Cambridge Assessment International Education

Example Candidate Responses – Paper 1

Cambridge International AS & A Level Computer Science 9618

For examination from 2021

Cambridge Pathway

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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge International AS & A Level Computer Science 9618, and to show how different levels of candidates' performance (high, middle and low) relate to the subject's curriculum and assessment objectives.

In this booklet candidate responses have been chosen from the June 2021 exam series to exemplify a range of answers.

For each question, the response is annotated with a clear explanation of where and why marks were awarded or omitted. This is followed by examiner comments on how the answer could have been improved. In this way, it is possible for you to understand what candidates have done to gain their marks and what they could do to improve their answers. There is also a list of common mistakes candidates made in their answers for each question.

This document provides illustrative examples of candidate work with examiner commentary. These help teachers to assess the standard required to achieve marks beyond the guidance of the mark scheme. Therefore, in some circumstances, such as where exact answers are required, there will not be much comment.

The questions, mark schemes and inserts used here are available to download from the School Support Hub. These files are:

9618 June 2021 Question Paper 13

9618 June 2021 Mark Scheme 13

Past exam resources and other teaching and learning resources are available on the School Support Hub:

www.cambridgeinternational.org/support

How to use this booklet

This booklet goes through the paper one question at a time, showing you the high-, middle- and low-level response for each question. The candidate answers are set in a table. In the left-hand column are the candidate answers, and in the right-hand column are the Examiner comments.

Example Candidate Response – high	Examiner comments

1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel	The smallest picture element can be drawn
File header	It stores all the information about the picture, like location, colour depth

[2]

and a colour depth

1 This is not a description of a pixel.

2 The candidate gives a correct description, together with an

Answers are by real candidates in exam conditions. These show you the types of answers for each level. Discuss and analyse the answers with your learners in the classroom to improve their skills.

Examiner comments are alongside the answers. These explain where and why marks were awarded. This helps you to interpret the standard of Cambridge exams so you can help your learners to refine their exam technique.

How the candidate could have improved their answer

- **(a)** The candidate could have expanded on what they meant by a 'picture element'.
- **(b)** The candidate states that it is an image that is compressed, but they could have described the compression of the pixels of an image rather than the characters of a piece of text.
- **(c)(ii)** The candidate could have included a statement showing explicitly the conversion of denary 15 to binary.

This section explains how the candidate could have improved each answer. This helps you to interpret the standard of Cambridge exams and helps your learners to refine their exam technique.

Common mistakes candidates made in this question

- **a(i)** Many candidates included a list of examples without any descriptions. Others used examples that were about any file and not specifically about a graphics file. Where the question gave a context, candidates' answers needed to be focussed on the context.
- **a(ii)** Many candidates multiplied the number of pixels by 8 to calculate the number of bits, but then forgot to subsequently divide by 8 to get the number of bytes.

Often candidates were not awarded marks because they misread or misinterpreted the questions.

Lists the common mistakes candidates made in answering each question. This will help your learners to avoid these mistakes and give them the best chance of achieving the available marks.

Question 1

Example Candidate Response – high

1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel	The smallest picture element can be drawn
File header	To stores all the information about the picture, like location, colour depth.

[2]

(ii) The image is scanned with an image resolution of 1024 × 512 pixels, and a colour depth of 8 bits per pixel.

Calculate an estimate for the file size, giving your answer in mebibytes. Show your working.

Working $\frac{1024 \times 512 \times 8}{8 \times 1024 \times 1024} = 0.5$ mebibytes

Answer 0.5 mebibytes

[3]

(b) The image is compressed using lossless compression.

Identify **one** method of lossless compression that can be used to compress the image **and** describe how the method will reduce the file size.

Lossless compression method Run-Length Encoding (RLE)

Description The character will be stored once, followed by the times it occurs. For example, EEEFAAAA will be recorded as E3F1A4. Thus, the number of bits is reduced.

[3]

Examiner comments

1 This is not a description of a pixel.

2 The candidate gives a correct description, together with an appropriate example.

Mark for (a)(i) = 1 out of 2

3 The candidate calculates the number of pixels correctly and uses the correct divisor.

Mark for (a)(ii) = 3 out of 3

4 The question refers to an image, but the candidate's answer refers to text.

Mark for (b) = 1 out of 3

Example Candidate Response – high, continued

(c) One of the colours used in the image has the hexadecimal colour code:

#FC238A

FC is the amount of red, 23 is the amount of green and 8A is the amount of blue in the colour.

(i) Convert the hexadecimal code FC into denary

252

[1]

(ii) The amount of green in binary is 00100011. This has the denary number 15 added to it to create a second colour.

Add the denary number 15 to the binary number 00100011 and give your answer in binary.

Perform the addition in binary. Show your working.

Working 00100011 5

+ 00001111

00110010

Answer (in binary) 00110010

[3]

(iii) Hexadecimal 23 in two's complement representation is 00100011. The denary number 10 needs to be subtracted from this value.

Subtract the denary number 10 from the two's complement representation 00100011.

Give your answer in binary. Show your working.

Working -10 : 11110110 6

00100011

+ 11110110 7

100011001

Answer (in binary) 00011001

[3]

Examiner comments

Mark for (c)(i) = 1 out of 1

5 The carry bits are clearly visible.

Mark for (c)(ii) = 3 out of 3

6 The two's complement of -10 (negative 10) is seen.

7 The candidate adds the correct value and the carry bits are clearly visible.

Mark for (c)(iii) = 3 out of 3

Example Candidate Response – high, continued	Examiner comments
(d) Anya made sure that the image was not subject to any copyright before scanning it. Describe what is meant by **copyright.** 8 It is a legal recognition of ownership of a software or something [2]	8 The candidate refers to the legal right of ownership. Mark for (d) = 1 out of 2 **Total mark awarded = 13 out of 17**

How the candidate could have improved their answer

- **(a)** The candidate could have expanded on what they meant by a 'picture element'.
- **(b)** The candidate states that it is an image that is compressed, but they could have described the compression of the pixels of an image rather than the characters of a piece of text.
- **(c)(ii)** The candidate could have included a statement showing explicitly the conversion of denary 15 to binary.
- **(c)(iii)** The candidate could have shown how the binary value for -10 was calculated in the space given for working, rather than doing this on the side of the page.
- **(d)** The candidate could have added a second statement to describe what was meant by copyright. There were two marks available for the question, so two distinct points were required.

Example Candidate Response – middle

1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel	1 a tiny recognised ~~able~~ area ~~element~~ ~~the~~ area · ~~at the case~~ of ~~an~~ an graphics image
File header	2 a file that contain the information about the file, for example type of compression used .

[2]

(ii) The image is scanned with an image resolution of 1024 x 512 pixels, and a colour depth of 8 bits per pixel.

Calculate an estimate for the file size, giving your answer in mebibytes. Show your working.

kilobytes
1000 bytes
10000
8 bits → byte
divide by 8.

Working Image resolution = 1024 x 512 .

File size = Resolution x colour depth 3

1024 x 512 x 8 x 3 | 512 x 3 | 1536

4 1024 x 1024 x 8 | 153.6 ≈ 1.536

Answer ≈ 1.536 mebibytes [3]

1000
1024

(b) The image is compressed using lossless compression.

Identify **one** method of lossless compression that can be used to compress the image **and** describe how the method will reduce the file size.

Lossless compression method Run-length encoding (RLE)

Description it will compress any adjacent strings that have identical character, 5
it will store in two value,
the first value represent the type of character
another value is the number of repetition of the character. 6 [3]

Examiner comments

1 The word 'tiny' is too vague.

2 A file header is not a file.

Mark for (a)(i) = 0 out of 2

3 The 3 is not required. The number of pixels is already multiplied by the number of bits needed for each one.

4 The divisor is correct.

Mark for (a)(ii) = 1 out of 3

5 The question refers to an image, but the candidate refers to characters.

6 The candidate is awarded the second mark under the error carried forward rule.

Mark for (b) = 2 out of 3

Example Candidate Response – middle, continued

(c) One of the colours used in the image has the hexadecimal colour code:

#FC238A

FC is the amount of red, 23 is the amount of green and 8A is the amount of blue in the colour.

(i) Convert the hexadecimal code FC into denary.

~~253~~ 252 [1]

(ii) The amount of green in binary is 00100011. This has the denary number 15 added to it to create a second colour.

Add the denary number 15 to the binary number 00100011 and give your answer in binary.

Perform the addition in binary. Show your working.

Working convert 15 to binary = 0000 1111 7

0000 1111 8

+ 0010 0011

0011 0010

Answer (in binary) 0011 0010

[3]

(iii) Hexadecimal 23 in two's complement representation is 00100011. The denary number 10 needs to be subtracted from this value.

Subtract the denary number 10 from the two's complement representation 00100011.

Give your answer in binary. Show your working. 0000 1010

Working convert 10 into binary = 0000 1010 9

~~0000 1010~~ 0010 0011

- 0000 1010 10

0010 0001

Answer (in binary) 0010 0001 11

[3]

Examiner comments

Mark for (c)(i) = 1 out of 1

7 The candidate clearly labels the conversion of 15 to binary.

8 The carry bits are clearly seen.

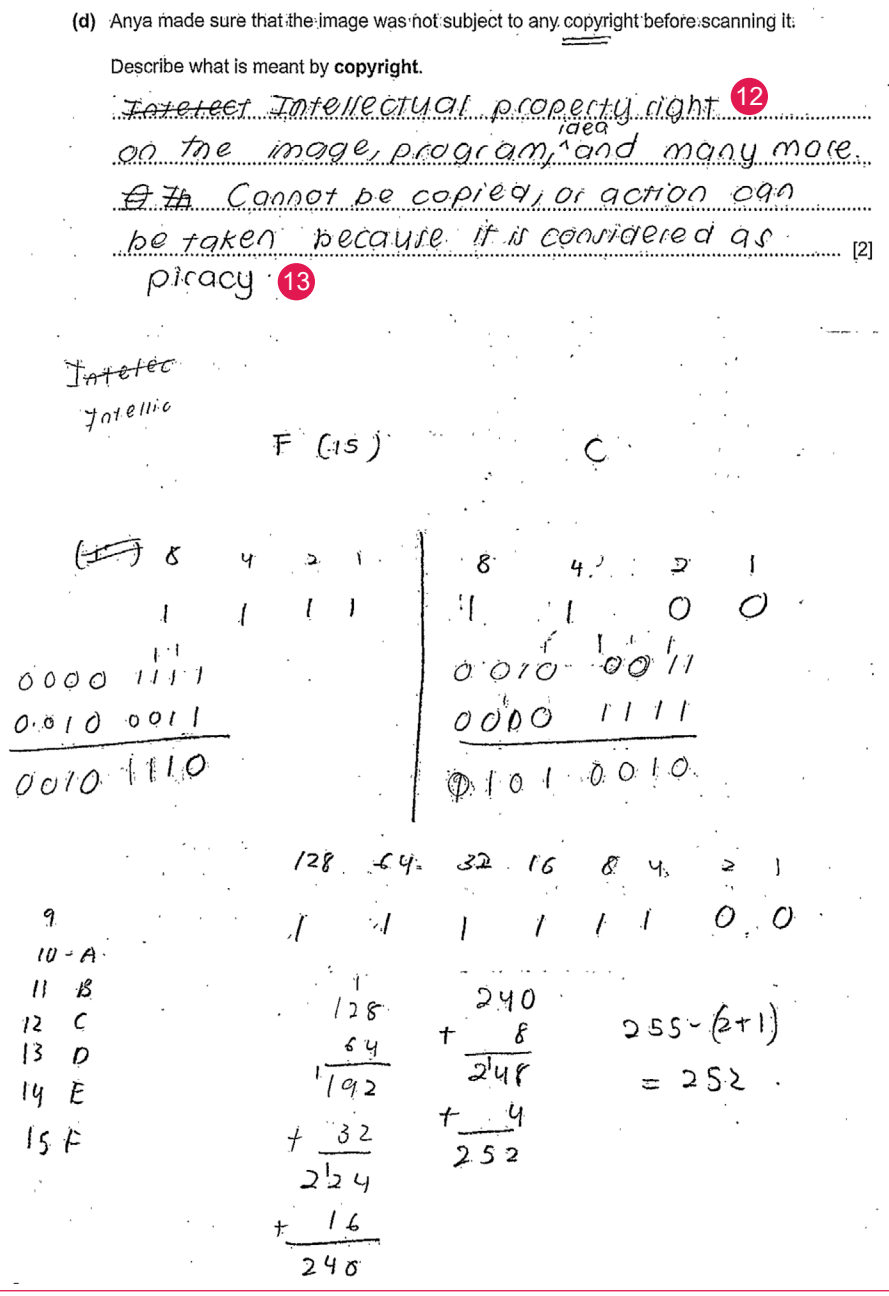
Mark for (c)(ii) = 3 out of 3

9 The conversion of 10 to binary is clear.

10 The candidate uses the method of direct subtraction and the carry bits are clear.

11 The candidate's answer is incorrect.

Mark for (c)(iii) = 2 out of 3

Example Candidate Response – middle, continued	Examiner comments
	12 The candidate identifies the right to intellectual property. 13 'Action can be taken' is not enough. Mark for (d) = 1 out of 2 **Total mark awarded = 10 out of 17**

How the candidate could have improved their answer

- **(a)** The candidate could have given more consideration to the terms used in the description.
- **(b)** The candidate stated that it was an image that was compressed, but they needed to describe the compression of the pixels of an image rather than the characters of a piece of text.
- **(c)(iii)** The candidate needed to take more care in their subtraction, however their method was correct.
- **(d)** The candidate made two points, but their second point could be more precise.

Example Candidate Response – low

1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel	The smallest unit ~~that~~ that can represent colors. 1 Pixel can be in different basic colors to form other colors.
File header	File header is a process to check whether an image is accurate.

[2]

(ii) The image is scanned with an image resolution of 1024 × 512 pixels, and a colour depth of 8 bits per pixel.

Calculate an estimate for the file size, giving your answer in mebibytes. Show your working.

Working file size = $1024 \times 512 \times 8 = 2^{11} \times 2^{10} \times 2^3$ 2

Answer 2×10^{-1} mebibytes

[3]

(b) The image is compressed using lossless compression.

Identify **one** method of lossless compression that can be used to compress the image **and** describe how the method will reduce the file size.

Lossless compression method ~~Similarity~~ color compression. 3

Description Lossless compression means there will be no data loss before and after, the image will be the same when it's decompressed. Color compression counts the amount of same colors in the image accurately, to make sure the image remains the same when decompressing.

[3]

Examiner comments

1 The candidate gives a description of a pixel.

Mark for (a)(i) = 1 out of 2

2 The number of pixels is incorrect and the candidate does not show a divisor.

Mark for (a)(ii) = 0 out of 3

3 The candidate gives a description of lossless compression, not a description of a method of accomplishing lossless compression.

Mark for (b) = 0 out of 3

Example Candidate Response – low, continued

(c) One of the colours used in the image has the hexadecimal colour code:

#FC238A

FC is the amount of red, 23 is the amount of green and 8A is the amount of blue in the colour.

(i) Convert the hexadecimal code FC into denary.

252 ..... [1]

(ii) The amount of green in binary is 00100011. This has the denary number 15 added to it to create a second colour.

Add the denary number 15 to the binary number 00100011 and give your answer in binary.

Perform the addition in binary. Show your working.

Working ... # 00100011 = 1+2+32=35

15+35=50 (4)

50= 00110010

Answer (in binary) ... 00110010 (5)

[3]

(iii) Hexadecimal 23 in two's complement representation is 00100011. The denary number 10 needs to be subtracted from this value.

Subtract the denary number 10 from the two's complement representation 00100011.

Give your answer in binary. Show your working.

Working ... 10= 00001010 (6)

00100011

+ 00001010 (7)

00101101

Answer (in binary) ... 00101101

[3]

Examiner comments

Mark for (c)(i) = 1 out of 1

(4) The candidate shows a denary calculation method but the question asks for a binary calculation.

(5) The answer is correct binary.

Mark for (c)(ii) = 1 out of 3

(6) The candidate's conversion of denary 10 to binary is correct.

(7) The candidate adds the value instead of subtracting it.

Mark for (c)(iii) = 1 out of 3

Example Candidate Response – low, continued	Examiner comments
(d) Anya made sure that the image was not subject to any copyright before scanning it. Describe what is meant by **copyright**. Copyright is when the image is authorized or belongs to private, if the image is a copyright, Anya must ask for authorization, if not, Anya's behavior is illegal. 8 9 [2]	8 The candidate's first statement is too vague to be awarded marks. 9 The candidate identifies the legal right of redress and is awarded a mark. Mark for (d) = 1 out of 2 **Total mark awarded = 5 out of 17**

How the candidate could have improved their answer

- **(b)** The candidate needed to describe a recognised method of lossless compression.
- **(c)(ii)** The candidate needed to ensure that they followed the instructions in the question.

Common mistakes candidates made in this question

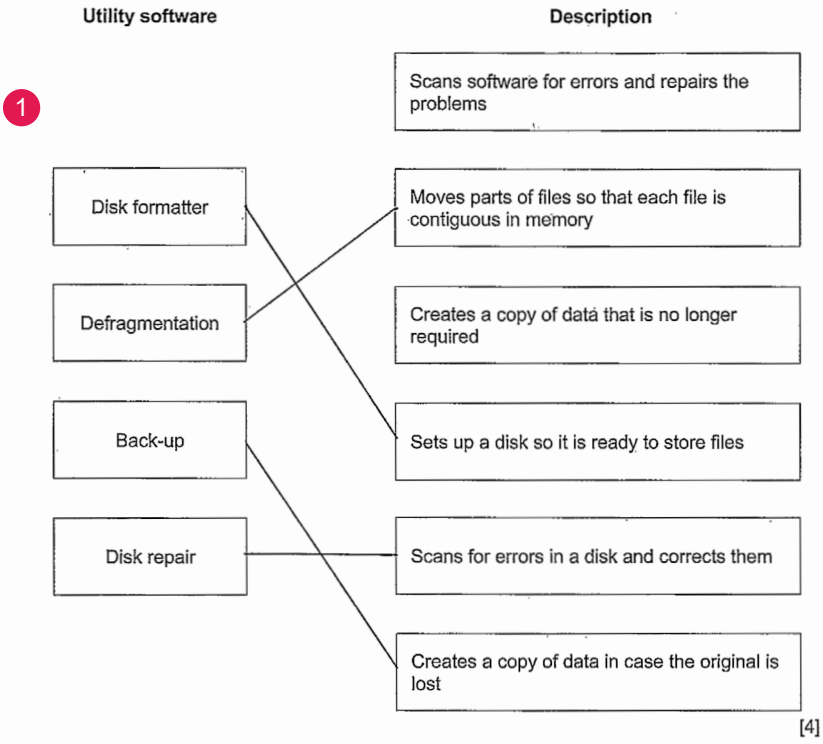
- **(a)(i)** Many candidates included a list of examples without any descriptions. Others used examples that were about any file and not specifically about a graphics file. Where the question gave a context, candidates' answers needed to be focussed on the context.
- **(a)(ii)** Many candidates multiplied the number of pixels by 8 to calculate the number of bits, but then forgot to subsequently divide by 8 to get the number of bytes.
- **(b)** Candidates referred to characters when the question asked about an image. Where the question gave a context, candidates' answers needed to be focussed on the context.
- **(c)(i)** Some candidates gave the answer in binary instead of denary.
- **(c)(ii)** and **(c)(iii)** Some candidates did not make their working obvious. Carry bits needed to be clearly visible.
- **(d)** Many candidates described how copyright could be broken, for example, by plagiarism, rather than stating that copyright gave protection against plagiarism.

Question 2

Example Candidate Response – high	Examiner comments

2 Bingwen's computer comes with an Operating System and utility software.

(a) Draw **one** line from each utility software to its correct description.



[4]

(b) Identify **four** key management tasks that the Operating System will perform.

1 Resource management
2 Memory management
3 Device management
4 Security management

[4]

2

1 The candidate matches all four utility programs to their correct descriptions.

Mark for (a) = 4 out of 4

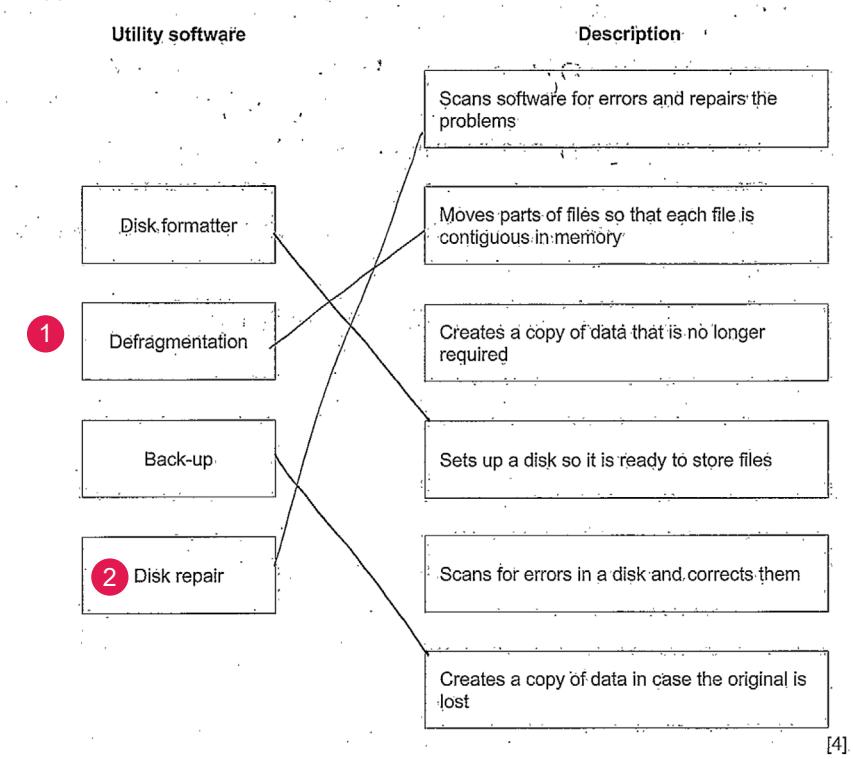
2 The candidate gives three correct management tasks, but device management and resource management are the same mark point so both cannot be awarded a mark.

Mark for (b) = 3 out of 4

Total mark awarded = 7 out of 8

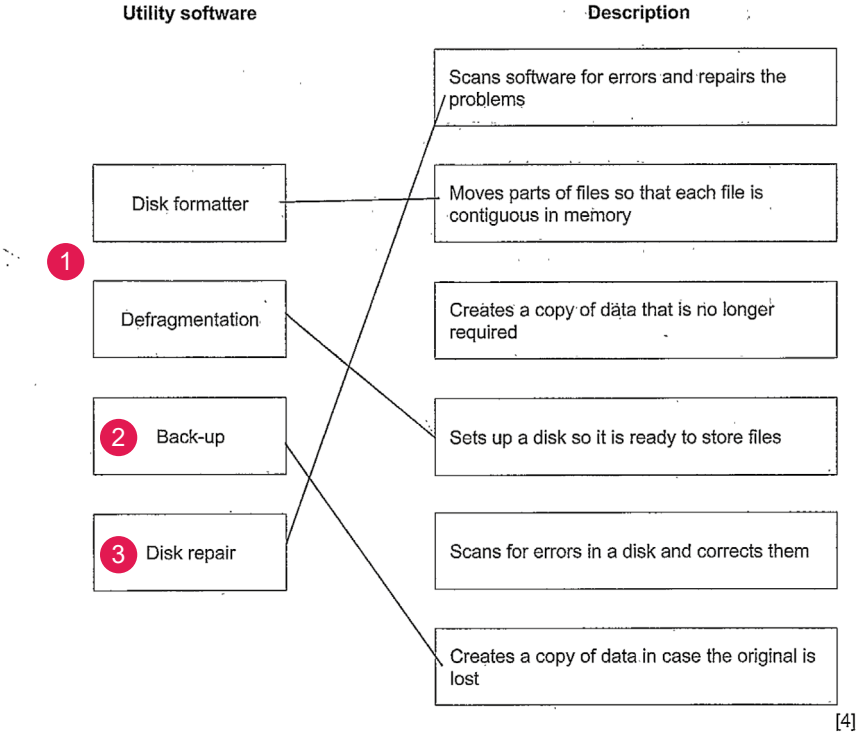
How the candidate could have improved their answer

(b) The candidate could have given a fourth different management task.

Example Candidate Response – middle	Examiner comments
2 Bingwen's computer comes with an Operating System and utility software. (a) Draw **one** line from each utility software to its correct description.  [4] (b) Identify **four** key management tasks that the Operating System will perform. 1 Input/out put management 2 process management 3 Storage management 4 Hardware management. [4]	1 The candidate links three of the utility programs to their correct descriptions. 2 Disk repair scans for errors on a disk, not errors in software. Mark for (a) = 3 out of 4 3 'Storage management' is not precise enough for the candidate to be awarded the mark for file management. Mark for (b) = 3 out of 4 **Total mark awarded = 6 out of 8**

How the candidate could have improved their answer

(a) The candidate needed to read the descriptions carefully and pick up the subtle difference between scanning software and scanning a disk.

Example Candidate Response – low	Examiner comments
2 Bingwen's computer comes with an Operating System and utility software. **(a)** Draw **one** line from each utility software to its correct description.  [4] **(b)** Identify **four** key management tasks that the Operating System will perform. 1 File ~~system~~ management 2 Security management 3 System management. 4 Data management. [4]	1 There is confusion between a disk formatter and defragmentation and the candidate's answers are reversed. 2 The candidate matches back-up to the correct description. 3 Disk repair scans a disk for errors, it does not scan software. Mark for (a) = 1 out of 4 4 The last two answers are not enough for the candidate to be awarded any marks. Mark for (b) = 2 out of 4 **Total mark awarded = 3 out of 8**

Common mistakes candidates made in this question

- **(a)** Some candidates mismatched 'disk repair' with it's description. Candidates needed to read the descriptions carefully.
- **(b)** Many candidates gave answers that could not be mapped to any of the mark points.

Question 3

Example Candidate Response – high

3 A processor has one general purpose register, the Accumulator (ACC), and several special purpose registers.

(a) Complete the following description of the role of the registers in the fetch-execute cycle by writing the missing registers.

The ..Program Program Counter.. holds the address of the next instruction to be loaded. This address is sent to the ..memory address register.. .

1 The ..Memory data register.. holds the data fetched from this address.

This data is sent to the ..algorithm Logic unit.. 2 and the Control Unit decodes the instruction's opcode.

The ..Program Counter.. is incremented.

[5]

(b) The following table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Opcode	Operand	
LDM	#n	Immediate addressing. Load the number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDI	<address>	Indirect addressing: The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the Index Register. Copy the contents of this calculated address to ACC
LDR	#n	Immediate addressing. Load the number n to IX
MOV	<register>	Move the contents of the accumulator to the given register (IX)
STO	<address>	Store contents of ACC at the given address
ADD	<address>	Add the contents of the given address to the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
CMP	<address>	Compare the contents of ACC with the contents of <address>
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False
JMP	<address>	Jump to the given address
OUT		Output to the screen the character whose ASCII value is stored in ACC
END		Return control to the operating system
LSL	#n	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right hand end
LSR	#n	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left hand end
<address> can be an absolute address or a symbolic address # denotes a denary number, e.g. #123		

Examiner comments

1 The candidate correctly identifies four registers.

2 This is not a register. ALU stands for Arithmetic and Logic Unit.

Mark for (a) = 4 out of 5

Example Candidate Response – high, continued

Examiner comments

The current contents of the main memory and selected values from the ASCII character set are shown.

Address	Instruction
200	LDD 365
201	CMP 366
202	JPE 209
203	INC ACC
204	STO 365
205	MOV IX
206	LDX 365
207	OUT
208	JMP 200
209	END
...	
365	1
366	3
367	65
368	66
IX	0

ASCII code table (selected codes only)

ASCII code	Character
65	A
66	B
67	C
68	D

Complete the trace table for the program currently in main memory.

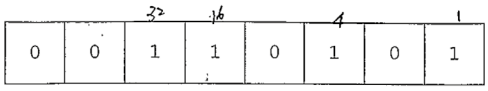
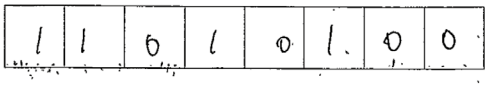
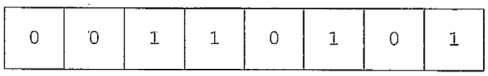
Instruction address	ACC	Memory address				IX	Output
		365	366	367	368		
		1	3	65	66	0	
200	1						
~~203~~ ~~207~~	2						
204		2					
205						2	
206	65						
207							'A'
200	2						
203	3						
204		3					
205						~~3~~	
206	66						
207							'B'
200	3						
209							

[6]

3 The candidate should not include quotation marks on output.

4 The candidate is awarded the mark under the error carried forward rule.

Mark for (b) = 5 out of 6

Example Candidate Response – high, continued	Examiner comments
(c) (i) The Accumulator currently contains the binary number:  0 0 1 1 0 1 0 1 Write the contents of the Accumulator after the processor has executed the following instruction: LSL #2  1 1 0 1 0 1 0 0 [1] (ii) The Accumulator currently contains the binary number:  0 0 1 1 0 1 0 1 Identify the mathematical operation that the following instruction will perform on the contents of the accumulator. LSR #3 Division by 8. [1]	Mark for (c)(i) = 1 out of 1 Mark for (c)(ii) = 1 out of 1 **Total mark awarded = 11 out of 13**

Example Candidate Response – middle

3 A processor has one general purpose register, the Accumulator (ACC), and several special purpose registers.

(a) Complete the following description of the role of the registers in the fetch-execute cycle by writing the missing registers.

The ..memory address register.. holds the address of the next instruction to be loaded. This address is sent to the ..memory data register.. .

The ..memory data register.. holds the data fetched from this address.

This data is sent to the ..current instruction register.. and the Control Unit decodes the instruction's opcode.

The ..program counter.. is incremented.

[5]

(b) The following table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Opcode	Operand	
LDM	#n	Immediate addressing. Load the number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDI	<address>	Indirect addressing: The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the Index Register. Copy the contents of this calculated address to ACC
LDR	#n	Immediate addressing. Load the number n to IX
MOV	<register>	Move the contents of the accumulator to the given register (IX)
STO	<address>	Store contents of ACC at the given address
ADD	<address>	Add the contents of the given address to the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
CMP	<address>	Compare the contents of ACC with the contents of <address>
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False
JMP	<address>	Jump to the given address
OUT		Output to the screen the character whose ASCII value is stored in ACC
END		Return control to the operating system
LSL	#n	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right hand end
LSR	#n	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left hand end

<address> can be an absolute address or a symbolic address
# denotes a denary number, e.g. #123

Examiner comments

1 The candidate's first two answers are incorrect.

Mark for (a) = 3 out of 5

Example Candidate Response – middle, continued

Examiner comments

The current contents of the main memory and selected values from the ASCII character set are shown.

Address	Instruction
200	LDD 365
201	CMP 366
202	JPE 209
203	INC ACC
204	STO 365
205	MOV IX
206	LDX 365
207	OUT
208	JMP 200
209	END
...	
365	1
366	3
367	65
368	66
IX	0

ASCII code table (selected codes only)

ASCII code	Character
65	A
66	B
67	C
68	D

Complete the trace table for the program currently in main memory.

Instruction address	ACC	Memory address				IX	Output
		365	366	367	368		
		1	3	65	66	0	
200	1						
201							False
202							
203	2						
204		2					
205						2	
206	65						
207							A
208	2						
200	2						
201							FALSE
202							
203	3						
204		3					
205						3	
206	66						
207							B
208							
200	3						
201							True
209							End

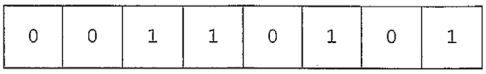
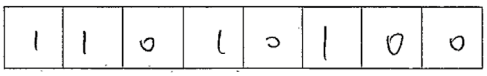
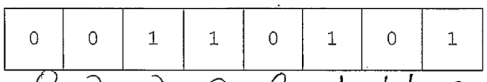
[6]

2 The instruction at address 201 is a 'compare' instruction and does not produce any output.

3 The error carried forward rule does not apply here.

4 The END instruction at address 209 does not produce any output.

Mark for (b) = 3 out of 6

Example Candidate Response – middle, continued	Examiner comments
(c) (i) The Accumulator currently contains the binary number:  0 0 1 1 0 1 0 1 Write the contents of the Accumulator after the processor has executed the following instruction: LSL #2  [1] **(ii)** The Accumulator currently contains the binary number:  0 0 1 1 0 1 0 1 Identify the mathematical operation that the following instruction will perform on the contents of the accumulator. LSR #3 .... [1]	Mark for (c)(i) = 1 out of 1 Mark for (c)(ii) = 0 out of 1 **Total mark awarded = 7 out of 13**

How the candidate could have improved their answer

(b) The candidate needed to leave the OUTPUT column solely for the results of the OUT instruction.

Example Candidate Response – low

3 A processor has one general purpose register, the Accumulator (ACC), and several special purpose registers.

(a) Complete the following description of the role of the registers in the fetch-execute cycle by writing the missing registers.

The .....~~data bus~~ PC: 1..... holds the address of the next instruction to be loaded. This address is sent to the .....~~&~~ ~~FPA~~ ALU:..... .

The .....address bus..... holds the data fetched from this address.

This data is sent to the .....accumulator..... and the Control Unit decodes the instruction's opcode. 2

The .....fetch bus..... is incremented.

[5]

(b) The following table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Opcode	Operand	
LDM	#n	Immediate addressing. Load the number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDI	<address>	Indirect addressing: The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the Index Register. Copy the contents of this calculated address to ACC
LDR	#n	Immediate addressing. Load the number n to IX
MOV	<register>	Move the contents of the accumulator to the given register (IX)
STO	<address>	Store contents of ACC at the given address
ADD	<address>	Add the contents of the given address to the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
CMP	<address>	Compare the contents of ACC with the contents of <address>
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False
JMP	<address>	Jump to the given address
OUT		Output to the screen the character whose ASCII value is stored in ACC
END		Return control to the operating system
LSL	#n	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right hand end
LSR	#n	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left hand end

<address> can be an absolute address or a symbolic address
# denotes a denary number, e.g. #123

Examiner comments

1 The candidate gives the correct abbreviation which is accepted as an answer.

2 The last four answers the candidate gives are not registers.

Mark for (a) = 1 out of 5

Example Candidate Response – low, continued

Examiner comments

The current contents of the main memory and selected values from the ASCII character set are shown.

Address	Instruction
200	LDD 365
201	CMP 366
202	JPE 209
203	INC ACC
204	STO 365
205	MOV IX
206	LDX 365
207	OUT
208	JMP 200
209	END
...	
365	1
366	3
367	65
368	66
IX	0

ASCII code table (selected codes only)

ASCII code	Character
65	A
66	B
67	C
68	D

Complete the trace table for the program currently in main memory.

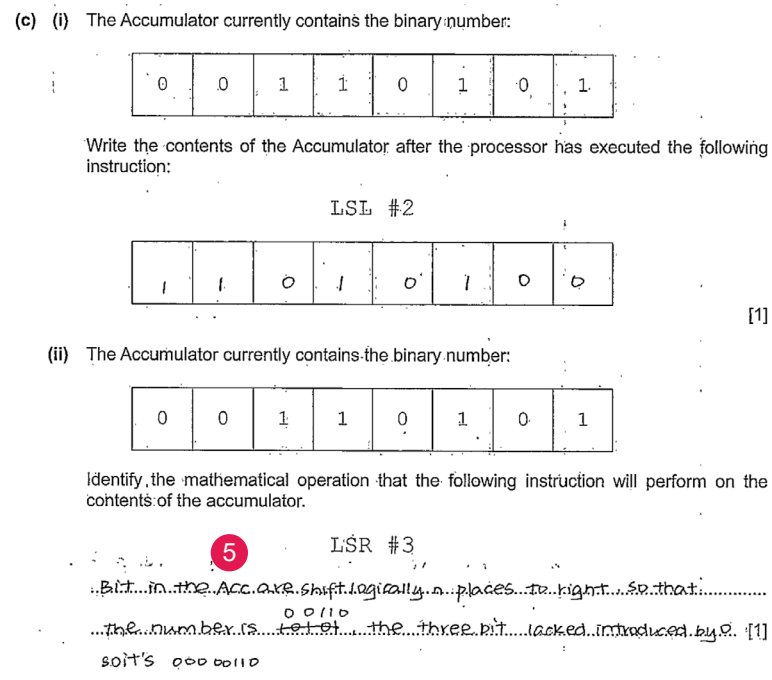
Instruction address	ACC	Memory address				IX	Output
		365	366	367	368		
200	1	1	3	65	66	0	
201	0		1				
202	0						
203	2						
204	1						
205	0					0	
206	1						
207	1						
208	1						
209	1						

[6]

3 The first instruction is correctly executed.

4 The candidate incorrectly enters a zero into the ACC when the value does not change.

Mark for (b) = 1 out of 6

Example Candidate Response – low, continued	Examiner comments
	Mark for (c)(i) = 1 out of 1 5 The candidate describes the instruction instead of stating the mathematical operation performed. Mark for (c)(ii) = 0 out of 1 **Total mark awarded = 3 out of 13**

(c) (i) The Accumulator currently contains the binary number:

0	0	1	1	0	1	0	1

Write the contents of the Accumulator after the processor has executed the following instruction:

LSL #2

1	1	0	1	0	1	0	0

[1]

(ii) The Accumulator currently contains the binary number:

0	0	1	1	0	1	0	1

Identify the mathematical operation that the following instruction will perform on the contents of the accumulator.

LSR #3

5

Bit in the Acc are shift logically n places to right so that 00110 the number is left at the three bit lacked introduced by 0. [1]

so it's 00000110

How the candidate could have improved their answer

(b) The candidate should not have made an entry to the ACC when an instruction did not change its value.

Common mistakes candidates made in this question

- **(a)** The command line in the question asked that the 'missing registers' were written into the spaces. Many candidates gave components that were not registers.
- **(b)** Some candidates used quotation marks on the output and others included END in the output when the instruction in address 209 was executed.

Question 4

Example Candidate Response – high

4 Melinda and her friends set up a peer-to-peer network between their computers to share data.

(a) Describe the key features of a peer-to-peer network.

Instead of having a centralised server, all the nodes are connected to each other through ~~eg~~ different topologies. In this network a node (Melinda for example) does both sending and receiving of ~~certain~~ all files. If she wants to download a file, she requests from her peers. Distributed parts of the file over the network. So Melinda owns part of the file. [2]

(b) Describe **two** drawbacks to Melinda and her friends of using a peer-to-peer network.

1 Very easy to get hacked / send malicious code and files. With this network you are placing trust in each 'peer' to send over the correct file. However, Someone with malicious intent can send over viruses, trojans, etc. because there is no security check done by the network.

2 If one node (eg. Melinda's friend) fails, the other users ~~the~~ might not be able to finish down loading a file. This is because every node contains part of the file. Additionally if one user has slow (internet) ~~bandwidth~~ bandwidth they might cause a huge traffic on the network, ~~from that~~ thus taking a long time to download or bad ~~data~~ connection [4]

(c) Melinda connects her laptop to the internet through her router.

(i) Tick (✓) **one** box in each row to identify whether the task is performed by the router or not.

Task	Performed by router	Not performed by router
Receives packets from devices	✓	
Finds the IP address of a Uniform Resource Locator (URL)		✓
Directs each packet to all devices attached to it	✓	
Stores the IP and/or MAC address of all devices attached to it	✓	

[2]

Examiner comments

1 The candidate recognises that there being no central server is equivalent to all computers being of equal status.

2 The candidate gives a good description which matches the second mark point about each computer providing access to resources.

Mark for (a) = 2 out of 2

3 The candidate identifies reduced security as a drawback and they make a good supporting point, so they are awarded the second mark.

4 The computer failing matches the last mark point and the candidate makes a good supporting statement.

Mark for (b) = 4 out of 4

Mark for (c)(i) = 1 out of 2

Example Candidate Response – high, continued

(ii) Melinda mainly uses the internet to watch films and play computer games.

Tick (✓) **one** box to identify whether Melinda should connect to the router using a wired or wireless network **and** justify your choice.

Wired	✓ 5
Wireless	

6

Justification A wired connection allows less interference so it maintains a more consistent connection. This prevents buffering and unexpected errors. A wired 7 connection also allows area for faster bandwidth during Melinda's 8 movie/gaming sessions. Finally using a wired connection is simple as it takes just one ethernet cable (eg CAT6) to from the router to Melinda's device. It allows for a 'plug-and-play'. The Wired methods are also more secure, allowing a smaller chance of Me getting hacked. [3]

(d) Melinda sends emails from her webmail account (email account accessed through a website).

Explain whether Melinda is using the internet, or the World Wide Web (WWW), or both.

9 Melinda is using both. Melinda is currently using the internet (a large infrastructure of the www) to access the World Wide Web (a large collection of all the webpages written in HTML, CSS, PHP, Javascript, etc.) which contains email services. She sends an email on the www through the internet. The internet uses TCP/IP protocols, where www uses HTTP or HTTPS protocols. 10 [3]

Examiner comments

5 The candidate's answers match the type of network indicated.

6 The candidate maps less interference to a more stable connection.

7 The candidate maps preventing buffering to fewer delays.

8 The candidate identifies greater bandwidth as a justification for a wired network.

Mark for (c)(ii) = 3 out of 3

9 The candidate correctly identifies that Melinda is using both.

10 The candidate gives no explanation of how the Internet and the World Wide Web are used to send the email.

Mark for (d) = 1 out of 3

Total mark awarded = 11 out of 14

How the candidate could have improved their answer

(d) The candidate could have applied their knowledge about the Internet and the World Wide Web to the sending of an email.

Example Candidate Response – middle

4 Melinda and her friends set up a peer-to-peer network between their computers to share data.

(a) Describe the key features of a peer-to-peer network.

All members of the network are connected to (1) each other and are considered equals. Each peer has access to another peer software and data, allowing peers to share functions and information (2) [2]

(b) Describe **two** drawbacks to Melinda and her friends of using a peer-to-peer network.

1 A peer-to-peer network becomes harder to manage as the network expands. The more peers that are added, the more complex the system gets (3)

2 A peer-to-peer network becomes is less secure and relies on trust. A peer could carry out malicious attacks on other peers, or accidentally introduce malicious software into the network. (4) [4]

(c) Melinda connects her laptop to the internet through her router.

(i) Tick (✓) **one** box in each row to identify whether the task is performed by the router or not.

Task	Performed by router	Not performed by router
Receives packets from devices	✓	
Finds the IP address of a Uniform Resource Locator (URL)		✓
Directs each packet to all devices attached to it	✓	
Stores the IP and/or MAC address of all devices attached to it	✓	

[2]

Examiner comments

(1) The candidate is awarded the mark for their comments that all computers are of equal status.

(2) This statement is equivalent to computers communicating and sharing resources.

Mark for (a) = 2 out of 2

(3) 'Harder to manage' is not enough to be awarded a mark. The word 'harder' does not match to difficult. It only shows it is more complex to manage as the number of computers increases. It could, however, still be simple to manage.

(4) The candidate identifies reduced security as a drawback, but their supporting statement is not enough to be awarded the second mark.

Mark for (b) = 1 out of 4

Mark for (c)(i) = 1 out of 2

Example Candidate Response – middle, continued	Examiner comments

(ii) Melinda mainly uses the internet to watch films and play computer games.

Tick (✓) **one** box to identify whether Melinda should connect to the router using a wired or wireless network **and** justify your choice.

Wired	✓
Wireless	

Justification Wired transmission is normally faster than wireless transmission, as allowing data to be transferred more quickly. Wired transmission is also more stable and reliable than wireless transmission, as wireless transmission is easily affected by other electromagnetic waves and obstacles. [3]

(d) Melinda sends emails from her webmail account (email account accessed through a website).

Explain whether Melinda is using the internet, or the World Wide Web (WWW), or both.

Melinda uses the World Wide Web to access her webmail account, both of which are connected to the Internet. The World Wide Web is only part of the larger Internet, and is not made up of a bunch of ~~es~~ servers. Thus, she is using both the Internet and the World Wide Web. [3]

5 The candidate makes three appropriate points and they match the choice of network.

Mark for (c)(ii) = 3 out of 3

6 The candidate does not explain how the Internet and the World Wide Web are used to send the email.

7 The candidate is correct to identify that both are used.

Mark for (d) = 1 out of 3

Total mark awarded = 8 out of 14

How the candidate could have improved their answer

- **(b)** The candidate needed to state a second drawback to the use of a peer-to-peer network and make sure that the supporting statements were complete.
- **(d)** The candidate needed to explain how the Internet and the World Wide Web are used when sending the email.

Example Candidate Response – low

4 Melinda and her friends set up a peer-to-peer network between their computers to share data.

(a) Describe the key features of a peer-to-peer network.

each computer can both act as a server or a client. ✓ 1

Also, it is easier for a new computer to join in. 2

[2]

(b) Describe **two** drawbacks to Melinda and her friends of using a peer-to-peer network.

1 it is difficult to manage so many computers in peer to peer network.

2 it is loss of centralism - security. 3

[4]

(c) Melinda connects her laptop to the internet through her router.

(i) Tick (✓) **one** box in each row to identify whether the task is performed by the router or not.

Task	Performed by router	Not performed by router
Receives packets from devices		✓
Finds the IP address of a Uniform Resource Locator (URL)	✓	
Directs each packet to all devices attached to it	✓	
Stores the IP and/or MAC address of all devices attached to it		✓

[2]

Examiner comments

1 The candidate is awarded the first mark point.

2 The candidate does not give a description of a feature of the network.

Mark for (a) = 1 out of 2

3 The candidate identifies two drawbacks, but they give no supporting statements.

Mark for (b) = 2 out of 4

Mark for (c)(i) = 0 out of 2

Example Candidate Response – low, continued

(ii) Melinda mainly uses the internet to watch films and play computer games.

Tick (✓) **one** box to identify whether Melinda should connect to the router using a wired or wireless network **and** justify your choice.

Wired	✓
Wireless	

Justification since he is watching films and play computer games, the bandwidth or the transfer rate is extremely important. Undeniably, the wired network has fiber-optical which has good bandwidth. Additionally, it doesn't need repeater. However, if he stays at a closed room, the wireless network signal may suffer interference or intervention, it can be weak [3]

(d) Melinda sends emails from her webmail account (email account accessed through a website).

Explain whether Melinda is using the internet, or the World Wide Web (WWW), or both.

I think it uses both. To begin with, when she send an email, she opens a web page which uses HTTP protocol. ~~which is~~ They are the characteristics of WWW. Moreover, the process of sending email ~~will use~~ need connection between her and others which ~~is characteristics of~~ uses TCP/IP protocol. These are characteristics of Internet [3]

Examiner comments

4 'The transfer rate is important' is not enough. However, the next sentence matches the choice of network and maps and the candidate is awarded the first mark point.

5 The candidate's statement about a wireless network does not match the choice they make.

Mark for (c)(ii) = 1 out of 3

6 The candidate identifies the use of both.

7 The candidate understands that a connection is needed to send the email and that a connection is a characteristic of the Internet. This is just enough to be awarded a mark.

Mark for (d) = 2 out of 3

Total mark awarded = 6 out of 14

How the candidate could have improved their answer

- **(a)** The candidate needed to include a second feature of a peer-to-peer network.
- **(b)** The candidate could have included some supporting statements for the two drawbacks they identified.
- **(c)(ii)** The candidate needed to apply all the statements to the chosen network (wired).
- **(d)** The candidate could have stated how the World Wide Web is used when sending the email.

Common mistakes candidates made in this question

- **(a)** Many candidates gave answers that applied to many other networks and not specifically to a peer-to-peer network. Some described the BitTorrent protocol rather than a network or confused a peer-to-peer network with a mesh topology.
- **(b)** Some candidates stated one or two drawbacks, but then did not include any supporting statements. There were four marks available for two answers, so each answer needed an identification and a supporting statement.
- **(c)(ii)** Some candidates' justification did not match their choice of network.
- **(d)** Many candidates wrote what was meant by the Internet and the World Wide Web, but did not answer the question of how they were used in the sending of the email.

Question 5

Example Candidate Response – high

5 Kiara has a washing machine and a refrigerator.

(a) She has an embedded system in her washing machine.

Describe what is meant by an **embedded system**, using the washing machine as an example.

It's a system which performs a specific task, usually simple, 1
For example, washing machine may be turned on or
off remotely using an app. 2

[2]

(b) The washing machine's embedded system makes use of both Random Access Memory (RAM) and Read Only Memory (ROM).

State the purpose of RAM and ROM within the washing machine's embedded system.

RAM Store currently running ~~use~~ data about embedded
system, like current instruction to turn on/off it. 3
ROM Store boot up instruction, like ~~os of embb~~
operating system of embedded system 4

[2]

(c) The temperature in her refrigerator must be kept between 4 and 6 degrees Celsius.

The microprocessor in the refrigerator turns on the cooling if the temperature is too high, and turns off the cooling if the temperature is too low.

Explain why the system in the refrigerator is a control and not a monitoring system.

5 The system will use actuator to adjust and take
action, by comparing the value received from
temperature sensors (4 and 6°C) with pre-set value. So, it's
controlling according to feedback, while monitoring system
only gives warning message. 6

[2]

Examiner comments

1 The candidate identifies the performance of a specific task.

2 The candidate gives an appropriate example.

Mark for (a) = 2 out of 2

3 The candidate needs to give a stronger example.

4 This maps to the start-up instructions.

Mark for (b) = 1 out of 2

5 The candidate identifies that the system takes an action and is awarded a mark.

6 The candidate correctly identifies the use of feedback.

Mark for (c) = 2 out of 2

Total mark awarded = 5 out of 6

How the candidate could have improved their answer

(b) The candidate could have given a stronger example.

Example Candidate Response – middle	Examiner comments

5 Kiara has a washing machine and a refrigerator.

(a) She has an embedded system in her washing machine.

Describe what is meant by an **embedded system**, using the washing machine as an example.

An embedded system is that microcomputer and software is embedded in ~~appliance~~ appliance applicants. 1 The embedded system in washing machine is made up of hardware, system software and BIOS. It can enable washing machine to do simple operations, like controlling motors, recording time. 2 [2]

(b) The washing machine's embedded system makes use of both Random Access Memory (RAM) and Read Only Memory (ROM).

State the purpose of RAM and ROM within the washing machine's embedded system.

RAM stores the currently running programs like the speed of motor, the steps of washing. 3

ROM stores the boot up files of the washing machine like its operating system. 4 [2]

(c) The temperature in her refrigerator must be kept between 4 and 6 degrees Celsius.

The microprocessor in the refrigerator turns on the cooling if the temperature is too high, and turns off the cooling if the temperature is too low.

Explain why the system in the refrigerator is a control and not a monitoring system.

There are sensors in the refrigerator, ~~to tell send feedback~~ to send signs to the microprocessor. The microprocessor will judge the temperature and ask actuator to do something. 5 If the temperature is too high or too low, the system will not give feedback to tell people, so it is not 6 a monitoring system. [2]

1 The candidate's description is not detailed enough.

2 The candidate needs to use a stronger example.

Mark for (a) = 0 out of 2

3 The candidate identifies a good example.

4 This maps to the start-up instructions.

Mark for (b) = 2 out of 2

5 The candidate correctly identifies that the system takes an action.

6 The candidate's statement about feedback is incorrect.

Mark for (c) = 1 out of 2

Total mark awarded = 3 out of 6

How the candidate could have improved their answer

(a) The candidate needed to give a better description and a stronger example to improve their answer.

Example Candidate Response – low	Examiner comments

5 Kiara has a washing machine and a refrigerator.

(a) She has an embedded system in her washing machine.

Describe what is meant by an **embedded system**, using the washing machine as an example.

can embeded system is a small piece of system that can run independently with some simple instruction. For example the user interface on the washing machine the embeded system has already been tested and debugged and it only process very limited instruction. [2]

1 The candidate's answer does not describe an embedded system.

Mark for (a) = 0 out of 2

(b) The washing machine's embedded system makes use of both Random Access Memory (RAM) and Read Only Memory (ROM).

State the purpose of RAM and ROM within the washing machine's embedded system.

RAM RAM is use to store the current process or task of the washing machine, it also store the next and waiting task and process.

ROM ROM is use to store the initial system of washing machine like the BIOS and the operating system of it. [2]

2 The candidate's answer is generic and they do not apply it to the washing machine.

3 This maps to the start-up instructions.

Mark for (b) = 1 out of 2

(c) The temperature in her refrigerator must be kept between 4 and 6 degrees Celsius.

The microprocessor in the refrigerator turns on the cooling if the temperature is too high, and turns off the cooling if the temperature is too low.

Explain why the system in the refrigerator is a control and not a monitoring system.

Because the purpose of the refrigerator is to take action while it received the instruction from the microprocessor and control the temperator. It is used to turn on and off the cooling to maintain the setting temperature so it is a control system but not monitoring system. A monitoring system would be the interaction between temperature sensor and microprocessor [2]

4 The candidate correctly identifies that the system takes action and they are awarded a mark.

5 The candidate needed to comment on the use of feedback to be awarded the second mark.

Mark for (c) = 1 out of 2

Total mark awarded = 2 out of 6

How the candidate could have improved their answer

(b) The candidate needed to apply their statement about the contents of RAM to the washing machine.

Common mistakes candidates made in this question

- **(a)** Many candidates tried to describe an embedded system by using the same word, for example, an embedded system is a system embedded in the washing machine.
- **(b)** Many candidate gave generic answers about the purpose of RAM and did not apply them to the washing machine scenario.
- **(c)** Some candidates described actions not performed by a monitoring system, but they needed to explain why the system described was a control system.

Question 6

Example Candidate Response – middle

6 Each of the following algorithms performs data validation.

State the type of validation check that each of the algorithms performs.

(a)

```
INPUT x
IF x < 0 OR x > 10 THEN
  OUTPUT "Invalid"
ENDIF
```

Range check ..... [1]

(b)

```
INPUT x
IF x = "" THEN
  OUTPUT "Invalid"
ENDIF
```

Presence Check. ..... [1]

(c)

```
INPUT x
IF NOT(x = "Red" OR x = "Yellow" OR x = "Blue") THEN
  OUTPUT "Invalid"
ENDIF
```

Select data from the list ..... [1]

Examiner comments

1 The candidate's first two answers are correct.

Mark for (a) = 1 out of 1

Mark for (b) = 1 out of 1

2 This is not the name of a verification check, it is a partial explanation of the code.

Mark for (c) = 0 out of 1

Total mark awarded = 2 out of 3

Example Candidate Response – low	Examiner comments

6 Each of the following algorithms performs data validation.
 	
State the type of validation check that each of the algorithms performs.
 	
(a)
 	
`INPUT x`
`IF x < 0 OR x > 10 THEN`
`  OUTPUT "Invalid"`
`ENDIF`
Range check (1) ..... [1]
 	
(b)
 	
`INPUT x`
`IF x = "" THEN`
`  OUTPUT "Invalid"`
`ENDIF`
appórient check (2) ..... [1]
 	
(c)
 	
`INPUT x`
`IF NOT(x = "Red" OR x = "Yellow" OR x = "Blue") THEN`
`  OUTPUT "Invalid"`
`ENDIF`
~~Range check~~ type check (3) ..... [1]
	(1) The candidate's answer is correct.
	
	Mark for (a) = 1 out of 1
	
	(2) This is not any recognisable verification check.
	
	Mark for (b) = 0 out of 1
	
	(3) The candidate's answer is incorrect.
	
	Mark for (c) = 0 out of 1
	
	Total mark awarded = 1 out of 3

Common mistakes candidates made in this question

Many candidates explained the code instead of naming the verification check.

Question 7

Example Candidate Response – high

7 Bobby and Kim are discussing databases.

(a) Bobby tells Kim that a file-based approach is usually better than a relational database.

Explain why Bobby is incorrect.

No data are stored in multiple tables that are linked together which increases data redundancy and data dependencies. 1

Data integrity is reduced as data needs to be updated more than once. 2

[3]

(b) Bobby has a shop that sells products to customers. His database will store data about his customers, their payment details, orders and the products he sells. Customers will have login details to access their accounts. The database will update customers' payment and login details without keeping any historical records.

(i) Give **one** example of each of the following relationships from Bobby's database.

one-to-one

Customer table linked to Account table. 3

Primary key

one-to-many

CustomerID in Customer table is linked to foreign key CustomerID in ShopDetails table. 4

many-to-many

Customer table is linked to Product table. 5

[3]

(ii) Tick (✓) **one** box to identify the relationship that cannot be directly implemented in a normalised relational database.

Relationship	Tick (✓)
one-to-one	
one-to-many	
many-to-many	✓

[1]

Examiner comments

1 The candidate correctly identifies increased data redundancy.

2 The candidate correctly identifies reduced data integrity.

Mark for (a) = 2 out of 3

3 The candidate gives a correct one-to-one relationship.

4 The candidate's answer is incorrect for two reasons. Firstly there is no indication that a ShopDetails table would be required for this scenario and secondly the answer is given using attribute names rather than entities.

5 The candidate gives a correct many-to-many relationship.

Mark for (b)(i) = 2 out of 3

Mark for (b)(ii) = 1 out of 1

Example Candidate Response – high, continued	Examiner comments
(iii) Bobby wants to name his database SHOPORDERS. Write a Data Definition Language (DDL) statement to define a new database with the name SHOPORDERS. CREATE DATABASE SHOPORDERS ; [1] (c) A database has a data dictionary. Give **three** items that are stored in a data dictionary. 1 Data Types. 2 Validations. 6 3 keys. [3]	Mark for (b)(iii) = 1 out of 1 6 The candidate identifies two correct answers but their third answer is not specific enough. Mark for (c) = 2 out of 3 **Total mark awarded = 8 out of 11**

How the candidate could have improved their answer

- **(a)** The candidate could have identified a third reason why the statement was incorrect, or they could have expanded further on the reasons they gave. The candidate needed to make it clear that redundancy occurs because the same data is repeated in different records in a flat-file and updating requires a change to every record containing that data, which may lead to inconsistencies. They could further improve their answer if they had stated whether the redundancy and reduced integrity applied to a flat-file or a relational database.
- **(b)(i)** The candidate wrote their answers in terms of links between tables, but they needed to write them in terms of the entities rather than the tables.
- **(b)** The candidate needed to identify the keys.

Example Candidate Response – middle

7 Bobby and Kim are discussing databases.

(a) Bobby tells Kim that a file-based approach is usually better than a relational database.

Explain why Bobby is incorrect.

A file-based ~~approach~~ approach can have many problems such as data privacy, data redundancy and data integrity. By using a relational database, it can limit access to ~~the~~ parts of database to certain people so there is improved data privacy. ~~I can check~~ Also, ~~if~~ a relational database does not need to be reprogrammed each time ~~the~~ new data is added, but ~~if~~ for file-based it has to be reprogrammed. [3]

(b) Bobby has a shop that sells products to customers. His database will store data about his customers, their payment details, orders and the products he sells. Customers will have login details to access their accounts. The database will update customers' payment and login details without keeping any historical records.

(i) Give **one** example of each of the following relationships from Bobby's database.

one-to-one

Customer ID to Login Details.

one-to-many

Customer ID to Orders.

many-to-many

Orders to ~~Product he sells~~ Product Selling.

[3]

(ii) Tick (✓) **one** box to identify the relationship that cannot be directly implemented in a normalised relational database.

Relationship	Tick (✓)
one-to-one	
one-to-many	
many-to-many	✓

[1]

Examiner comments

1 The candidate identifies data redundancy in a flat file and is awarded the first mark.

2 The candidate identifies improved data privacy in a relational database to be awarded the second mark.

Mark for (a) = 2 out of 3

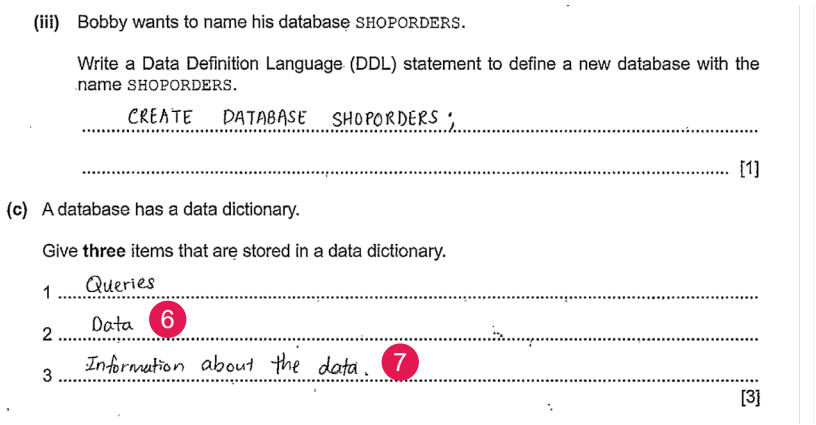
3 The candidate uses an attribute rather than the entity, so they are not awarded the mark.

4 The candidate is awarded the mark here under the error carried forward rule.

5 The candidate gives a correct many-to-many relationship.

Mark for (b)(i) = 2 out of 3

Mark for (b)(ii) = 1 out of 1

Example Candidate Response – middle, continued	Examiner comments
	Mark for (b)(iii) = 1 out of 1 6 The candidate's first two answers are items found in a DataBase Management System (DBMS), not in a data dictionary. 7 The candidate's third answer is a description of a data dictionary, not something that would be stored in it. Mark for (c) = 0 out of 3 **Total mark awarded = 6 out of 11**

(iii) Bobby wants to name his database SHOPORDERS.

Write a Data Definition Language (DDL) statement to define a new database with the name SHOPORDERS.

CREATE DATABASE SHOPORDERS;

[1]

(c) A database has a data dictionary.

Give **three** items that are stored in a data dictionary.

1 Queries

2 Data 6

3 Information about the data. 7

[3]

How the candidate could have improved their answer

- **(a)** The candidate correctly identified that there could be problems in a flat-file with data privacy and data integrity, but they did not state the nature of the problem. The candidate's answer needed to refer to poor data privacy or reduced data integrity. The candidate could have improved their statement about a flat-file needing to be reprogrammed if they had made it clear that adding new data referred to changes to the record structure and not just adding another record.
- **(b)(i)** The candidate needed to use the entity rather than the primary key.

Example Candidate Response – low

7 Bobby and Kim are discussing databases.

(a) Bobby tells Kim that a file-based approach is usually better than a relational database.

Explain why Bobby is incorrect.

There are three points that a relational database is better than file-based.

1. All the data are stored once only, which save time and memory.

2. All the data in a database will also be available on others, so prevent the difference between database. 1

2 3. To prevent inconsistency which means that the database are all connected prevent the primary key in one database doesn't match the foreign key in another one. [3]

(b) Bobby has a shop that sells products to customers. His database will store data about his customers, their payment details, orders and the products he sells. Customers will have login details to access their accounts. The database will update customers' payment and login details without keeping any historical records.

(i) Give **one** example of each of the following relationships from Bobby's database.

one-to-one

Customers and payment details 3

one-to-many

Products and payment details

many-to-many

Customers and payment details

[3]

(ii) Tick (✓) **one** box to identify the relationship that cannot be directly implemented in a normalised relational database.

Relationship	Tick (✓)
one-to-one	
one-to-many	
many-to-many	✓

[1]

Examiner comments

1 The candidate's first two answers have insufficient detail and they are confused about the use of 'database' and 'table'.

2 The candidate correctly identifies the prevention of inconsistency as a benefit of a relational database.

Mark for (a) = 1 out of 3

3 The candidate gives a correct one-to-one relationship.

Mark for (b)(i) = 1 out of 3

Mark for (b)(ii) = 1 out of 1

Example Candidate Response – low, continued	Examiner comments
(iii) Bobby wants to name his database SHOPORDERS. Write a Data Definition Language (DDL) statement to define a new database with the name SHOPORDERS. CREATE DATABASE SHOPORDERS [1] **(c)** A database has a data dictionary. Give **three** items that are stored in a data dictionary. 1 How to open, create, ~~detetate~~ delete a table 2 How to ates, save, exert a database 4 3 How to tiansfer format of database in different computer [3]	Mark for (b)(iii) = 1 out of 1 4 These are not items stored in a data dictionary. Mark for (c) = 0 out of 3 **Total mark awarded = 4 out of 11**

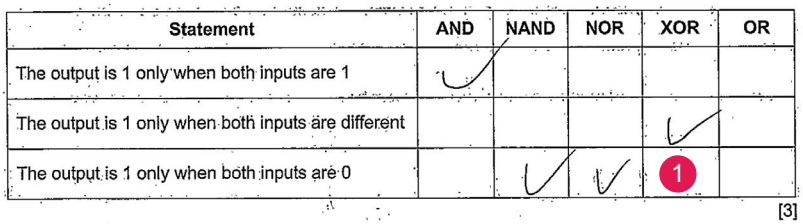
How the candidate could have improved their answer

- **(a)** The candidate needed to state why a flat-file was not usually better than a relational database. They also needed to use the appropriate technical words, such as ‘redundancy’ or ‘integrity’ in their answer.

Common mistakes candidates made in this question

- **(a)** Many candidates used the words ‘data dependency’, rather than the correct term ‘program-data dependency’, or did not include a description to explain the term given. That is, that the programs accessing a flat-file would need to change if the structure of a record changed, for example, by adding a new field.
- **(b)(i)** Many candidates used attributes instead of the entities.
- **(b)(iii)** Many candidates misspelled the database name and used the CREATE TABLE statement instead of the CREATE DATABASE statement.
- **(c)** Some candidates listed items found in a DBMS rather than items found in a data dictionary.

Question 8

Example Candidate Response – middle	Examiner comments
8 Tick (✓) **one** box in each row to identify the logic gate that each statement describes.  [3]	1 The candidate ticks two boxes in the bottom row when they are asked to only tick one. **Total mark awarded = 2 out of 3**

How the candidate could have improved their answer

The candidate needed to read the question carefully and take note of the instruction to tick one box in reach row.

Example Candidate Response – middle

8 Tick (✓) **one** box in each row to identify the logic gate that each statement describes.

Statement	AND	NAND	NOR	XOR	OR
The output is 1 only when both inputs are 1	✓				
The output is 1 only when both inputs are different				✓	
The output is 1 only when both inputs are 0		✓	1		

[3]

Examiner comments

1 The candidate confuses NAND with NOR.

Total mark awarded =
2 out of 3

Example Candidate Response – low	Examiner comments
8 Tick (✓) **one** box in each row to identify the logic gate that each statement describes. [3]	1 The candidate confuses OR with XOR. 2 The candidate confuses NAND with NOR. **Total mark awarded = 1 out of 3**

Statement	AND	NAND	NOR	XOR	OR
The output is 1 only when both inputs are 1	✓				
The output is 1 only when both inputs are different				1	✓
The output is 1 only when both inputs are 0		✓	2		

Common mistakes candidates made in this question

Many candidates ticked more than one box in a row.

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