



FOR OFFICIAL USE

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National  
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**X816/75/01**

**Computing Science**

WEDNESDAY, 20 MAY

9:00 AM – 10:30 AM



Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

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Surname

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Number of seat

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Date of birth

Day

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Month

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Scottish candidate number

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**Total marks — 80**

**SECTION 1 — Software design and development, and Computer systems — 55 marks**

Attempt ALL questions.

**Attempt EITHER Section 2 OR Section 3**

**SECTION 2 — Database design and development — 25 marks**

**SECTION 3 — Web design and development — 25 marks**

**You may use a calculator.**

Show all workings.

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.

Do not remove any exam materials. You must leave this booklet on your desk; if you do not, you could lose all the marks for this paper.



SECTION 1 — SOFTWARE DESIGN AND DEVELOPMENT, AND COMPUTER SYSTEMS  
— 55 marks

Attempt ALL questions

1. A company wants to reduce its energy consumption.

Describe two methods to reduce the energy consumption of its office computers when in use.

2

Method 1 \_\_\_\_\_

\_\_\_\_\_

Method 2 \_\_\_\_\_

\_\_\_\_\_

2. The weekly average screen time use of a tablet is calculated and stored in the variable `screenTime`.

Using a programming language of your choice, write the code to store this weekly average screen time to two decimal places.

2

3. An online shop uses a firewall.

Describe how a firewall ensures customer data is kept secure.

1

\_\_\_\_\_

\_\_\_\_\_



\* X 8 1 6 7 5 0 1 0 2 \*

4. The following code checks if a pupil will receive a merit.

```
...
Line 34 IF peerMentor = TRUE AND attendance > 95 THEN
Line 35     SET merit TO "Yes"
Line 36 END IF
...
```

(a) Identify the logical operator in this code.

1

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(b) This code is tested using normal test data.

(i) Describe the purpose of using normal test data when testing code.

1

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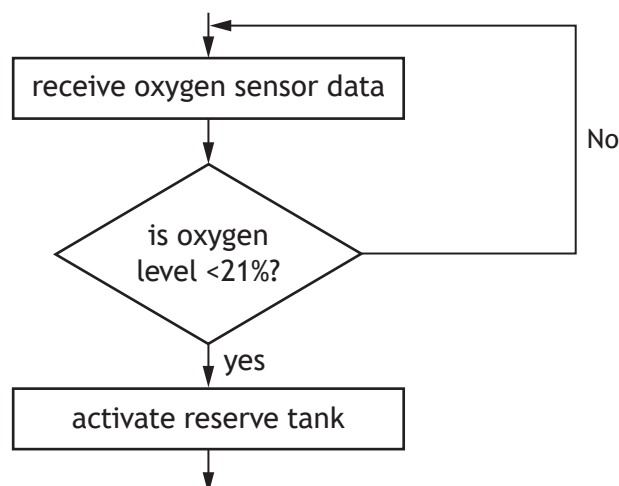
---

(ii) Give an example of normal test data that could be used on line 34.

1

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5. The oxygen level in the International Space Station is monitored using sensors. Part of the design of a program to control the oxygen level is shown below.



Name the coding construct shown in this design.

1

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[Turn over

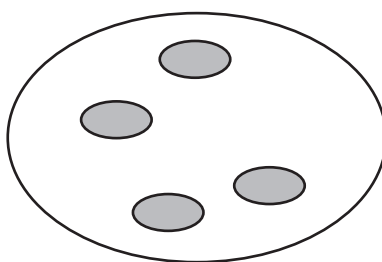


6. AquaQuest Explorations measures the depth of a loch. The greatest depth they measured was 114 metres.

(a) Convert the denary number 114 into 8-bit binary.

1

(b) A map of the loch is shown below.



The map is saved as a vector graphic.

(i) State one object used in this graphic.

1

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(ii) This graphic could also be stored as a bit-mapped graphic.

Describe how a bit-mapped graphic would be stored in a computer system's memory.

2

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7. Explain why the development of a program is an iterative process.

1

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8. SkySprings Trampoline Park is developing a program to allow customers to book group entry to the park.

The program will ask the user how many people are in the group and if each person would like refreshments (Y or N). The program will display the total cost.

- (a) Identify two processes for this program.

2

Process 1 \_\_\_\_\_

\_\_\_\_\_

Process 2 \_\_\_\_\_

\_\_\_\_\_

- (b) The program will use a loop to ask if each person in the group would like refreshments.

State the type of loop that should be used. Explain your answer.

2

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (c) When a booking is made the user must create a password. The password is stored in `userPass`.

Using a programming language of your choice, write the code to ask the user to enter their new password, and calculate the number of characters it contains.

2

- (d) Complete the table below to state which data type should be used for the `cost` and `refreshments` variables.

2

| Variable     | Sample data | Data type |
|--------------|-------------|-----------|
| cost         | 27.50       |           |
| refreshments | Y           |           |



9. A program is being designed to allow customers to hire paddleboards.



The algorithm for this program is shown below.

1. Initialise variables
  2. Ask user for valid number of hours
  3. Use number of hours to assign cost for one paddleboard
  4. Ask user for number of paddleboards required
  5. Ask user for the number of wetsuits required
  6. Calculate totalHire
  7. Display totalHire
- (a) Using a design technique of your choice, refine step 2 to ensure the user enters a valid number of hours.

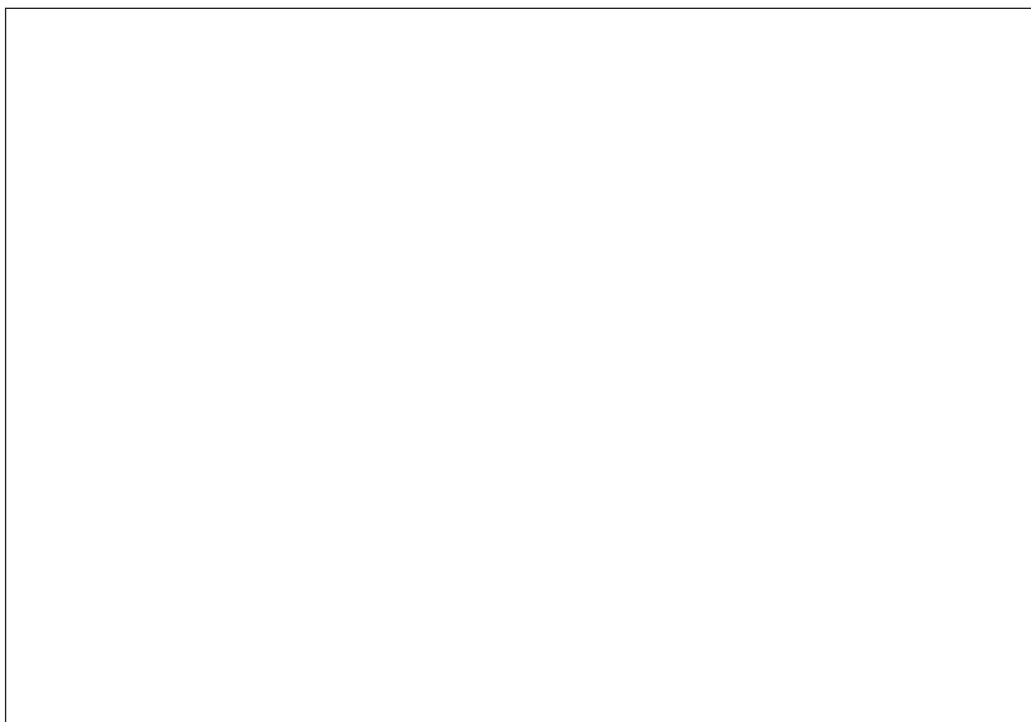
4



9. (continued)

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

3



(c) State the part of the processor that will temporarily store the calculated total cost of a hire once the program is implemented.

1

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[Turn over



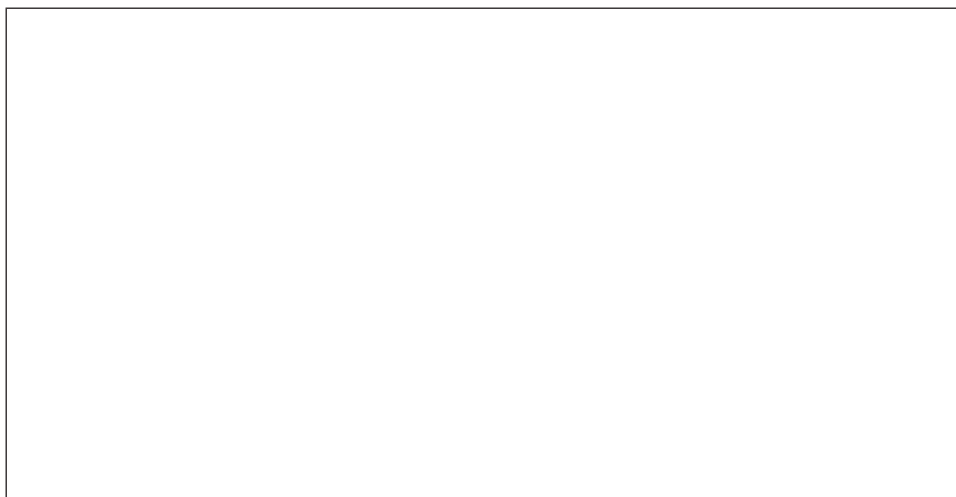
10. Scottish Space Agency is recruiting staff for its space exploration project.

- (a) A program is being developed that will allow applicants to complete an electronic application form. They must enter their name, age and the job they want to apply for. Once this information is entered, the interview date for the chosen job is displayed.

Design a user-interface for the:

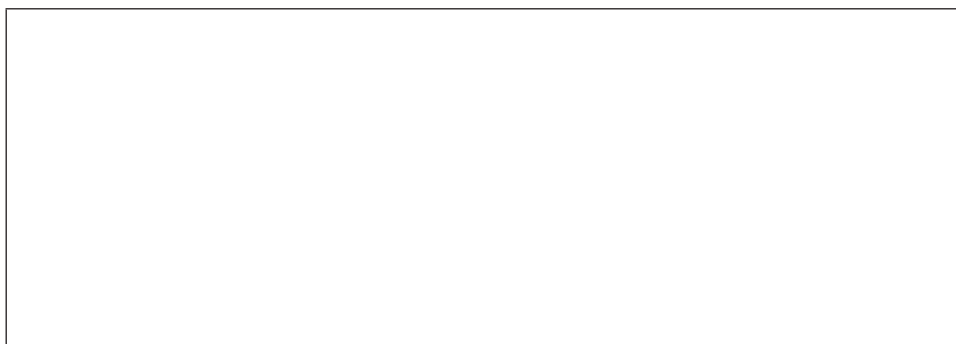
- (i) input for this program

1



- (ii) output for this program.

1




10. (continued)

MARKS

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(b) There were 84 applicants. The applicants' ages are stored in a data structure called `ages`.

(i) Identify the most suitable data structure and data type for `ages`.

2

Data structure \_\_\_\_\_

Data type \_\_\_\_\_

(ii) Using a programming language of your choice and the data structure `ages`, write the code to calculate and display the average age of applicants.

4

[Turn over



10. (continued)

- (c) The launch speed of a rocket is 7.83 kilometres per second. This value would be stored in a computer system using floating-point representation as shown below:

$$0.783 \times 10^1$$

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

Mantissa \_\_\_\_\_

Exponent \_\_\_\_\_



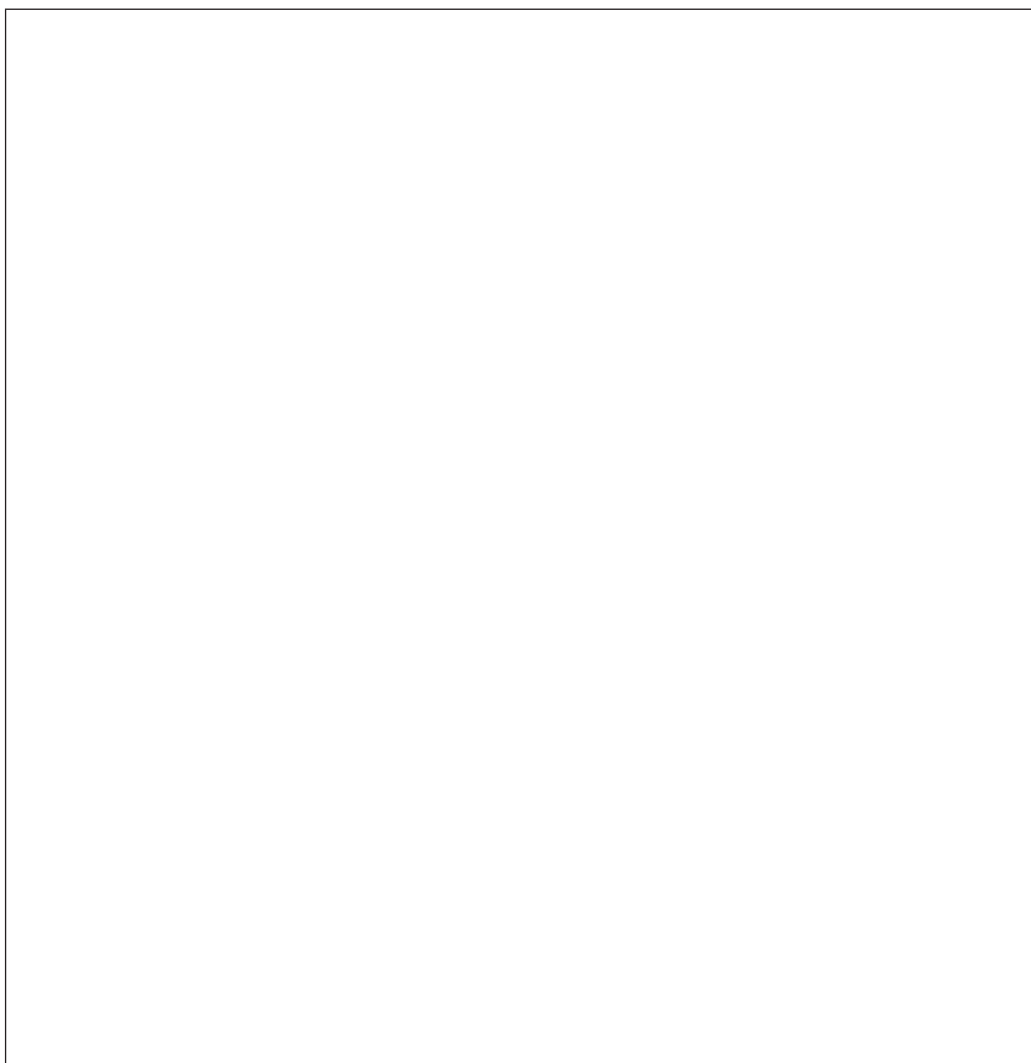
11. In an online game, players control a character in a fantasy world.

(a) The character's status is determined by their current health and food scores using the following rules:

- 'Feeling fine' — your character has 40 or more food points and 50 or more health points.
- 'Getting tired' — your character has under 40 food points or under 50 health points.
- 'Help' — your character has any other combination of points.

Using a design technique of your choice, design the code to determine the character's status.

4



[Turn over

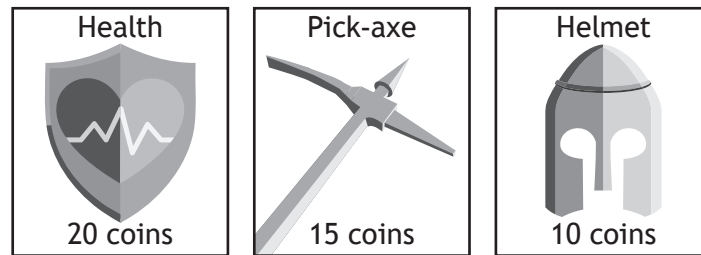


11. (continued)

MARKS

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- (b) Players collect coins that they can use to buy upgrades.



The number of coins collected and spent by a player are stored in the variables `coinTotal` and `coinsSpent`.

Part of the code for this game is shown below.

```
...
Line 13 <player collects coins>
Line 14 <player spends coins>
Line 15 SET coinTotal TO coinTotal - coinsSpent
Line 16 IF coinTotal < 50 THEN
Line 17     SET bonusCoins TO 100 / coinTotal
Line 18 END IF
Line 19 SEND "You have" TO DISPLAY
Line 20 SEND bonusCoins TO DISPLAY
Line 21 SEND "bonus coins" TO DISPLAY
...
```

A player has collected 10 coins and has bought a helmet. The program stops and produces an error at line 17.

State the type of error that has occurred at line 17 and explain why this has happened.

2

Type of error \_\_\_\_\_

Explanation \_\_\_\_\_

- (c) Name the part of the computer architecture that transfers the value of `coinTotal` from main memory to the processor.

1

\_\_\_\_\_

- (d) Using a programming language of your choice, write the code to combine the outputs in lines 19, 20 and 21 into a single output message that tells the player how many bonus coins they have.

2



- (e) A programmer commented on the readability of the program.

Explain what is meant by readability. Your answer should refer to one example from lines 15–18 in the code on the previous page.

2

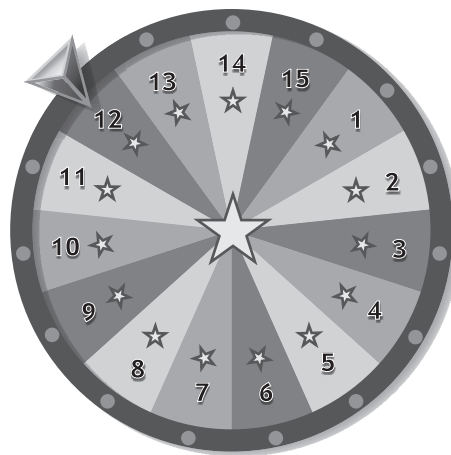
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Every day players are given a free spin of a bonus wheel to win more coins. Players will receive between 1 and 15 coins.



12 bonus coins received

- (f) Using a programming language of your choice, write the code to generate and store a value between 1 and 15 in a variable called `bonus`.

3

[illegible]

- (g) During the software development process, the code must be translated.

State the type of translator that should be used when the game is released to the public.

1

**[END OF SECTION 1]**



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**SECTION 2 — DATABASE DESIGN AND DEVELOPMENT — 25 marks**

**Attempt ALL questions**

12. A card collector uses a database to store information on the cards in their collection.

Some of the data currently stored is shown below.

| Collection |                 |                   |        |          |        |
|------------|-----------------|-------------------|--------|----------|--------|
| cardName   | series          | expansion         | setNum | cardCode | graded |
| Night Dog  | Little Monster  | Sparkling Sea     | 92477  | D5826    | True   |
| Alex Kaur  | MBA League      | Legendary Ballers | 16748  | F9730    | True   |
| Fire Mouse | Little Monster  | Evolved Monsters  | 66438  | B7351    | False  |
| Unblock    | Spells Gathered | Trapped Potential | 59351  | C1043    | True   |
| Sam Speed  | MBA League      | The Court         | 30134  | E2904    | False  |
| ...        | ...             | ...               | ...    | ...      | ...    |

The collector no longer collects MBA League cards and wants to remove them from the database.

The following SQL statement is written to remove these records.

```
DELETE FROM Collection
WHERE expansion = "The Court";
```

- (a) Explain why this SQL statement is not fit for purpose.

1

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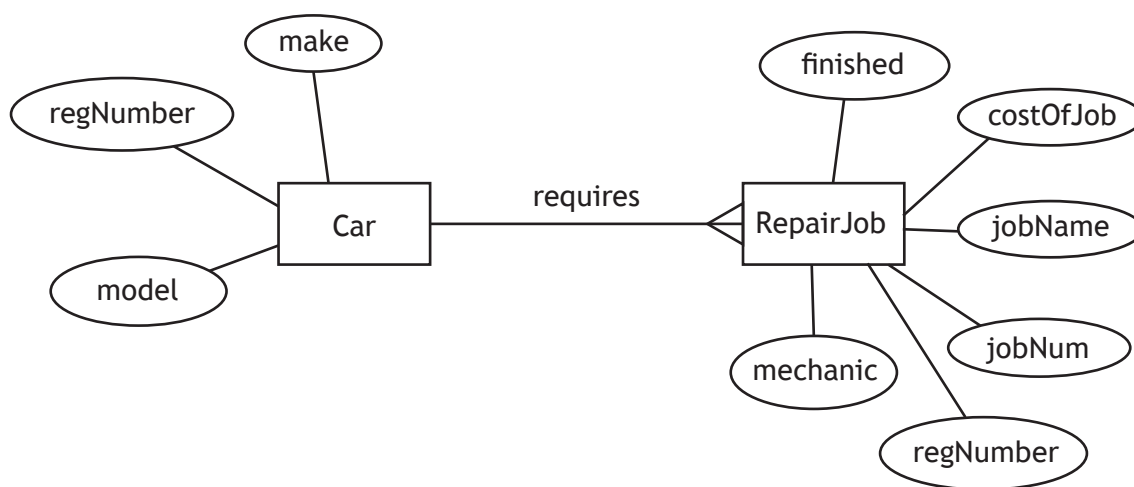
- (b) Rewrite the SQL statement to remove the records correctly.

1

[Turn over



13. An entity-relationship diagram was created to design a database for a garage. Complete the entity-relationship diagram below by identifying the primary and foreign keys.



14. A school carried out a survey to find out how pupils travel to school. Pupils completed the survey shown below.

School Travel Survey

Please answer the questions below.

Mode of transport

Car

Bus

Walk

Cycle

Other

Class

Scottish Candidate Number

(This is your 9-digit code)

All results were stored in a database. A sample record is shown below.

| scotN     | class | transport |
|-----------|-------|-----------|
| 132548702 | 4N1   | Bus       |

Complete the table below to identify the validation for the fields scotN and transport.

| Field     | Validation |
|-----------|------------|
| scotN     |            |
| transport |            |



15. A library uses a relational database to store the details of books that have been borrowed and the members who have borrowed them.

A sample of the data stored in each table is shown below.

| Member        |             |          |             |
|---------------|-------------|----------|-------------|
| memberName    | contactNum  | memNum   | dateOfBirth |
| Jo Thompson   | 07721454187 | B4L04062 | 25/08/1988  |
| Skyler Parker | 07895582319 | DB3S3741 | 01/08/2003  |
| Sam Smart     | 07378565190 | K2S06536 | 11/09/2010  |
| Casey Kim     | 01415571239 | LO6N6448 | 16/10/1991  |
| Ellis Chen    | 07178251143 | MN567379 | 20/06/2012  |
| Aliyah Taylor | 01415829631 | T2D26905 | 05/06/2009  |
| Ari Morgan    | 01418529637 | V0D33927 | 30/01/1993  |
| ...           | ...         | ...      | ...         |

| Borrowed              |                      |            |           |          |              |
|-----------------------|----------------------|------------|-----------|----------|--------------|
| title                 | author               | genre      | borrowRef | memNum   | dateBorrowed |
| Hunting the Skylark   | Harper Bea           | Historical | 678 0062  | B4L04062 | 09/02/2026   |
| Hunting the Skylark   | Harper Bea           | Historical | 678 4578  | DB3S3741 | 28/12/2025   |
| The Drifter's Diary   | J Dorean             | Fiction    | 678 0316  | T2D26905 | 21/04/2026   |
| Year Zero             | Brodie Arwen         | Horror     | 678 0454  | K2S06536 | 13/04/2026   |
| Blooded Prince        | Bran Harper          | Horror     | 678 0486  | T2D26905 | 14/02/2026   |
| Forgotten Map         | H.P.P. Sullen        | Adventure  | 678 0547  | V0D33927 | 03/03/2026   |
| The Silver Masquerade | J. Ronald Fitzgerald | Classic    | 678 0743  | DB3S3741 | 21/02/2026   |
| Vanity and Valor      | Janey Alexander      | Classic    | 678 1563  | LO6N6448 | 19/03/2026   |
| ...                   | ...                  | ...        | ...       | ...      | ...          |



15. (continued)

- (a) Explain why the `borrowRef` field is stored as a text data type.

1

- (b) A publishing company asks the library to provide the contact details of all members who have borrowed an adventure book.

- (i) Design a query that could be used to generate a list of names and phone numbers of members who have borrowed an adventure book before 15/03/2026 with the most recent date borrowed first.

5

|                 |  |
|-----------------|--|
| Field(s)        |  |
| Table(s)        |  |
| Search criteria |  |
| Sort order      |  |

- (ii) A member has complained that they have been contacted by the publishing company. The member tells the library that they have breached UK General Data Protection Regulation (UK GDPR).

Explain why the library has breached UK GDPR.

1

[Turn over



15. (continued)

- (c) A new member has joined the library.

Their details are added to the `Member` table by executing the following SQL statement.

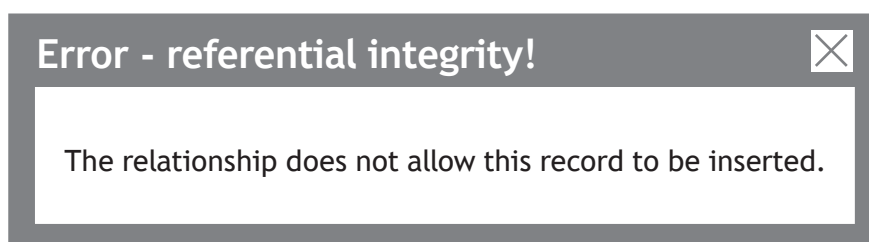
```
INSERT INTO Member (memberName, contactNum, memNum,
dateOfBirth)
VALUES ("Darcy Hughes", "01415831584", "CH0S1162",
"07/07/2003");
```

Once they have a membership, they borrow the 'Classic' book 'Beyond the Veil' by Billy Jameson on 28 April 2026.

Write an SQL statement that will add this record to the `Borrowed` table, using the `borrowRef` '678 0061'.

2

- (d) The librarian tries to add a new record to the `Borrowed` table, but the error message below is displayed.



Explain why referential integrity has been broken.

1

[Turn over for next question

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16. A restaurant manager keeps information about staff and bookings in a relational database. Sample data from both tables is shown below.

| Staff      |               |               |
|------------|---------------|---------------|
| employeeID | staffName     | contractHours |
| 99         | Steven Miller | 15            |
| 213        | Mary Joyce    | 35            |
| 102        | Lily Stewart  | 28            |
| ...        | ...           | ...           |

| Booking    |          |             |       |            |           |            |
|------------|----------|-------------|-------|------------|-----------|------------|
| bookingRef | tableNum | bookingName | time  | date       | numGuests | employeeID |
| A546       | 5        | Smith       | 18:45 | 03/04/2026 | 5         | 213        |
| A785       | 10       | Howie       | 15:00 | 05/04/2026 | 2         | 102        |
| B124       | 2        | Barr        | 19:00 | 01/04/2026 | 9         | 99         |
| F368       | 6        | Grant       | 12:00 | 04/04/2026 | 3         | 213        |
| ...        | ...      | ...         | ...   | ...        | ...       | ...        |

- (a) The manager would like a list of staff names and number of guests for all bookings after 21:00 with five or more guests.

Complete the SQL statement below that would produce this output.

5

SELECT \_\_\_\_\_

FROM \_\_\_\_\_

WHERE \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



\* X 8 1 6 7 5 0 1 2 2 \*

16. (continued)

- (b) Mary Joyce is not able to come to work on 4 June 2026. Steven Miller will now serve the bookings that Mary had been allocated.

Complete the SQL Statement below to update the database.

4

UPDATE \_\_\_\_\_

SET \_\_\_\_\_

WHERE \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

[END OF SECTION 2]

[Turn over



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### SECTION 3 — WEB DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

17. The following HTML code is added to each page of a website to link to an external stylesheet.

```
<link rel="stylesheet" type="text/css" href="style.css">
```

- (a) Describe the purpose of a stylesheet.

1

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- (b) Explain why an external stylesheet is used.

1

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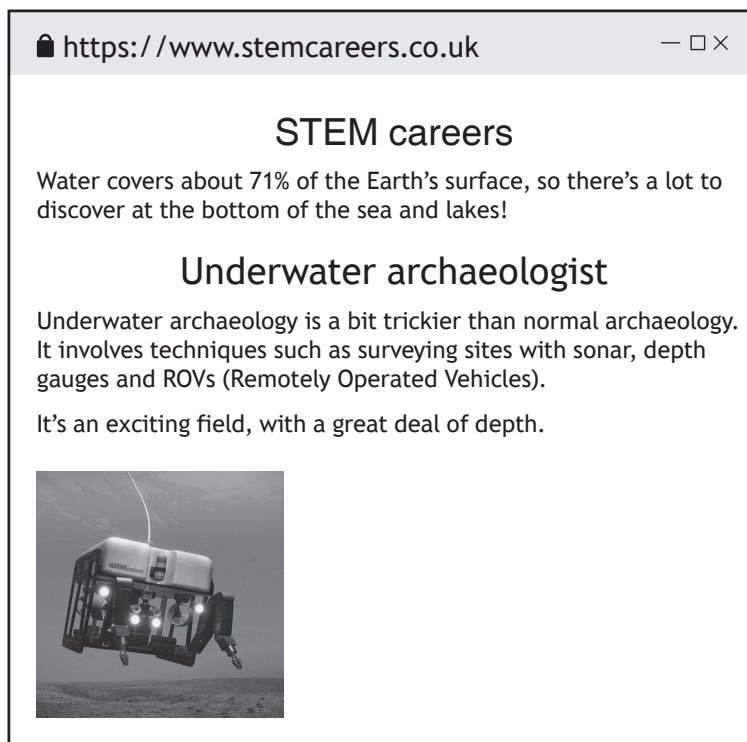


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[Turn over



18. Part of a STEM careers website is shown below.



The headings 'STEM careers' and 'Underwater archaeologist' have been styled using the following CSS rule.

```
.headings{text-align: center; font-size: 26px;}
```

Explain why a class has been used.

1

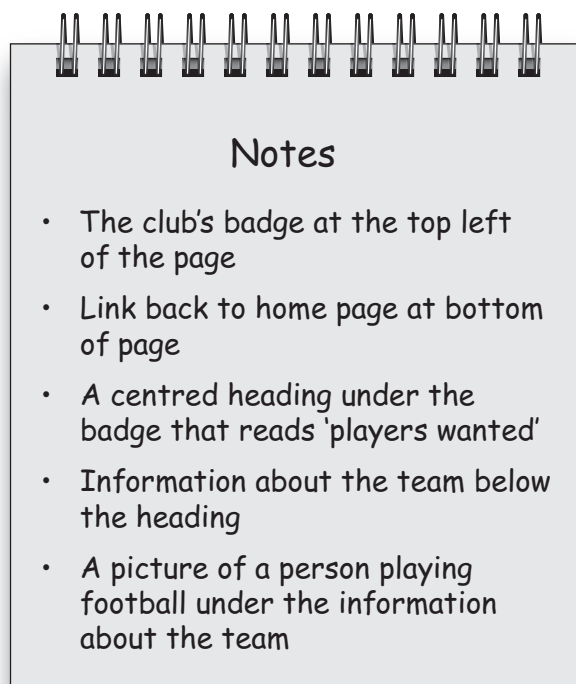
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19. A football team would like to add a page to their website to advertise for new players.  
After meeting with the team's coach, the requirements were noted as shown below.



Complete the wireframe below to design this web page.

3

badge

Information about the team

20. Gary has a website for his garden centre.

- (a) The home page tab displays the name of the web page as 'home.html' as shown below.



This should be displayed as 'Gary's garden centre'.

Write the code to implement this.

1

The HTML and the CSS code for the home page is shown below.

#### HTML code

```
...
<body>
<h1 class="style1"> GGC </h1>
<h2 id="style2"> Plants </h2>
<p class ="style1"> The best plants in town </p>

<p> Here are some of our best sellers </p>
<ul>
    <li> Lily </li>
    <li> Rose </li>
    <li> Cactus </li>
    <li> Jade </li>
</ul>
</body>
</html>
```

#### CSS code

```
.style1{text-align:center;}

p{text-align:left;}

#style2{text-align:right;}
```



20. (continued)

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

3


<https://www.garysgardencentre.co.uk>




The best plants in town



Here are some of our best sellers



20. (continued)

- (c) All the files for the website are stored in a folder called 'plants' as shown below.

> website > plants

| Name      | Type        |
|-----------|-------------|
| Media     | File Folder |
| Lily      | File Folder |
| Rose      | File Folder |
| Cactus    | File Folder |
| Jade      | File Folder |
| home.html | HTML        |

> website > plants > rose

| Name            | Type      |
|-----------------|-----------|
| Rose1           | GIF File  |
| Rose2           | JPEG File |
| Rose3           | MP3 File  |
| Rose4           | MP4 File  |
| roseplants.html | HTML      |

- (i) Gary wants to add links to his best-selling plants list.

Complete the following code to add the link to the 'Rose' page.

3

```
<li>

</li>
```

- (ii) Gary wants to add the animated picture of a rose to the 'Rose' page.

Write the code to implement this.

2

20. (continued)

- (d) The 'Cactus' page includes a feature that changes an image of a young cactus plant, to an image of a fully grown cactus plant, when the cursor is placed on the image.

(i) State the programming language used to implement this feature.

1

---

(ii) State the type of event that is used.

1

---

- (e) Gary would like to use pictures of customers' gardens on the website.

State the name of the legislation that applies to the use of these pictures.

1

---

[Turn over



21. A restaurant has a website.

The HTML and CSS code for the home page is shown below.

| HTML code                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>... &lt;body&gt; &lt;div&gt; &lt;h1&gt; Bella Restaurant &lt;/h1&gt; &lt;h2&gt; The best restaurant in town &lt;/h2&gt; &lt;p&gt; Welcome to our restaurant &lt;/p&gt; &lt;/div&gt; &lt;div id ="menu"&gt; &lt;h2&gt; Italian food &lt;/h2&gt; &lt;p&gt; Pasta&lt;/p&gt; &lt;p&gt; Pizza&lt;/p&gt; &lt;/div&gt; ...</pre> |

| CSS code                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>div{background-color:green;text-align:center;} p{font-size:18px;font-family:verdana;} #menu{background-color:red;text-align:right;} body{background-color:blue;font-family:arial; font-size:20px;}</pre> |

(a) Complete the table below to identify how this code would display the ‘Italian food’ and ‘Welcome to our restaurant’ text in a browser.

4

|                   | ‘Italian food’ | ‘Welcome to our restaurant’ |
|-------------------|----------------|-----------------------------|
| Font              |                |                             |
| Text size         |                |                             |
| Background colour |                |                             |
| Text alignment    |                |                             |

(b) The restaurant wants to add a link to one of their supplier’s website.

‘www.lowdensuppliers.com’

State the type of addressing required.

1

---



21. (continued)

- (c) The restaurant has added an audio file to the website using the following code.

```
<audio controls>
  <source src="food.wav" type="audio/wav">
</audio>
```

The file is converted to an MP3 file and replaces the audio file on the website.

Describe one benefit and one drawback of this change to the website user.

2

Benefit \_\_\_\_\_

\_\_\_\_\_

Drawback \_\_\_\_\_

\_\_\_\_\_

[END OF SECTION 3]

[END OF QUESTION PAPER]





ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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