FOR OFFICIAL USE

N5

National Qualifications 2018

Mark

X816/75/01 Computing Science

TUESDAY, 22 MAY
1:00 PM – 3:00 PM

X8167501

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth
Day Month Year

Scottish candidate number

Total marks — 110

SECTION 1 — 25 marks

Attempt ALL questions.

SECTION 2 — 85 marks

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

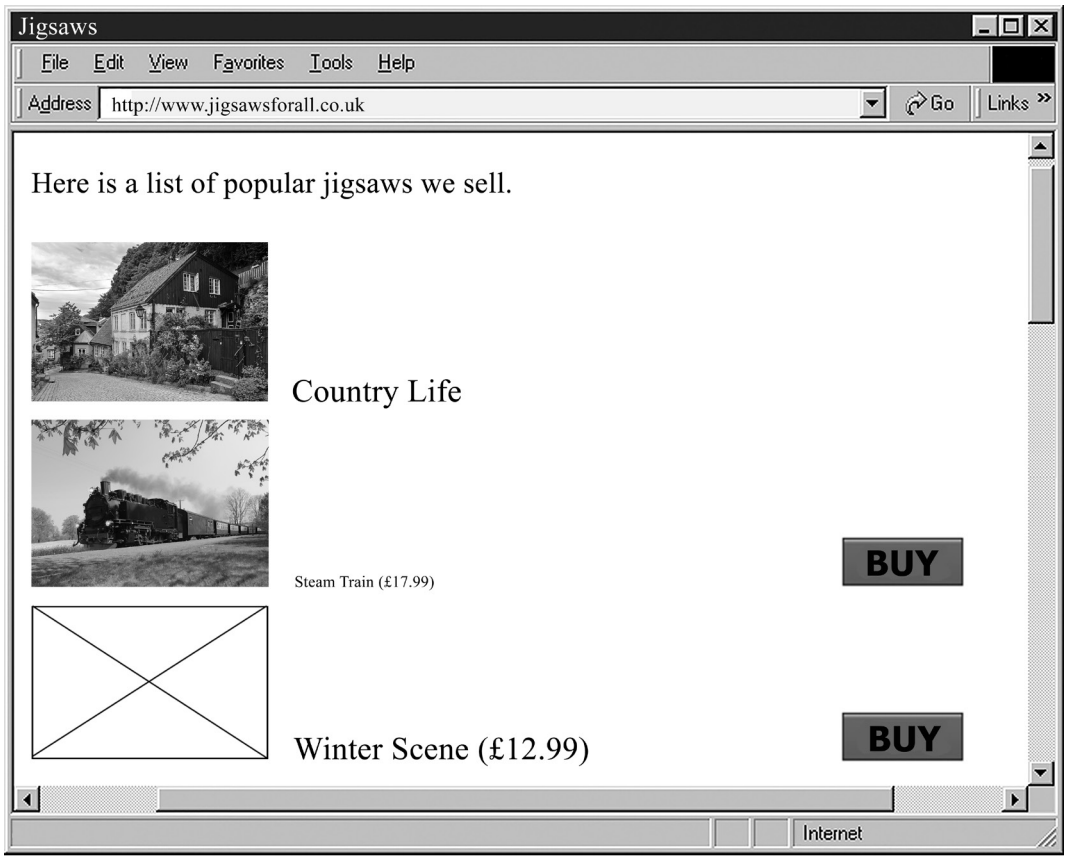
SECTION 1 — 25 marks

Attempt ALL questions

1. State a graphic file type suitable for storing an animated logo. **1**

_____

2. The web page below was created to sell jigsaws online.



State two reasons why the above web page is not fit for purpose. **2**

Reason 1 _____

_____

Reason 2 _____

_____

3. Describe one method used to reduce the file size of a sound file without altering its running time. **1**

_____

_____

4. The program below is used to switch a security light on or off depending on a reading taken from a light sensor.

```
Line 1  DECLARE storedLight INITIALLY 765.2
Line 2  RECEIVE reading FROM <light sensor>
Line 3  IF reading < storedLight THEN
Line 4        <switch on light>
Line 5  ELSE
Line 6        <switch off light>
Line 7  END IF
```

(a) State the smallest light sensor value that would result in the security light being off. **1**

_____

(b) The value 765·2 would be stored in a computer system using 'floating-point representation' as shown below.

$$0{\cdot}7652 \times 10^3$$

Identify the mantissa and exponent in the above floating-point representation. **2**

Mantissa _____

Exponent _____

[Turn over

5. State why a database table should be designed to include a primary key field. **1**

_____

_____

6. State a precaution used to secure data in electronic communications. **1**

_____

7. The code for part of a program is shown below.

```
...
Line 41  SET runnerTime TO firstRaceTime +
         secondRaceTime + thirdRaceTime +
         fourthRaceTime + fifthRaceTime
Line 42  SET runnerAverage TO runnerTime / 5
Line 43  <display average to 2 decimal places>
...
```

State the pre-defined function and a parameter that could be used in Line 43. **2**

Pre-defined function _____

Parameter _____

8. Describe one aspect of consistency that should be considered when testing a website. **1**

_____

_____

9. When a mouse pointer hovers over an image on a web page the image changes to a different picture.

State the type of coding and the event used to implement this. **2**

Type of coding _____

Event _____

10. A shop stores stock information in a database. Part of the database table is shown below.

Stock				
stockCode	**type**	**description**	**price**	**quantity**
2374	Vase	Blue with floral pattern	12.40	1
3467	Book	Satellite Games	0.45	2
4576	Book	Organic Farming	0.45	1
186	Garden	Hand fork	0.90	1
8964	Jigsaw	Picture of Culzean Castle	1.00	1
3647	DVD	The 49 Steps	0.45	1
762	Book	Baking Pies	0.45	1

The manager writes the following SQL statement to change the price of all books to 50p.

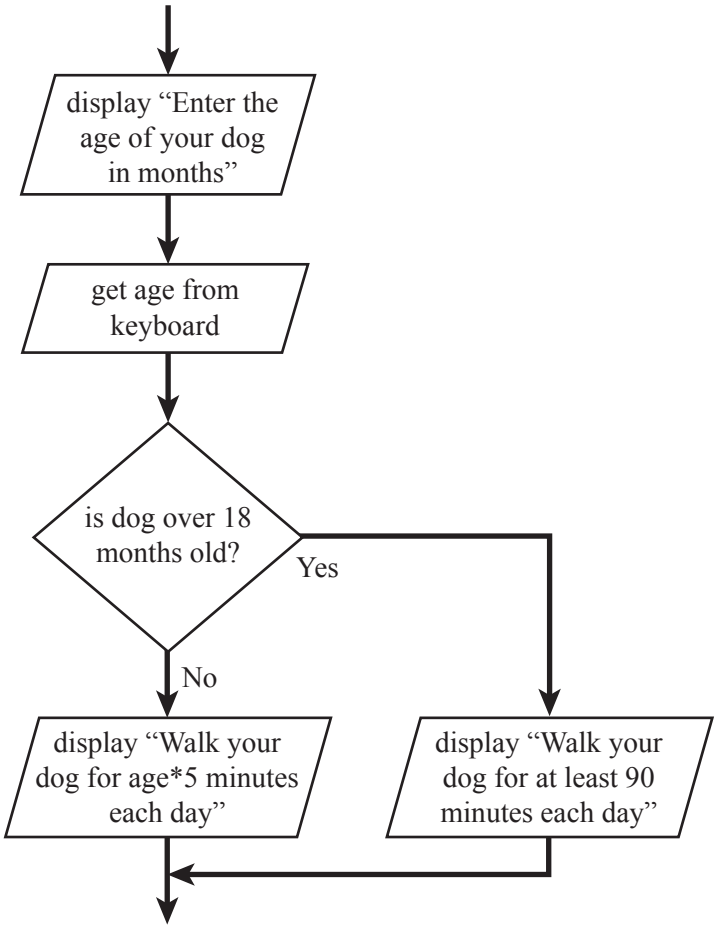
```
UPDATE Stock
SET price = 0.50
WHERE price = 0.45;
```

(a) Explain why the SQL statement above would give an unexpected result. **1**

(b) Rewrite the SQL statement to give the expected output. **2**

11. The design shown below asks a user to enter the age of their dog. It then displays advice on how many minutes the dog should be walked each day.

Circle the condition in the design below. **1**



12. Explain why low-fidelity prototypes are used when designing a website. **1**

13. Eduardo has created a website to display photos that he has taken.

Explain why Eduardo did not have to consider the Copyright Designs and Patents Act when creating his website. **1**

14. The program code below calculates the delivery cost of orders.

```
...
Line 13  IF orderTotal < 50.00 AND NOT(cardType = "Platinum") THEN
Line 14          SET deliveryCost TO 5.00
Line 15  ELSE
Line 16          SET delivery TO 1.50
Line 17  END IF
Line 18  SEND deliveryCost TO DISPLAY
...
```

(a) Explain why the program may not display the expected output at line 18. **1**

(b) Identify one logical operator in the above code. **1**

(c) State the delivery cost for the following order.

Card Type: Gold
Order Total: 43.00 **1**

15. Explain why a conditional loop would be used when writing code. **1**

[Turn over

16. A database table 'TeamScore' stores information about a team's top scorers. The table is shown below.

TeamScore		
competitor	**club**	**averageScore**
R. Oliver	Fairmilehead	92.0
G. Byer	Currie	92.5
K. Willis	Peterborough	91.4
B. McRae	Dunfermline	97.0

Describe what would happen to the table when the SQL statement below is run.

```
DELETE FROM TeamScore
WHERE averageScore < 92.0;
```

1

[Turn over for next question

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SECTION 2 — 85 marks

Attempt ALL questions

17. Scott is developing an online quiz with ten true or false questions. At the end of the quiz, the user's final score will be calculated.

(a) The user interface is shown below.

(i) Explain why a 1-D array of Boolean values is a suitable data structure to store the user's responses. **2**

17. (a) (continued)

(ii) For each correct response, 5 points are added to the user's score.

Using a programming language of your choice, write efficient code to calculate the user's final score.

Your code should use a running total within a loop. **4**

(b) Explain why the quiz program would be compiled. **1**

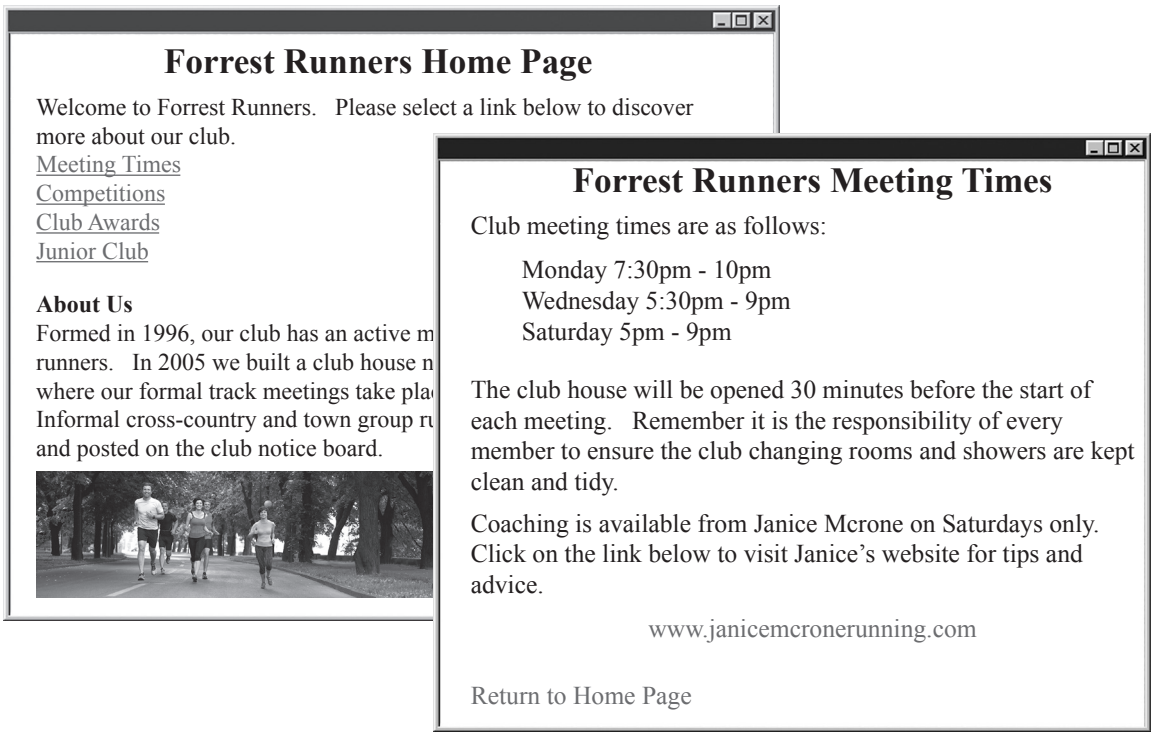
_____

_____

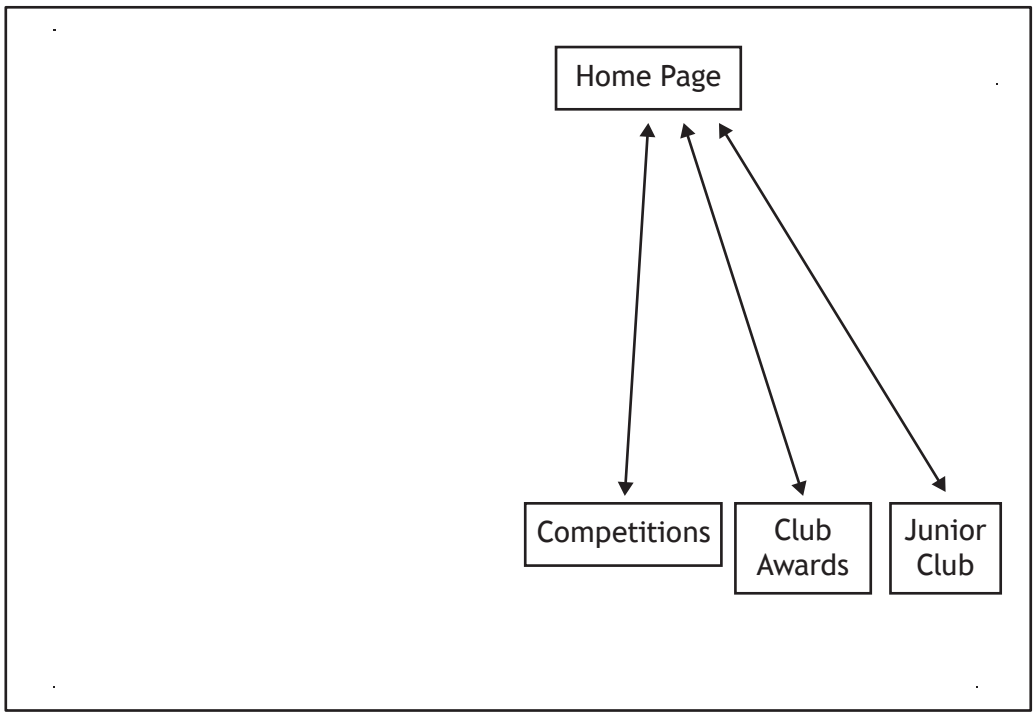
[Turn over

18. Julie creates a website to advertise her athletics club.

(a) Low-fidelity prototypes of each web page are shown below.



Referring to the two prototypes, complete the hierarchical structure of the website below. **3**

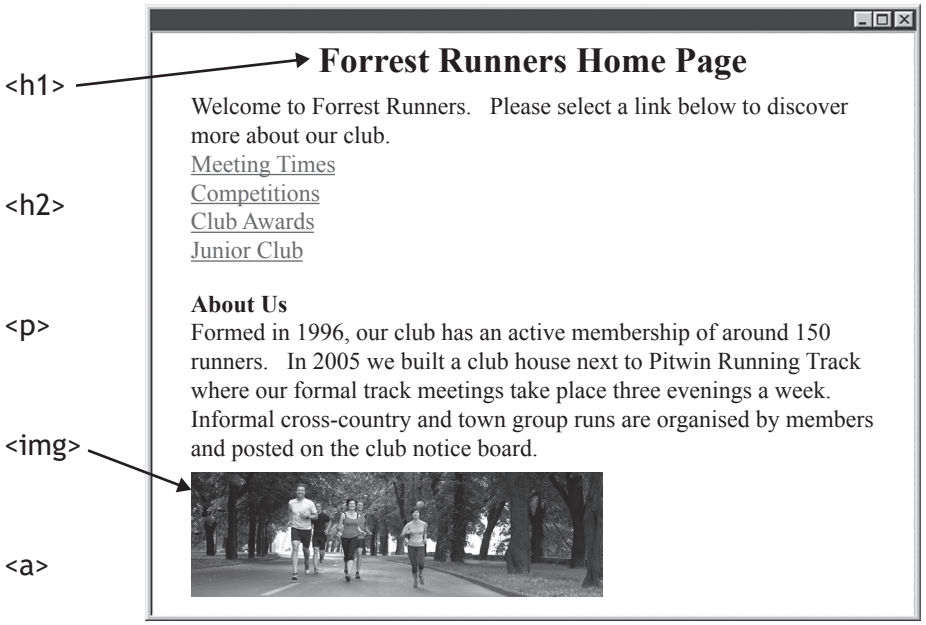


18. (continued)

(b) When implementing the home page prototype, Julie makes use of several HTML elements.

The diagram below identifies where <h1> and <img> elements have been used.

Complete the diagram by drawing arrows to identify where the <p>, <h2> and <a> elements should be used. **3**



(c) State two reasons why jpeg files are often used as the standard file format for photographs on web pages. **2**

Reason 1 _____

_____

Reason 2 _____

_____

[Turn over

MARKS

DO NOT WRITE IN THIS MARGIN

(d) When Julie created the 'Junior Club' web page, she used three elements and external CSS rules to colour each of the three sections.

HTML Document

```
<!DOCTYPE html>
<html>
<head>
<title>Forrest Runners</title>
<link rel="stylesheet" href="styles.css">
</head>
<body>
<div>
<h2>Forrest Juniors</h2> <p>Forrest Juniors Running Club is open
to anybody aged 5 to 17. If you wish to run seriously or just
for fun please come along at the following times.</p>
</div>
<div class="middlePart">
<h2>Meeting Times</h2> <p>Junior meeting times are 4pm-6pm on
Tuesday, Wednesday and Sunday afternoons.</p>
</div>
<div>
<h2>Required Kit</h2> <p>All runners are expected to bring their
own:</p>
<ul> <li> T-shirt or running top </li> <li> Shorts </li> <li>
Trainers or running spikes </li> </ul>
<a href="homePage.html">Back to Home Page</a>
</div>
</body>
</html>
```

styles.css

```
body{background-color:DarkBlue}
div {background-color:LightBlue}
p { font-family:Times New Roman;
    font-size:12px;
    text-align:left;
    color:Black}
.middlePart {background-color:White}
```

Julie styled her elements to display with a light blue background:

```
div {background-color:LightBlue}
```

Explain why a browser would not display the page with three light blue sections. **2**

MARKS

DO NOT WRITE IN THIS MARGIN

(e) The Junior Club web page is displayed in a browser. Part of this is shown below.

All runners are expected to bring their own:

- T-shirt or running top
- Shorts
- Trainers or running spikes

Write a CSS rule that would ensure the text size of the bullet point list is the same text size as the sentence. **2**

(f) The user can return to the Home page from the Junior Club page.

(i) State the type of hyperlink that has been used to return to the Home page. **1**

(ii) State the type of addressing that has been used in the hyperlink. **1**

(g) Web developers test the consistency of the web pages they create.

State two other examples of tests that can be carried out on a web page. **2**

Test 1 _____

Test 2 _____

[Turn over

19. A program is being designed that will allow pupils to add money to their lunch money account. The user enters their name, an 8 character password and the amount of money they want to add. A button is then clicked and the updated balance of the account is displayed.

(a) Analyse the problem and identify all inputs, processes and outputs. **3**

Input(s) _____

_____

Process(es) _____

_____

Output(s) _____

_____

(b) Design a user interface for this program. **3**

(c) The password must contain 8 characters.

(i) State a suitable pre-defined function to check that the password contains 8 characters. **1**

_____

(ii) Explain why a pre-defined function would be used. **1**

_____

_____

19. (continued)

(d) Using a design technique of your choice, design an efficient solution to ensure that a password of only 8 characters can be entered.

An error message should be displayed if the incorrect number of characters is entered, and the user asked to re-enter the password. **4**

(e) Test data will be used to ensure the validation of the password works correctly.

Complete the test table below. **3**

Type of test	Input	Expected result
Normal		Program continues
	Jaj8up	

[Turn over

20. A database stores information about a walking club.

The table 'Route' stores all the available routes.

The table 'Walk' stores information when one of these routes is completed.

Part of the information stored in each table is shown below.

Route						
routeID	**start**	**finish**	**estimatedMins**	**Kms**	**routeType**	**rating**
1	Shiel Bridge	Glen More	480	23	Mountain	5
2	Aberdour	Anstruther	600	44	Coastal	4
3	Rackwick	Rackwick	180	12	Coastal	2
4	Kelty	Loch Glow	90	5	Forest	1
5	Fort William	Steall Falls	210	8	Hill	4
6	Pitlochry	Blair Atholl	175	11	Forest	2

Walk						
walkNumber	**walkDay**	**departure**	**numberWalkers**	**rained**	**minutesTaken**	**routeID**
1893	21/03/17	09:00	9	Yes	213	3
2002	30/04/17	07:30	15	No	167	3
0019	27/11/14	11:10	30	No	606	2
0218	01/02/16	13:30	3	No	102	4
0723	16/10/15	02:00	12	Yes	713	2
0086	01/01/15	08:45	24	Yes	180	6
1992	05/04/17	13:00	2	No	512	1
0499	19/11/15	14:00	9	No	190	5

MARKS DO NOT WRITE IN THIS MARGIN

(a) Complete the table below to identify the keys that were created when this relational database was implemented. **3**

	Table	Field
Primary Key		
Primary Key		
Foreign Key		

MARKS

DO NOT WRITE IN THIS MARGIN

(b) State the attribute type that would be most suitable for the following fields. **2**

walkDay _____

minutesTaken _____

(c) Design a query that would find the routeID of all the Mountain routes with a rating of 3 or more. **5**

Field(s)	
Table(s)	
Search criteria	

(d) (i) Read the SQL statement below.

```
SELECT start, routeType, minutesTaken
FROM Route, Walk
WHERE Route.routeID = Walk.routeID
AND rating = 2;
```

Complete the table below to show the expected output from this SQL statement. **3**

start	routeType	minutesTaken

20. (d) (continued)

(ii) Describe how to evaluate the accuracy of the expected output from an SQL statement. **1**

(e) The database was implemented without referential integrity.

Describe a problem that may occur when adding a new record to the 'Walk' table. **1**

[Turn over for next question

DO NOT WRITE ON THIS PAGE

21. A program will calculate the total cost when customers purchase tickets to a theme park.

Adults pay £25 per ticket; children pay £10. If there are two or more adults with more than two children a discount of £5 is subtracted from the total cost.

Algorithm

1. Store cost of adult and child ticket
2. Get name of person making booking
3. Get quantity of tickets
4. Calculate total cost
5. Display food voucher message

Refinement

2.1 Get first name
2.2 Get second name

3.1 Get quantity of adult tickets
3.2 Get quantity of child tickets

(a) Using a design technique of your choice, refine step 4. **6**

21. (continued)

(b) Customers who spend £50 or more on tickets qualify for a number of food vouchers.

Step 5 of the algorithm has been implemented below.

```
...
Line 23   IF totalCost < 50 THEN
Line 24       SEND "Sorry, no food voucher" TO DISPLAY
Line 25   ELSE
Line 26       IF totalCost >100 THEN
Line 27           SEND "You have been awarded 2 food
                  vouchers" TO DISPLAY
Line 28       ELSE
Line 29           SEND "You have been awarded 1 food
                  voucher" TO DISPLAY
Line 30       END IF
Line 31   END IF
...
```

(i) State the output if:

(A) the total cost is 104; **1**

(B) the total cost is 50. **1**

(ii) When the completed code is tested, a user enters 2.5 for the number of adult tickets.

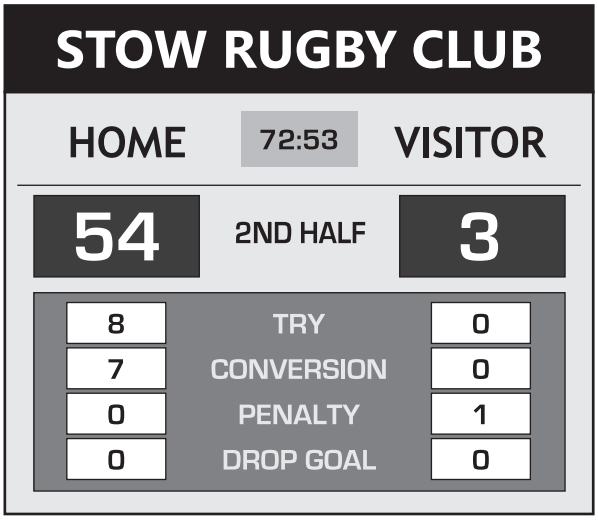
The program continues to run and calculates the total cost.

Explain how the program could be made fit for purpose. **1**

(iii) State the processor component that calculates the total cost. **1**

(iv) Name the part of the computer system that transfers the value of totalCost from main memory to the processor. **1**

22. An electronic scoreboard is operated by a computer system.



(a) The computer system stores the time and scores as binary numbers and the text using extended ASCII code.

(i) In the box below, show how the value 54 would be stored as an 8-bit binary number. **1**

(ii) Calculate the number of bits required to store the text '2ND HALF'. **2**

22. (continued)

(b) The scoreboard highlights some of the information it displays using coloured objects. These are stored as vector graphics.

(i) State the name of the object. **1**

_____

(ii) State two attributes of this object. **2**

Attribute 1 _____

Attribute 2 _____

(c) Describe a feature or function of the computer system that could be used to reduce the amount of energy it uses. **1**

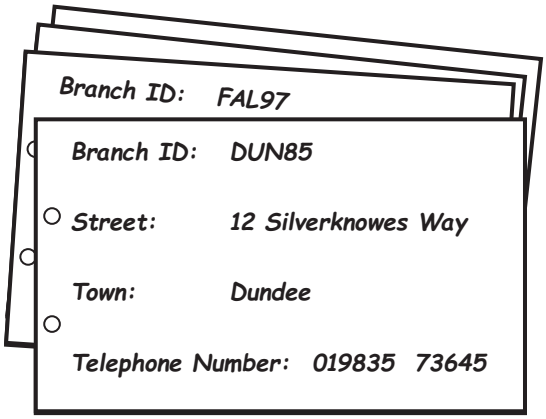
_____

_____

[Turn over

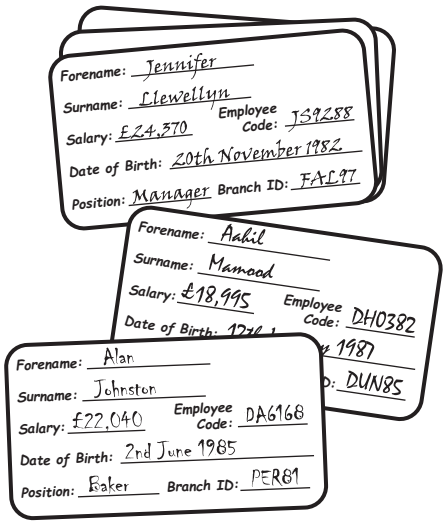
23. Sydney Bakery owns three high street shops in Dundee, Falkirk and Perth.

The bakery wishes to design and implement a database to store the information shown below.



Examples of Shop Information Cards

Currently typed up by staff and kept as printed copies.

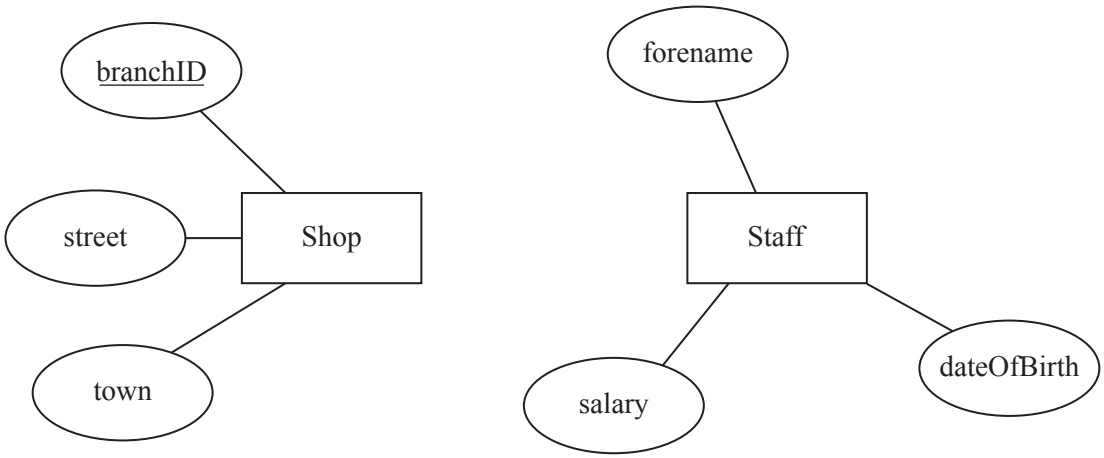


Examples of Staff Information Cards

Currently hand written by each shop manager and kept for reference.

(a) Complete the entity relationship diagram below by:

- drawing any missing attributes from either entity
- drawing the relationship between the entities
- naming the relationship between the entities
- identifying any additional key fields. **6**



23. (continued)

(b) As well as an entity relationship diagram, a data dictionary is created at the design stage.

(i) State the purpose of a data dictionary. **1**

_____

_____

(ii) The attribute 'town' will store the place where each shop is located. A presence check has been noted in the data dictionary for this field.

State one other type of validation that should be included in the data dictionary for this attribute. **1**

_____

_____

[Turn over

23. (continued)

(c) Sydney Bakery also maintains a website.

Part of the HTML code for the home page is shown below.

```
...
<style>
.mainHeading {text-align:right}
h2 {text-align:center}
div {text-align:left}
</style>
</head>

<body>
<div class="mainHeading">
<h1>Sydney Bakery</h1>
<h2>Baking Since 1935</h2>
</div>

<div>
<p>Started over 70 years ago, Sydney's now employs
over 100 staff.
<ol><li><a href="#Option1">Sydney's Family</a></li>
<li><a href="#Option2">Our Stores</a></li> <li><a
href="#Option3">Our Products</a></li></ol>
</p>

<p id="Option1">The founders of our bakery were
David and Davina Sydney.</p>
</div>

...
```

(i) Explain the purpose of `href="#Option1"` in the code above. **1**

23. (c) (continued)

(ii) Draw how the home page will look when viewed in a browser. **5**
Some of the content has already been added.

Started over 70 years ago, Sydney's now employs over 100 staff.

The founders of our bakery were David and Davina Sydney.

[END OF QUESTION PAPER]

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

ACKNOWLEDGEMENTS

Question 2 – Rusla Ruseyn/Shutterstock.com
Anyaivanova/Shutterstock.com

Question 17 – sportpoint/Shutterstock.com

Question 18 – dotshock/Shutterstock.com