Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Sample assessment material for first teaching
September 2020

Time: 1 hour 30 minutes

Paper Reference **1CP2/01**

Computer Science

Paper 1: Principles of Computer Science

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You are not allowed to use a calculator.

Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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S 6 7 2 8 5 A 0 1 1 6

Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Data

(a) Identify the smallest unit of measurement.

(1)

☒ **A** bit

☒ **B** byte

☒ **C** kibibyte

☒ **D** nibble

(b) Identify the maximum number of values that can be represented with 5 bits.

(1)

☒ **A** 5

☒ **B** 16

☒ **C** 25

☒ **D** 32

(c) A car park uses a number-plate recognition system.

(i) Identify the reason why an unsigned integer should be used to record the number of cars entering the car park, rather than a signed integer.

(1)

☒ **A** Unsigned integers are more accurate

☒ **B** Unsigned integers cannot have overflow errors

☒ **C** Unsigned integers store more positive values

☒ **D** Unsigned integers do not use a parity bit

(ii) The system stores images of car number plates.

Construct an expression to show how many bytes there are in 6 tebibytes.

You do not need to carry out the calculation.

(3)

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(d) Identify the 4-bit binary addition that will result in an overflow error.

(1)

- ☒ **A** 1001+1000
- ☒ **B** 0011+1001
- ☒ **C** 1000+0110
- ☒ **D** 0111+1000

(e) Give the 8-bit binary representation of the denary number 82.

(2)

(f) (i) Convert the binary number 0011 1101 to hexadecimal.

(2)

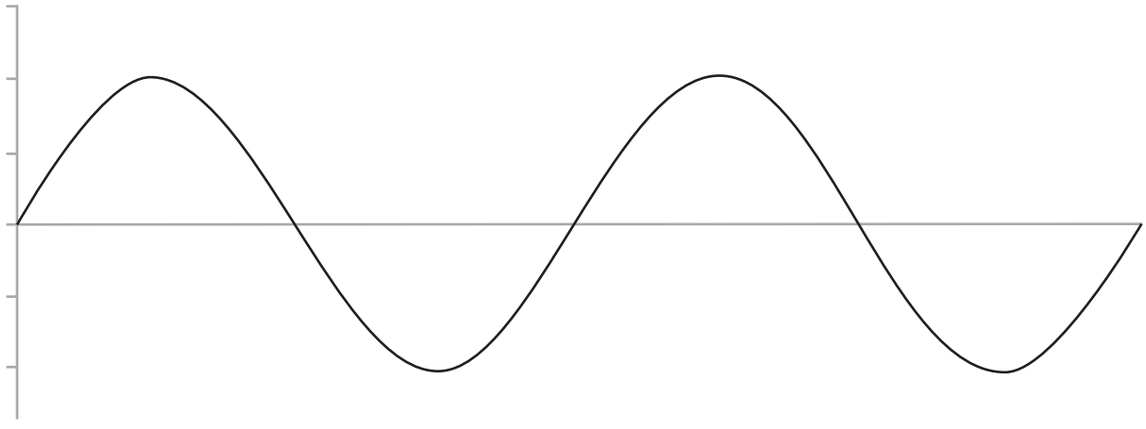
(ii) Explain why hexadecimal notation is used.

(2)

(g) An analogue to digital converter is used to change the sounds received by a microphone into a form that can be processed by a computer.

Complete the diagram to show a sample interval and label both axes.

(3)



(h) An image uses a 12-bit colour depth. It is 64 pixels wide and 48 pixels high.

Construct an expression to calculate the file size of the image in MiB.

You do not have to do the calculation.

(4)

(Total for Question 1 = 20 marks)

2 Networks

(a) A hotel chain has hotels in several countries and a head office in England.

State the type of network needed to connect these hotels to the head office.

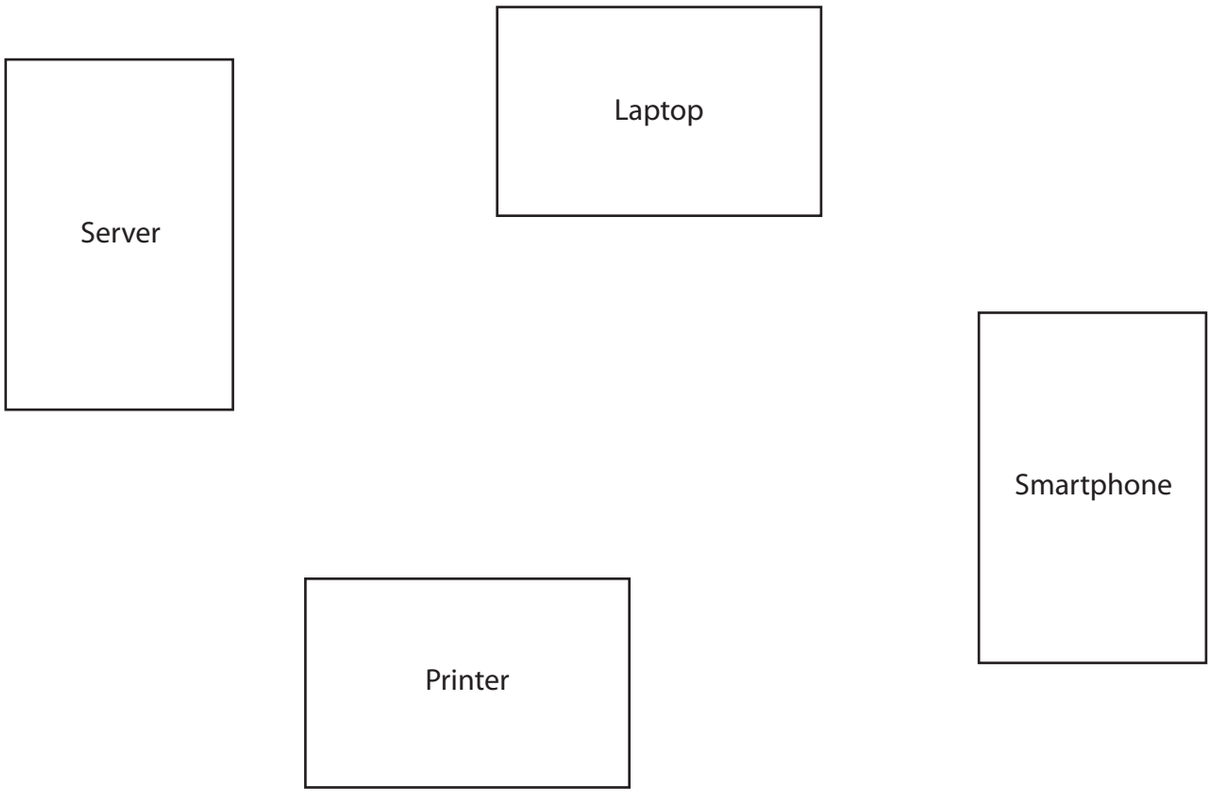
(1)

.....

.....

(b) Draw lines between these devices to show a fully-connected mesh network topology diagram:

(2)



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(c) Routers send packets that contain data around the internet.

State **two other** items found in a packet.

(2)

1 .....

.....

2 .....

.....

(d) The transport layer of network protocols splits data into packets before sending it. All the packets are received correctly.

Describe the process that ensures the data received matches the original.

(2)

.....

.....

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.....

(e) Construct an expression to show how many seconds it will take to transmit 20 MiB of data using a network transmission speed of 2 Mbps.

You do not have to do the calculation.

(4)

(Total for Question 2 = 11 marks)

3 Issues and impact

(a) State **two** environmental issues associated with the disposal of digital technology.

(2)

1 .....

.....

2 .....

.....

(b) This notification appears on a computer screen.

Thank you for clicking our link.
Your important files are no longer accessible.

Can I get access to my files?
Yes, you can. Simply send your payment as described below.

How long do I have?
14 days.

How do I pay?
Send £500 in Bitcoin to abc123def456ghi789.

(i) Name the type of malware used in this cyberattack.

(1)

.....

.....

(ii) Explain **one** way that digital systems may be vulnerable to cyberattacks when users do not properly maintain their software.

(2)

.....

.....

.....

.....

(c) People use spoken commands to interact with digital assistants.

Explain **one** ethical concern associated with digital assistant technologies.

(2)

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(d) Students are asked to sign an acceptable use policy.

Explain **one** way that an acceptable use policy helps to protect student data.

(2)

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(Total for Question 3 = 9 marks)

4 Computers

(a) One function of utility software is to provide anti-malware.

State **two other** functions of utility software.

(2)

1 .....

.....

2 .....

.....

(b) State **one** way that a code review helps programmers to produce robust software.

(1)

.....

.....

(c) Describe the role of the control unit, the control bus, the data bus and the address bus when fetching an instruction from memory.

(4)

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(d) The operating system controls the scheduling of processes.

Describe how the operating system uses scheduling to allocate processor time.

(4)

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(e) A team of programmers is creating the code for an alarm system. The system uses a high-level programming language for the touchscreen graphical user interface and a low-level language for the control unit that monitors the sensors and triggers the alarm.

Discuss the characteristics of high-level languages and low-level languages that make them appropriate for the team of programmers to code these uses.

Your answer should consider:

- the purpose of the system
- the advantages of high-level languages
- the advantages of low-level languages.

(6)

(Total for Question 4 = 17 marks)

5 Computational thinking

(a) State the type of error that can be found in **algorithms**.

(1)

.....

.....

(b) A binary search algorithm is used with this list to find the target value 'b'.

a b c d e f g h i j k

Complete the table to show the **three** characters in the order that the algorithm would compare them against the target value.

(3)

First	
Second	
Third	
Fourth	b

(c) Programmers can use all capitals to show that a value is a constant.

A constant is shown here on line 3.

```
2  # Prototype for the main swimming pool
3  MAX_CAPACITY = 120      # Maximum number of swimmers
4
5  numAdult = 14           # Current number of adults swimming
6  numChild = 73           # Current number of children swimming
```

Explain **one** reason why programmers use signals indicating a value is a constant, rather than repeating the same fixed value throughout an algorithm.

(2)

.....

.....

.....

.....

(d) Margaret owns an ice-cream shop.

This program manipulates sales figures from Margaret's shop.

```
num = 0
x = 999
y = 0
line = ""

f = open("SalesFile.txt", "r")
for line in f:
    num = int(line)
    if num < x:
        x = num
    if num > y:
        y = num
print(x, y)
f.close()
```

The only inputs from the file to the program are 355, 554, 199 and 409.

Complete the trace table showing the execution of the program with these four inputs.

You may not need to fill in all the rows in the table.

(6)

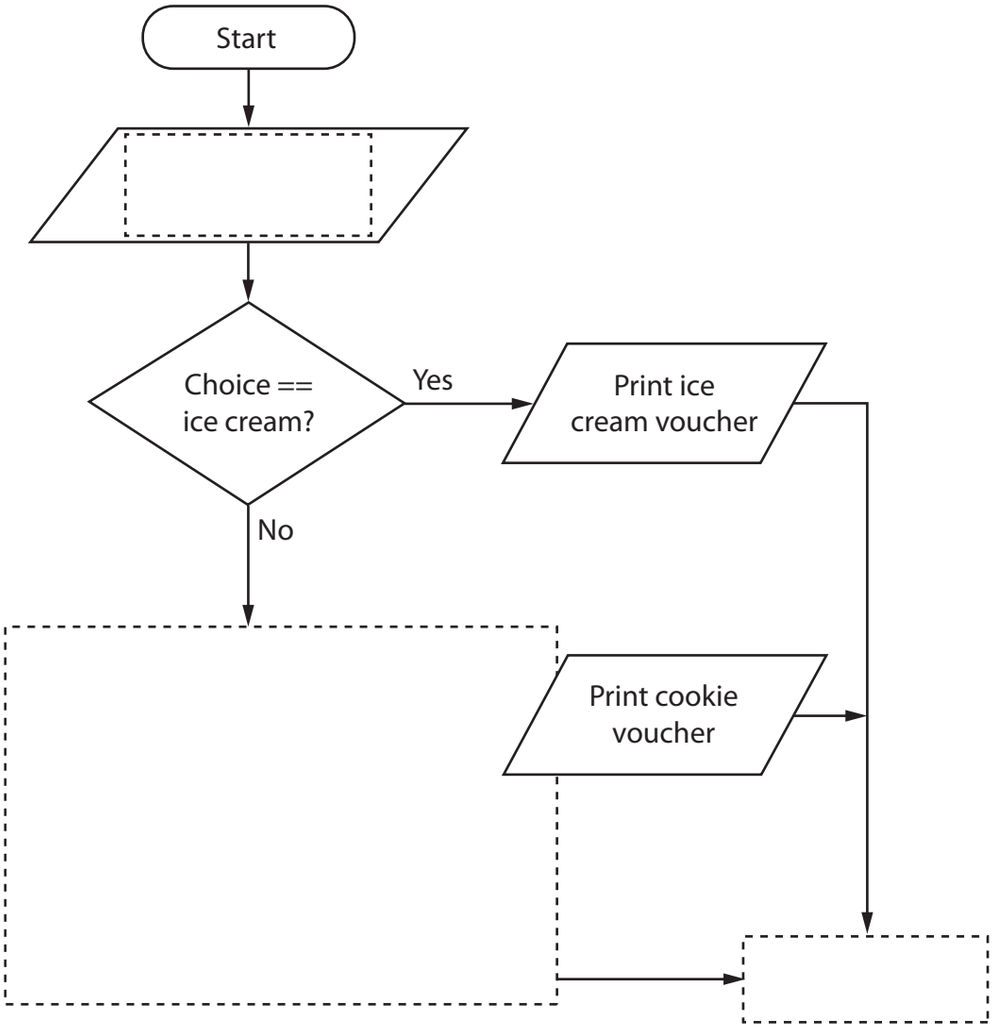
num	x	y	Display

(e) Customers can get a voucher for their favourite item.

- Customers whose favourite item is ice cream get a voucher for ice cream.
- Customers whose favourite item is cookies get a voucher for cookies.
- Customers who do not choose either get a voucher for drinks.

Complete the flowchart to show this process.

(6)



(Total for Question 5 = 18 marks)

TOTAL FOR PAPER = 75 MARKS

Paper 1 mark scheme

Question number	Answer	Additional guidance	Mark
1(a)	**A** bit ***B*** *is not correct because a bit is smaller than a byte* ***C*** *is not correct because a bit is smaller than a kibibyte* ***D*** *is not correct because a bit is smaller than a nibble*		**(1)**

Question number	Answer	Additional guidance	Mark
1(b)	**D** 32 ***A*** *is not correct because 5 bits can represent 32 values* ***B*** *is not correct because 5 bits can represent 32 values* ***C*** *is not correct because 5 bits can represent 32 values*		**(1)**

Question number	Answer	Additional guidance	Mark
1(c)(i)	**C** Unsigned integers store more positive values ***A*** *is not correct because unsigned integers are not more accurate* ***B*** *is not correct because overflow errors can still occur with unsigned integers* ***D*** *is not correct because the use of a parity bit is not relevant to the scenario*		**(1)**

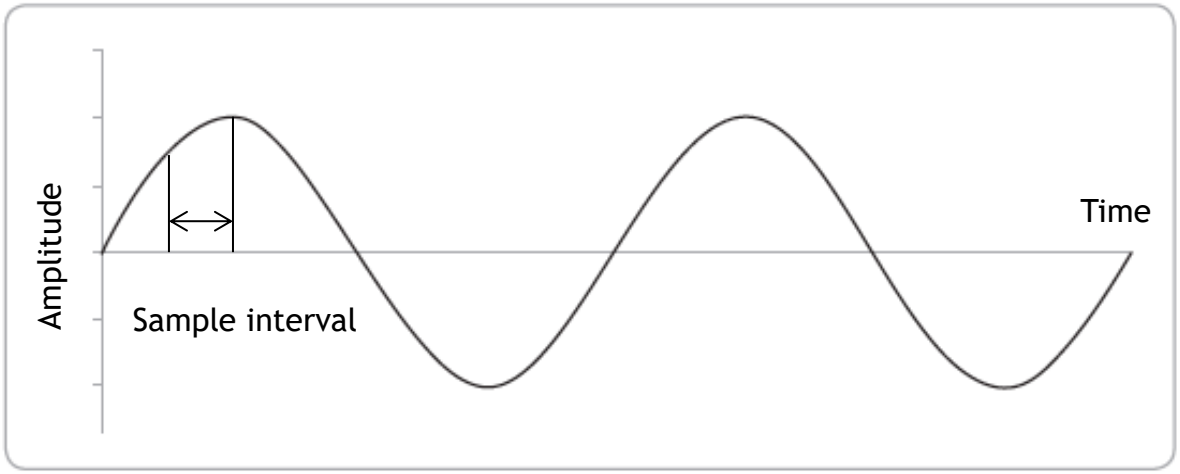
Question number	Answer	Additional guidance	Mark
1(c)(ii)	6×1024^4 Award **1** mark for sight of 1024 Award **1** mark for sight of ^{4} (applied only to 1024) Award **1** mark for sight of x6 Award **all** marks if the result of the calculation is given: 6,597,069,766,656 (bytes). **N.B.** This is not needed or expected.	Equivalent expressions are awarded.	**(3)**

Question number	Answer	Additional guidance	Mark
1(d)	**A** 1001+1000 ***B*** *is not correct because it will result in 1100* ***C*** *is not correct because it will result in 1110* ***D*** *is not correct because it will result in 1111*		**(1)**

Question number	Answer	Additional guidance	Mark
1(e)	0101 0010	Award 1 mark for each nibble in the correct location.	**(2)**

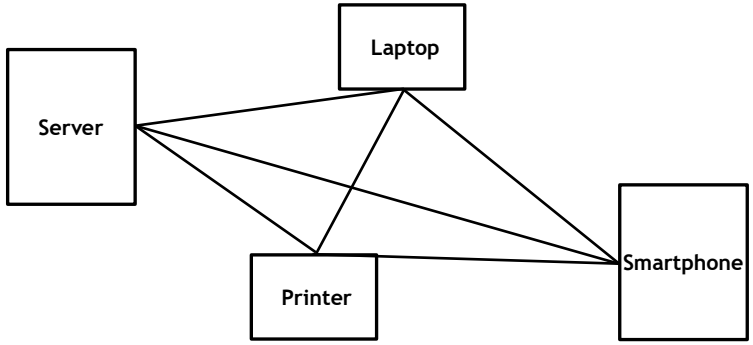
Question number	Answer	Additional guidance	Mark
1(f)(i)	3D	Award 1 mark for each nibble in the correct location.	**(2)**

Question number	Answer	Additional guidance	Mark
1(f)(ii)	Award **1** mark for the identification of the reason (1) with a linked justification/exemplification (1), up to a maximum of **2** marks. Hexadecimal is used as shorthand for binary / uses fewer digits/characters (1), so **humans** make fewer mistakes / find it easier to read/understand/remember/manipulate (1).	Do not accept answers suggesting that fewer digits save storage/memory.	**(2)**

Question number	Answer	Additional guidance	Mark
1(g)	X axis correctly labelled (1) Y axis correctly labelled (1) Sample interval indicated (1) Do not award marks if wavelength is labelled rather than sample interval. Accept for sample interval if two points given that are shorter than the wavelength.  	Accept a unit of time for the X axis. Accept signal strength for the Y axis.	**(3)**

Question number	Answer	Additional guidance	Mark
1(h)	Award **1** mark for: Sight of: 64 × 48 x 12 Award **1** mark for: Sight of: 1024 x 8 Award **1** mark for: Sight of: (1024) × (1024) **OR** $(1024)^2$ Award **1** mark for correct numerator/denominator orientation. Examples of expressions that gains full marks: $\frac{64 \times 48 \times 12}{1024 \times 1024 \times 8}$	Accept any other equivalent mathematical expression.	**(4)**

Question number	Answer	Additional guidance	Mark
2(a)	WAN/Wide Area Network		**(1)**

Question number	Answer	Additional guidance	Mark
2(b)	 • **1** mark for at least two connections to each device. • **2** marks for three connections to each device.		**(2)**

Question number	Answer	Additional guidance	Mark
2(c)	Any **two** items from: • Destination address (1) • Source address (1) • Error checking field / check sum (1) • Time stamp (1) • Sequence number (1). Accept any other appropriate response.		**(2)**

Question number	Answer	Additional guidance	Mark
2(d)	A linked description that makes reference to the following points: Each packet has a sequence number (added at the sending end) (1) The packets are put back into (sequence) order (at the destination) (1).		**(2)**

Question number	Answer	Additional guidance	Mark
2(e)	Total number of bits to transfer: **1** mark for 20×1024^2 **1** mark for $\times 8$ Speed in bits per second: **1** mark for 2×1000000 Numerator/denominator: **1** mark for $$\frac{bits\ to\ transfer}{bits\ per\ second}$$ e.g.: $$\frac{20 \times 1024 \times 1024 \times 8}{2 \times 1000000}$$	Any equivalent expression to be awarded.	**(4)**

Question number	Answer	Additional guidance	Mark
3(a)	Any **two** issues from: • Waste materials end in landfill (1) • Dangerous toxins are released into the ground/water (1) • Waste is transported overseas (carbon emissions) (1).		**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	Ransomware		**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(ii)	Award **1** mark for the identification of a way (1) with a linked justification/exemplification (1), up to a maximum of **2** marks. • Software may contain security bugs (1) because it is unpatched (1). • Anti-malware may not identify an attack (1) because the virus definitions are out of date (1). Accept any other appropriate response.		**(2)**

Question number	Answer	Additional guidance	Mark
3(c)	Award **1** mark for the identification of an ethical concern (1) with a linked justification/exemplification (1), up to a maximum of **2** marks. • The data may no longer be private (1) because companies may share it (1). • People may not realise their data is analysed (1) because it is unclear who owns the data (1). • People are willing to sacrifice (some) privacy (1) in return for access to services (1). Accept any other appropriate response.		**(2)**

Question number	Answer	Additional guidance	Mark
3(d)	Award **1** mark for the identification of a way (1) with a linked justification/exemplification (1), up to a maximum of **2** marks. • Students are deterred from unsafe practices (1) because consequences are clarified (1). • People follow safe/good practices (1) because permitted activities are defined/set out (1). Accept any other appropriate response.		**(2)**

Question number	Answer	Additional guidance	Mark
4(a)	Any **two** functions from: • Repairing files (1) • Compression (1) • Defragmentation (1) • Back-up (1) • Firewall (1) • Managing application updates (1) • Formatting disks/drives (1) • System analysis tools (1).		**(2)**

Question number	Answer	Additional guidance	Mark
4(b)	Any **one** way from: • By identifying bad programming practices (1) • By identifying vulnerabilities in the code (1) • By checking for efficiency of code (1).	Do not accept 'Checking for errors' if not qualified with 'not picked up in testing'.	**(1)**

Question number	Answer	Additional guidance	Mark
4(c)	A linked description that makes reference to the **four** following points: • The address of memory (holding instruction) is placed on the address bus (1). • The control unit sends a signal (1) on the control bus (to start a read operation) (1). • The instruction is/the contents of the memory are placed on the data bus (1).		**(4)**

Question number	Answer	Additional guidance	Mark
4(d)	A linked description that makes reference to any **four** of the following points: • All processes are held in a queue (1) • Processes are prioritised (1) • Processes are allocated time slices (1) • Length of time slice depends on priority (1) • (and) processes are switched (at the end of their time slice) (1) • Unfinished processes are put to the back of the queue (1) • During the time slice the process has exclusive use of the processor (1).		**(4)**

Question number	Indicative content	Mark
4(e)	Advantages of high-level languages: • High-level languages come with libraries of ready-made graphical user interface components (buttons, icons and menus), which the team can use to reduce the amount of code they have to write from scratch. • High-level languages have a range of integrated development tools, editors and syntax checkers, which will enable the team to develop the interface code more efficiently. • Portability is a real consideration: should the company decide to use a different chipset in the future, programs written in a high-level language won't need to be rewritten. They can be recompiled to run on new architecture relatively quickly. • High-level languages use keywords, which will enable team members to read and understand the code for the user interface more easily. • There are lots of people who can program in a high-level language, making it relatively easy to recruit experienced programmers to the user interface team. • As high-level language translators exist for a range of operating systems, each member of the user interface team can develop code in their preferred environment. Advantages of low-level languages: • Code written in assembly language normally executes more quickly and takes up less memory than code written in a high-level language. This may be crucial to enable the control unit for the alarm system to function effectively. • There may be no high-level language for the microprocessor chip inside the control unit, so an assembly language would have to be used for it. • Code written in assembly language allows the programmer to directly control system hardware.	**(6)**

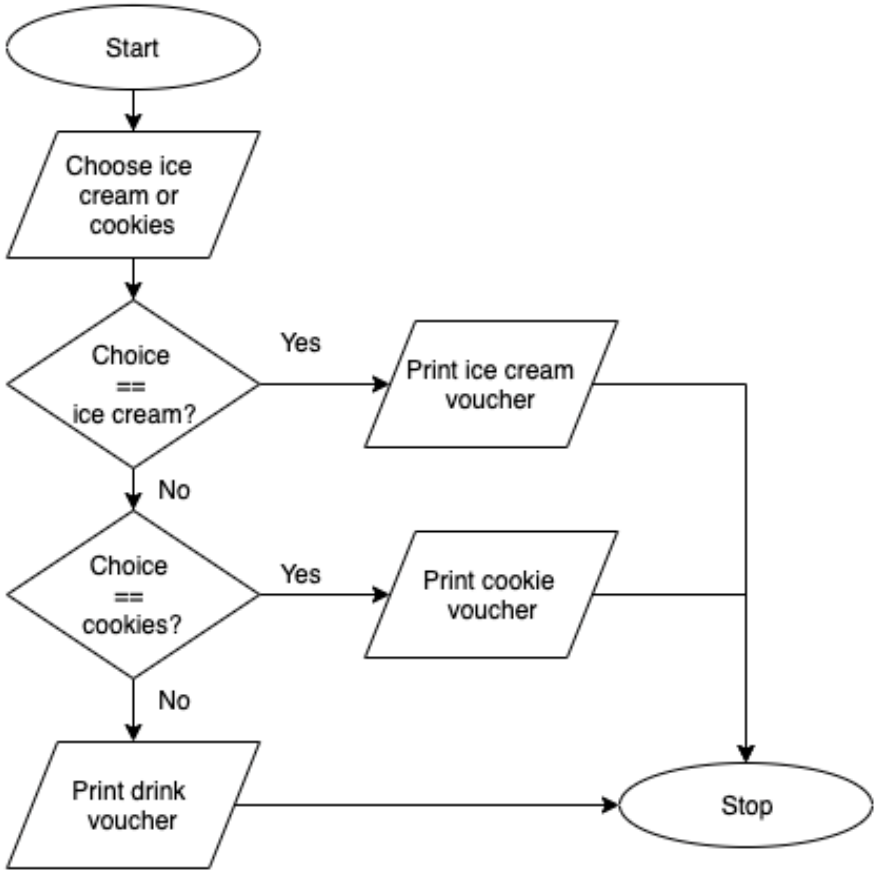
Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

Question number	Answer	Additional guidance	Mark
5(a)	Logic		**(1)**

Question number	Answer	Additional guidance	Mark
5(b)	Award **1** mark for each correct cell. First: f Second: c Third: a Fourth: b		**(3)**

Question number	Answer	Additional guidance	Mark
5(c)	Award **1** mark for the identification of a reason (1) with a linked justification/exemplification (1), up to a maximum of **2** marks. • Constants (shown in all capitals) are less likely to be changed by accident or error (1), so algorithms that use them should be more robust (1). • If the value of a constant does have to be altered (1), only one change is required (on the line where it is created and set) (1). • Constants allow values to be replaced with a name/identifier (1), so code is easier to read/maintain (1).		**(2)**

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>5(d)</td><td>1 mark for initialising all variables and 1 mark for each correct pass through the loop.
<table>
<tr><th>num</th><th>x</th><th>y</th><th>Display</th><th>Marks</th></tr>
<tr><td>0</td><td>999</td><td>0</td><td></td><td>(1)</td></tr>
<tr><td>355</td><td>355</td><td>355</td><td></td><td>(1)</td></tr>
<tr><td>554</td><td></td><td>554</td><td></td><td>(1)</td></tr>
<tr><td>199</td><td>199</td><td></td><td></td><td>(1)</td></tr>
<tr><td>409</td><td></td><td></td><td></td><td>(1)</td></tr>
<tr><td></td><td></td><td></td><td>199 554</td><td>(1)</td></tr>
</table></td><td>• Award alternative versions of the trace table if correct. For example, copying of values that do not change.
• Passes are incorrect if display is indicated.
• Display must be after the final pass (on a separate line in the table).</td><td>(6)</td></tr>
</table>

Question number	Answer	Additional guidance	Mark
5(e)	• Correct message in output box acting as a prompt for the user (1). • Correct diamond symbol for decision (1). • Correct test 'Choice == cookies?' for decision (1). • Correct label 'Yes' on right arrow AND Correct label 'No' on bottom arrow (1). • Correct output symbol with suitable message (1). • Correct ellipse symbol and 'stop' for terminator (1). 	• Symbol and contents are awarded independently. • Award 'End', 'Stop', 'Start' and 'Begin' as text for terminator symbols. • Award '==' and '=' used for equivalence inside decision symbol, but not in process symbol. • Accept 'Input choice' as an alternative response in the top process symbol	**(6)**