any ~~mix~~ missing ones* , but TCP will make sure that all packets are ready and sent , so no ~~lost~~ packet loss and no interruptions or stops.

* so there ~~are~~ ^(can be) ~~are~~ d interruptions or stops.

Commentary

This is an excellent response which received **2 marks**. The student has explained the difference well and has given two example applications.

Question number 13

Question number 13 assessed AO1 understanding of cyber security.

Question number part 13.1

1	3	.	1

David is an administrator at a bank.

One social engineering method that a criminal might use to obtain David's login details is shouldering.

Name and describe **one other** social engineering method that a criminal could use to obtain David's login, so that they can access the bank's computer systems.

[3 marks]

Mark scheme

Question	Part	Marking guidance	Total marks
13	1	Award **1 mark** for the naming of a correct method: Blagging/Pretexting // Phishing // Pharming; **R.** phishing, pharming spelt incorrectly (eg as fishing) for this mark point but if this mistake is made, marks can be awarded for the description. Award up to **2 marks** for a description of the named method (do not award marks for descriptions of other methods or for descriptions if no method was named): • **Description of blagging/pretexting:** Create scenario to trick him into revealing these details; for example, by telephoning him and telling him his account has been locked and needs unlocking; **A.** other reasonable examples • **Description of phishing:** Send email/SMS with link for him to follow to login // send email/SMS with a request to contact the sender; which goes to a fake login page // so that the criminal can collect his login/personal details (that might help obtain the login); **A.** "message" for "SMS" • **Description of pharming:** <u>Redirect</u> his login to another server / website; which can collect his login details; Award **Max 2** marks if not answered in context. **Max 3**	3 AO1=3

Response A

13.1 David is an administrator at a bank.

One social engineering method that a criminal might use to obtain David's login details is shouldering.

Name and describe **one other** social engineering method that a criminal could use to obtain David's login, so that they can access the bank's computer systems.

[3 marks]

Phishing can be used. This is when a fake email is sent to David with contents that can manipulate influence him to disclose his bank's login details. Such as a fake email from David's bank friend where he has to send his login credentials for influencing certain needs.

Commentary

This was a good response that was awarded **3 marks**. The student has named a valid method and has described it well, explaining that phishing could be in the form of an email trying to trick David into disclosing his login credentials.

Response B

13.1 David is an administrator at a bank.

One social engineering method that a criminal might use to obtain David's login details is shouldering.

Name and describe **one other** social engineering method that a criminal could use to obtain David's login, so that they can access the bank's computer systems.

[3 marks]

*Fake website.
Use thae the websites but its not real that attract people enter it. and show the information (like oode) in the fake website.*

Commentary

This response received **0 marks**. "Fake website" is not the name of a social engineering method and the description is too vague to be markworthy.

Question number part 13.2

| 1 | 3 | . | 2 | The bank uses penetration testing to help ensure that their systems are secure.

Explain what penetration testing is.

[2 marks]

_____

_____

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
13	2	Attempting to gain access to resources/a network/a system; with the authority of the owners; without / with limited knowledge of usernames / passwords / login details / other normal means of access; in order to identify security weaknesses / flaws; **NE.** to ensure systems are secure **Max 1** if neither the third or fourth mark points are made. **Max 2**	2 AO1=2

Response A

| 1 3 | . | 2 | The bank uses penetration testing to help ensure that their systems are secure. |

Explain what penetration testing is.

[2 marks]

> Hire some white hackers and order them try to penetrate the fire wall to access the information. Use this method to check the security of the systems.

Commentary

This response received **1 mark**. The student correctly identified that a party would attempt to gain access to a system with the authority of the owners (this was implied by "hire"). The point in the second paragraph was not enough for the mark about identifying security loopholes, as it only stated that penetration testing would check the security of the system, which was given in the question. It did not explain that specific loopholes would be identified.

Response B

| 1 3 | . | 2 | The bank uses penetration testing to help ensure that their systems are secure. |

Explain what penetration testing is.

[2 marks]

> Penetration testing is a method to find a way to find a way to access the data. There are 2 types of penetration testing: Black box pen testing → which is when the hacker don't know the security code and try to brute force to get through the security. Another type is white box. This is when the hacker knows the code and etc and try to find the way to access the code. If both tests can access the data, this means that the system is not secure.

Commentary

This response received **2 marks**. The student identified that penetration testing was finding a way to access data and the point "doesn't know the security code" was enough to award a mark for the hacker not having any login credentials.

Question number 14

Question number 14 tested AO1 knowledge of what compression is and AO2 skills building a Huffman tree.

Question number part 14.1

| 1 | 4 | . | 1 | What is the purpose of data compression?

[1 mark]

_____

_____

_____

_____

Mark scheme

Question	Part	Marking guidance	Total marks
14	1	To reduce file size; To reduce the time it will take to transmit data; To reduce the number of bits used to represent data; To increase the amount of data / number of files that can be stored in a certain amount of memory / on a device; **A.** examples of devices **Max 1**	1 AO1=1

Response A

| 1 | 4 | . | 1 | What is the purpose of data compression?

[1 mark]

The tot Less storage of a file
Make the same place can store more files.

Commentary

This response received **1 mark**. The first sentence "The less storage of a file" was not very clear, but the mark was awarded when this was clarified by the second sentence about being able to store more files. A good response would have stated that compression reduces the amount of storage space that a file requires.

Response B

| 1 | 4 | . | 1 | What is the purpose of data compression?

[1 mark]

ANN It is reduce the storage space of
It's reduce the amount of storage space in one device.

Commentary

This response received **0 marks**. Whilst it does refer to storage space, the assertion that compression would reduce the amount of storage space in a device is incorrect. It would reduce the amount of storage space that a file required.

Question number part 14.2

| 1 | 4 |.| 2 | To create a Huffman coding a Huffman tree is often used.

Complete the Huffman tree in **Figure 9** assuming that it was created using the string `AGATTACA`

You will need to add a seventh node to the diagram and put the characters `A`, `T` and `C` in the correct places.

[3 marks]

Figure 9

Mark scheme

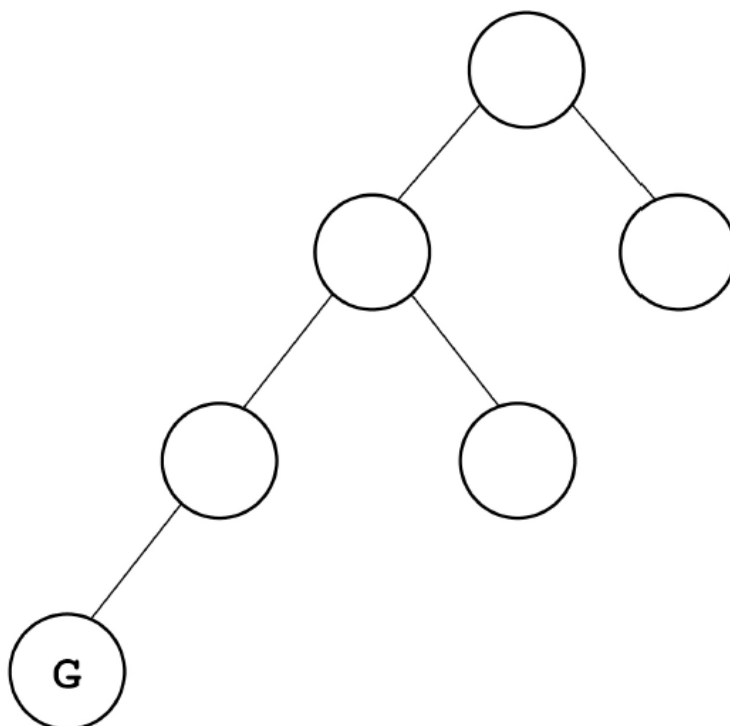| Question	Part	Marking guidance	Total marks
14	2	**1 mark:** A added in correct place in diagram **1 mark:** T added in correct place in diagram **1 mark:** C added in correct place in diagram **Do not award the mark for a letter if it has been added in more than one place.** **Ignore values (other than A,T, C) written in the nodes that should be empty.** **Max 2 marks if any errors** 	3 AO2=3

Response A

1 4 . 2 To create a Huffman coding a Huffman tree is often used.

Complete the Huffman tree in **Figure 9** assuming that it was created using the string
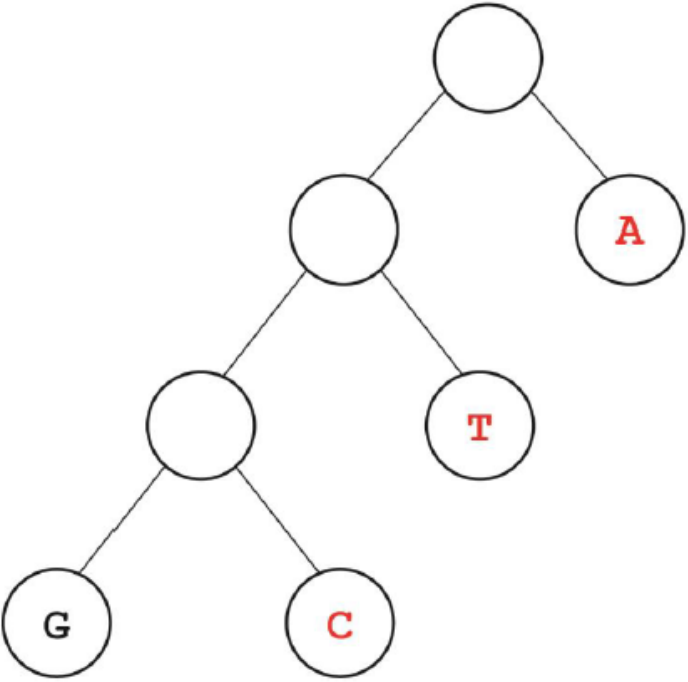AGATTACA

You will need to add a seventh node to the diagram and put the characters A, T and C
in the correct places.

[3 marks]

Figure 9

Commentary

This response received **2 marks**. Characters A and T were correctly placed, but C was not.
The values 7 and 3 were ignored when marking as these represented the student's working.
Node C was incorrectly placed. The question contained the information that a seventh node
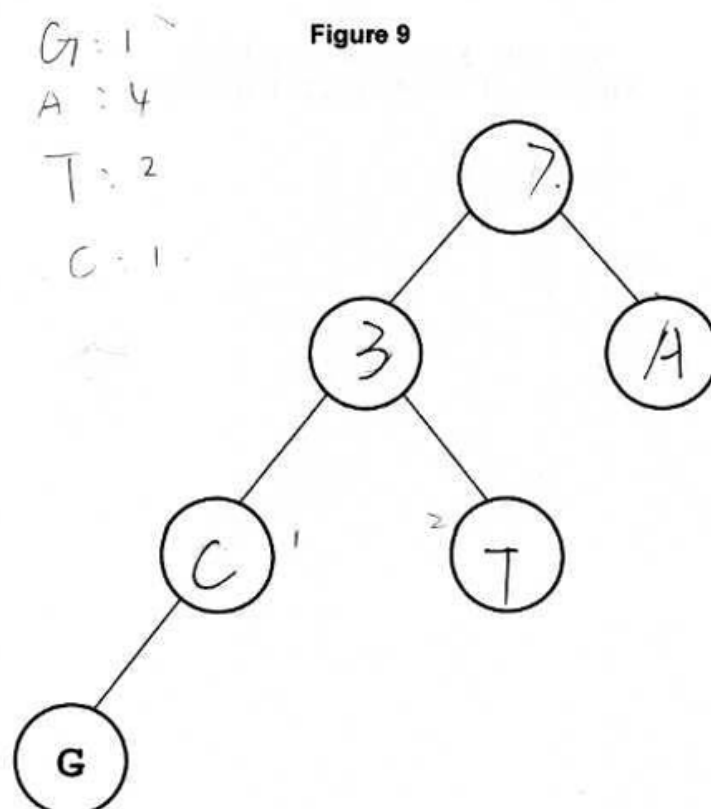needed to be added (for the character C), which this student has not done.

Response B

14.2 To create a Huffman coding a Huffman tree is often used.

Complete the Huffman tree in **Figure 9** assuming that it was created using the string `AGATTACA`

You will need to add a seventh node to the diagram and put the characters A, T and C in the correct places.

[3 marks]

Figure 9
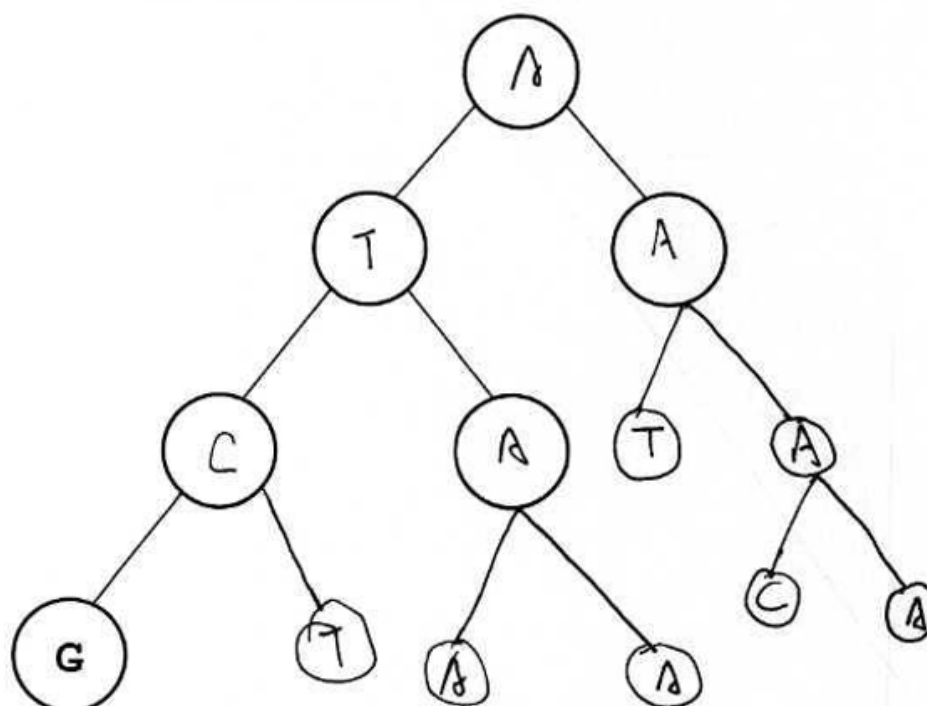
Commentary

This response received **0 marks**. The student has correctly placed one letter A but a mark was not awarded for this as the student has placed A another five times, so clearly does not understand how a Huffman tree works.

Question number part 14.3

| 1 4 . 3 | How many bits will be used to represent the character G with this Huffman coding?
[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
14	3	3;	1
AO2=1

Response A

| 1 4 . 3 | How many bits will be used to represent the character G with this Huffman coding?
[1 mark]

4

Commentary

This response received **0 marks**. The correct answer is 3.

Response B

| 1 4 . 3 | How many bits will be used to represent the character G with this Huffman coding?
[1 mark]

G : 000 ∴ (3 bits)

Commentary

This response received **1 mark**. The working that the student did was ignored when the response was marked.

Question number 15

This was an AO2 skills-based question about relational databases and SQL.

Question number part 15.1

| 1 | 5 |

A relational database is being developed to store information about the books that are available to borrow in a school library and the students who can borrow the books.

The database contains two tables: **Student** and **Book**.

The database is currently being tested by the person who has developed it, so the tables only contain a small amount of data.

The contents of the tables are shown in **Figure 10**.

When a book is loaned out to a student, the `StudentID` of the person who has borrowed the book is recorded in the **Book** table. If a book is not on loan then it is in the library and a `StudentID` of −1 is recorded in the **Book** table to indicate this.

Figure 10

Student

StudentID	Forename	Surname	YearGroup
12	Bethany	Lerman	4
93	Mahat	Jalal	5
104	Henry	McCay	5
27	Harpreet	Singh	4
201	Maria	Sklair	5

Book

BookID	Title	Category	StudentID	DateDueBack	Cost
1	Mr Fish	Fiction	93	01/08/2020	4.49
2	Space Explorer	Fiction	−1		11.99
3	Solar System	Science	201	08/07/2020	8.99
4	Big Cats	Nature	27	05/06/2020	10.00
5	A Lovely Life	Biography	−1		12.00

| 1 | 5 |.| 1 |

State the name of a suitable data type that could be used for the `Cost` field in the **Book** table.

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
15	1	Smallmoney // Money // Currency // Float // Real // Decimal // Double; **A.** Minor errors in spelling **A.** Other data types that could store a non-integer numeric value **NE.** Number	1 AO2=1

Response A

1 5 . 1 State the name of a suitable data type that could be used for the Cost field in the **Book** table.

[1 mark]

Real

Commentary

This response received **1 mark**. The student has correctly identified that the data being stored is numerical and has a decimal part, so real is an appropriate data type.

Response B

1 5 . 1 State the name of a suitable data type that could be used for the Cost field in the **Book** table.

[1 mark]

float

Commentary

This response received **1 mark**. Whilst float is not listed as a data type in the specification, it is a common data type for decimal numbers in programming languages so is markworthy.

Question number part 15.2

| 1 | 5 | . | 2 | State the name of the field that has been used as the primary key in the **Student** table. |

[1 mark]

Mark scheme

Question	Part	Marking guidance	Total marks
15	2	`StudentID;` **A.** Minor errors in spelling and case and space between `Student` and `ID`	1 AO2=1

Response A

| 1 | 5 | . | 2 | State the name of the field that has been used as the primary key in the **Student** table. |

[1 mark]

Student ID

Commentary

This response received **1 mark**. The student correctly identified the primary key.

Response B

| 1 | 5 | . | 2 | State the name of the field that has been used as the primary key in the **Student** table. |

[1 mark]

Book ID

Commentary

This response received **0 marks**. BookID is not part of the Student table so it seems likely that the student misread the question and gave the primary key of the Book table instead.

Question number part 15.3

| 1 | 5 | . | 3 |

The developer has written this SQL query:

```
SELECT  Surname, BookID, Cost
FROM    Student, Book
WHERE   YearGroup = 5
        AND Student.StudentID = Book.StudentID
```

List the records that would be displayed when this query is carried out on the data shown in the tables in **Figure 10**.

[3 marks]

Mark scheme

Question	Part	Marking guidance	Total marks
15	3	<table><tr><td>Surname</td><td>BookID</td><td>Cost</td></tr><tr><td>Jalal</td><td>1</td><td>4.49</td></tr><tr><td>Sklair</td><td>3</td><td>8.99</td></tr></table> **1 mark:** For each record listed: the fields listed are the correct ones (`Surname`, `BookID`, `Cost`), with the correct values and no other fields are displayed. Award this mark whether or not the records are the correct ones, so long as they have been correctly linked using the primary and foreign keys. **1 mark:** Record for Jalal included in results. **1 mark:** Record for Sklair included in results Award the two marks for having the correct records (Jalal, Sklair) regardless of which fields are shown for the records. **Max 1** of the two marks for having the correct records (Jalal, Sklair) if any other records also included. **Max 2** if: • any incorrect data included in results table • results table is incomplete • fields are included in the results table in a different order (eg `BookID` before `Surname`) A. Minor spelling and case errors in `Surname` field. A. Use of different symbol to decimal point in `Cost` field. A. Both records written on same row, so long as one is written after the other and the fields are listed in the same order for each record. I. Whether fieldnames are or are not included at top of results.	3 AO2=3

Response A

1 5 . 3 The developer has written this SQL query:

```
SELECT  Surname, BookID, Cost
FROM    Student, Book
WHERE   YearGroup = 5
        AND Student.StudentID = Book.StudentID
```

List the records that would be displayed when this query is carried out on the data shown in the tables in **Figure 10**.

[3 marks]

Jalal , 1 , 4.49

Commentary

This response received **2 marks.** The student has correctly listed the fields for one correct record but has missed the fact that the record for Sklair should also be listed.

Response B

1 5 . 3 The developer has written this SQL query:

```
SELECT  Surname, BookID, Cost
FROM    Student, Book
WHERE   YearGroup = 5
        AND Student.StudentID = Book.StudentID
```

List the records that would be displayed when this query is carried out on the data shown in the tables in **Figure 10**.

[3 marks]

Jalal ≥ 4.49

Commentary

This response received **1 mark**. The student has correctly identified that the record for Jalal should be listed but the values of the fields are not all correct and the record for Sklair has not been listed.