

2 Four descriptions of programming techniques and five programming techniques are given.

Draw one line from each description to the relevant technique. Not all techniques will be used.

Description	Programming technique
adding up a set of numbers	output
displaying the result of a calculation	selection
executing a set of instructions based on a condition	totalling
executing the same set of instructions multiple times	iteration
	counting

[4]

1 A computer stores data temporarily in random access memory (RAM).

(a) RAM is one example of primary storage.

Give one other example of primary storage.
..... [1]

(b) Give one reason why data is only stored temporarily in the RAM.

..... [1]

(c) The denary numbers 19 and 230 are converted to binary numbers to be stored in the RAM.

Convert the two denary numbers to binary numbers.
19
230 [2]

Working space
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(d) The hexadecimal numbers 35 and 8AD are converted to binary numbers to be stored in the RAM.

Convert the two hexadecimal numbers to binary numbers.
35
8AD [2]

Working space
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- (e) The 8-bit binary numbers 01100101 and 01110000 are stored in RAM.

The binary numbers are added together.

Add the **two** binary numbers using binary addition.

Give your answer in binary. You must show all your working.

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    0 1 1 0 0 1 0 1
+   0 1 1 1 0 0 0 0

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[3]

- (f) An overflow occurs when two other 8-bit binary numbers are added together.

Explain why the overflow error occurs.

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..... [2]

- (g) The negative denary number -22 is stored in RAM.

Negative denary numbers can be represented as binary using two's complement.

Give the two's complement 8-bit binary integer that would be stored for the denary number -22.

You must show all your working.

Working space

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Two's complement 8-bit binary integer [2]

- 5 A hospital has computers and technology that it uses when caring for its patients.

- (a) One computer is an expert system that is used to help diagnose a patient's illness.

The doctor inputs the patient's symptoms into an interface and a diagnosis is output.

Describe how the expert system decides the diagnosis.

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..... [3]

- (b) The hospital has a robot that is used to perform surgery. A doctor controls the robot from a different location to perform surgery on a patient.

- (i) One feature of the robot is that it has electrical components.

Give **two** examples of the electrical components of a robot.

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2 [2]

- (ii) Explain the advantages of using the robot to perform surgery.

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..... [4]

..... [2]

- Complete and annotate the diagram to show how the web page is requested for the patient.



[6]

- [6]

[6]

- [2]

[2]

- (b) The website asks a user to input their username and password to log into their account.

The company want to make their login system more secure.

Tick (✓) **one** box to show **one** other security method that could be added to make the login system more secure.

- | | |
|--------------------------------|--------------------------|
| A access levels | ☐ |
| B firewall | ☐ |
| C spyware | ☐ |
| D two-step verification | ☐ |

[1]

- (c) The company uses a proxy server to keep the web server safe from distributed denial of service (DDoS) attacks.

- (i) Complete and annotate a diagram to show how a DDoS attack is carried out on the web server.



[5]

- (ii) Identify **two** tasks that can be performed by a proxy server that are **not** performed by a firewall.

- 1
- 2

[2]

- (d) The company uses cookies to allow users to keep items in a shopping cart. The items remain in the cart after the user closes their web browser.

- (i) Tick (✓) **one** box to show the type of cookie that is used for this process.

- | | |
|---------------------|--------------------------|
| A dynamic | ☐ |
| B persistent | ☐ |
| C session | ☐ |
| D static | ☐ |

[1]

- (ii) Give **three** other ways that the company can use cookies.

- 1
- 2
- 3

[3]

- (iii) Cookies are stored by a web browser.

Give **two** other functions of a web browser.

- 1
- 2

[2]

1 The size of a file can be measured using different units.

(a) Tick (✓) **one** box to show which of these is **not** a unit of measurement for a file.

- | | | |
|----------|--------|--------------------------|
| A | bit | ☐ |
| B | bot | ☐ |
| C | nibble | ☐ |
| D | byte | ☐ |

[1]

(b) The size of a file can be reduced by compressing it.

(i) Give **two** types of compression that can be used to reduce the size of a file.

- 1
- 2

[2]

(ii) Give **three** benefits of reducing the size of a file for storage and transmission.

- 1
- 2
- 3

[3]

2 A car park has a payment machine that allows a customer to pay for their parking.

The cost of parking is displayed as a denary number on a screen on the payment machine.

The cost of parking is stored in two 8-bit binary registers.

For the parking cost of \$10.50:

- register 1 stores the denary value 10 as binary
- register 2 stores the denary value 50 as binary.

(a) Give the parking cost that would be displayed on the payment machine when the registers store:

- register 1: 00010001
- register 2: 01000110

Parking cost displayed \$ [2]

Working space

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- (b)** The parking cost of \$14.98 is displayed on the payment machine.

Give the 8-bit binary numbers that are stored in the registers to display the parking cost.

Register 1

Register 2

[2]

Working space

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- (c)** The payment machine gives the customer a ticket when they have paid their parking cost. Each ticket has a 4-digit hexadecimal ticket number that is stored as binary.

The binary number 1010000000111101 is stored for a customer's ticket number.

Give the hexadecimal ticket number that would be displayed on this customer's ticket.

Hexadecimal ticket number [4]

Working space

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- (d)** Explain why data input into the payment machine needs to be converted to binary.

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..... [2]

- (e)** When a customer is leaving the car park they arrive at a barrier. The customer needs to insert their ticket into a system at the barrier. This system reads the ticket number then checks whether the parking cost has been paid for the car. The barrier is raised if it has been paid.

The system uses a microprocessor.

Describe the role of the microprocessor in the system and how it checks whether the parking cost has been paid.

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