H

National Qualifications SPECIMEN ONLY

Mark

S816/76/01

Computing Science

Duration — 2 hours

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 — 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.

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

Attempt ALL questions

1. Two's complement can be used to represent positive and negative integers.

   (a) Convert the denary number −9 into 8-bit two's complement. **1**

   (b) State the range of denary values that can be represented using 8-bit two's complement. **2**

2. Increasing clock speed is one method of improving processor performance.

   (a) State one other method of improving processor performance. **1**

   (b) Explain how your answer to part (a) improves performance. **1**

3. Describe an intelligent system used on a car journey that is beneficial for the environment.

Justify your answer.   **2**

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4. A software development project can be progressed using an agile methodology or an iterative development process.

Describe two advantages of the agile methodology when compared to iterative.   **2**

Advantage 1 _____

_____

_____

_____

Advantage 2 _____

_____

_____

_____

[Turn over

5. A check digit is the number at the end of a series of characters that can confirm that something is correct.

A program is to be written to add a check digit to a user's password. The password is input and then the program totals the ASCII values of all the characters, divides the total by 11 and calculates the remainder. This remainder is then attached to the original password as a check digit. For example, for the password 'Fox':

Character	ASCII Value
F	70
o	111
x	120
Total	301
	301/11 = 27 remainder 4

The updated password is 'Fox4'.

Using a recognised design technique, design an algorithm that would create the updated password. **4**

6. An athletics competition takes place between different clubs. The competition includes four throwing events which are shot put, discus, hammer and javelin.

The result for each competitor is stored in a CSV file. The file stores the competitor's name, club, event name and distance thrown in metres.

A program is required to read the data from the CSV file and then process it.

A sample of the data is shown below.

F Dean,Rothesay Rovers,Discus,58.04
J Smith,Hawick Harriers,Shot Put,17.23
K Singh,Rothesay Rovers,Javelin,71.75
...

(a) The data from the file is imported into an array of records.

   (i) Using a programming language of your choice, define a suitable data structure to store the data. **2**

(ii) The CSV file contains 800 results.

Using a programming language of your choice, declare a variable that can store the data for the 800 results. Your answer should include the data structure from part (i). **2**

[Turn over

6. (continued)

(b) In order to qualify for the javelin final, a competitor must throw a distance of 70 metres or more.

The event organisers would like the program to create a file with the name and club of all the competitors who have qualified for the javelin final.

Using a recognised design technique, design an algorithm that would create this file. **5**

6. (continued)

(c) The event organisers would like to be able to display the distance thrown by a competitor in a particular event.

Using a programming language of your choice, write code that:

- asks for the name of a competitor and the event

- displays the competitor name, distance and event, for example 'J Smith threw 17.23 in the Shot Put' or displays the message 'Competitor not found'.

Your answer should make use of the data structure defined in part (a).   **6**

6. (continued)

(d) A participant manages to access the file and change their own score.

State two ways in which the participant has breached the Computer Misuse Act.

2

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7. An app uses three selected letters from a user's password to help identify a user when logging in. An example is shown below.

> Please enter the letters requested from your password.
> For example, if your password was "London" and you are asked for letters 1, 3 and 5 then you should enter L, n, o

Letter 1	Letter 3	Letter 5
*	*	*

The top-level design for this part of the program is shown below.

1. Ask user for username and find password.

2. Generate three random positions within length of password.

3. Ask user for letters at generated random positions and check for a match.

(a) Complete the table below to show the missing data flow in steps 2 and 3. **2**

Step	IN/OUT	Data Flow
1	IN	
	OUT	password
2	IN	
	OUT	randPos1, randPos2, randPos3
3	IN	
	OUT	valid

(b) By considering the data flow in part (a), explain why it would be appropriate to make use of a function rather than a procedure for step 3. **1**

_____

_____

_____

[Turn over

7. **(continued)**

(c) Explain why the programmer refers to the data flow in the top-level design when implementing the code for the program.

1

_____

_____

_____

7. (continued)

(d) The code for step 2 is shown below.

```
…
Line 45  PROCEDURE getLetters (STRING word, INTEGER first,
         INTEGER second, INTEGER third)
Line 46    DECLARE wordLength AS INTEGER INITIALLY length(word)
Line 47    SET first TO <random number from 1 to wordLength>
Line 48    SET second TO <random number from 1 to wordLength>
Line 49    SET third TO <random number from 1 to wordLength>
Line 50  END PROCEDURE
…
Line 60  getLetters(password,randPos1,randPos2,randPos3)
…
```

(i) Formal and actual parameters are used in the code above.

Identify one formal parameter and its **associated** actual parameter.   **2**

Formal parameter _____

Actual parameter _____

(ii) State the scope of the variable `wordLength`.   **1**

_____

_____

(iii) During testing it was found that users were asked for duplicate letters, for example asking for letters 1, 1 and 7 of their password.

Describe how the procedure could be altered to ensure three different letters are requested from the user.   **2**

_____

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[Turn over

7. (continued)

(e) Users log into the app and details are transferred securely.

Describe the role of public and private keys when transferring secure data. **2**
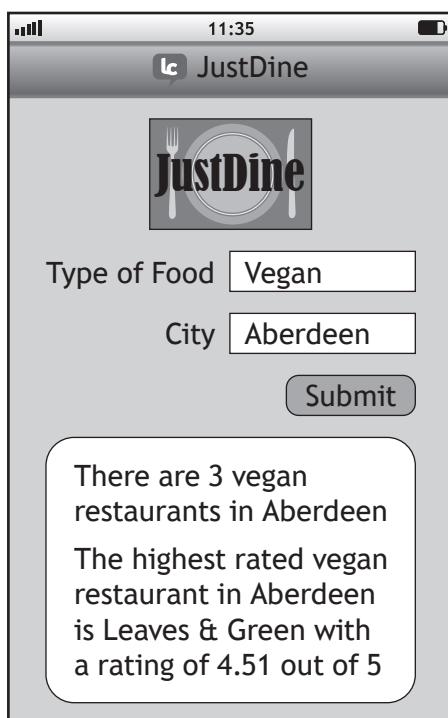
_____

_____

_____

8. JustDine is developing a smartphone app to allow a user to identify restaurants based on the type of food. Restaurants register with JustDine. The app will store the name, city, type of food and rating for each restaurant.

Features of the app:

- users can enter the type of food and city

- displays the number of matching restaurants

- displays the name and rating of the highest rated matching restaurant.

The user interface for the app is shown below.

	11:35	
	lc JustDine	

JustDine

Type of Food | Vegan

City | Aberdeen

[Submit]

There are 3 vegan restaurants in Aberdeen

The highest rated vegan restaurant in Aberdeen is Leaves & Green with a rating of 4.51 out of 5

(a) During analysis the inputs, processes and outputs were identified.

Describe two processes.

2

_____

_____

_____

_____

[Turn over

8. (continued)

(b) Details for registered restaurants are stored in four parallel 1-D arrays:

- `restaurantName`
- `foodType`
- `city`
- `rating`

Using a recognised design technique, design an algorithm that would count the number of restaurants that match the user's food type and city.

4

(c) The following function is to be used to find the highest rating for a restaurant.

During testing it is found that this code contains an error.

```
…
Line 26  FUNCTION findMax (ARRAY OF REAL list) RETURNS REAL
Line 27     DECLARE upper INITIALLY length(list) -1
Line 28     DECLARE highest INITIALLY list[0]
Line 29        FOR index FROM 1 TO upper DO
Line 30            IF highest > list[index] THEN
Line 31               SET highest TO list[index]
Line 32             END IF
Line 33          END FOR
Line 34     RETURN highest
Line 35  END FUNCTION
…
```

A trace table is used when the function is tested with the following values [4.51, 4.12, 4.99].

Line Number	index	list [index]	highest	highest > list [index]
…				
28			4.51	
29	1			
30		4.12	4.51	true
31			**A**	
29	2			
30		**B**	4.12	**C**
34			4.12	

(i) Identify the missing values A, B and C.   **3**

A _____

B _____

C _____

(ii) Describe how a breakpoint could be used to check the values in the trace table.   **2**

_____

_____

_____

_____

8. **(c)** **(continued)**

(iii) Describe how the error in this code can be corrected. **1**

_____

_____

_____

(d) The function `findMax` in part (c) is used to assign the highest rating from the array `rating` to the variable `myHighest`.

Using a programming language of your choice, write the line of code that assigns the highest rating to `myHighest`. **2**

[END OF SECTION 1]

SECTION 2 — DATABASE DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

9. A relational database is used to store data about the products that a shop sells. The database has the following tables.

Product	Category	Courier	Manufacturer
productID	categoryName	courierID	manufacturerName
name	categoryDescrip	courierName	manufacturerAddress
description	currentDiscount	courierAddress	manufacturerTelNo
price		courierTelNo	courierID*
categoryName*			
manufacturerName*			

Draw an entity-relationship diagram to show the relationships that exist in this database.

Your answer should show the entity names and cardinality.

Attributes are not required on the diagram.

3

[Turn over

10. A database table is shown below.

Film				
filmID	title	releaseDate	runTime	rating
SC1	Spider craze	01/12/2018	117	12A
WM1	Waterman	21/12/2018	143	PG
IL1	Isn't it love	13/02/2019	89	12A
BW1	Battle of the world	14/02/2019	122	12A
HT1	How to train your puppy	22/02/2019	104	PG
IC2	Ice cold	22/02/2019	119	15
MB1	Miss Becca	03/03/2019	104	15
TA1	The afterlife	05/03/2019	109	15
CD1	Captain Delsie	08/03/2019	124	12A
GB1	Green band	12/03/2019	130	12A

Complete the table below showing the expected output from the following SQL statement.

3

```
SELECT rating, MAX(runTime) AS [Longest movie]
FROM Film
GROUP BY rating
ORDER BY MAX(runTime) DESC;
```

rating	Longest movie

11. A shop uses a relational database to keep track of stock. One of the database tables is shown below.

Snack					
productID	productName	type	weight	price	stock
001	Baked Cheese Snacks	Single	37.5	0.65	565
002	Sweet Chilli Flakes	Single	28	0.65	300
003	Chicken Crisps	Single	32.5	0.55	240
004	Ready Salted Crisps	Single	30	0.58	654
005	Cheese Straws	Single	12	0.70	120
006	Tomato Puffs	Single	20	0.70	400
007	Prawn Cocktail Crisps	Multi-bag	78.6	1.00	335
008	Wheat Crunch Crisps	Multi-bag	138	1.00	356
009	Assorted Flat Crisps	Multi-bag	153	1.50	545
010	Variety Pack	Multi-bag	150	0.56	678
011	Salted Pack	Multi-bag	150	1.30	614
012	Salted Pretzels	Family bag	80	0.45	450
013	Tortilla Chips	Family bag	200	0.46	456
014	Aberdeen Angus Crisps	Family bag	225	1.89	684
015	Salt and Pepper Shakes	Family bag	150	0.99	600

[Turn over

11. **(continued)**

(a) Design a query to display the most expensive multi-bag and family bag as shown below.   **4**

type	Most Expensive Item
Multi-bag	1.50
Family bag	1.89

Field(s) and calculation(s)	
Tables(s) and query	Snack
Search criteria	
Grouping	
Sort order	

(b) The manager wants to half the price of all products with stock levels of more than 500.

Write the SQL statement that would make these changes.   **3**

11. (continued)

(c) A query is written to display the total amount of stock for each type of snack.

The expected ordered output is shown below.

type	Total Stock
Multi-bag	2528
Single	2279
Family bag	2190

When the SQL statement below is tested the actual output does not match the expected output.

```
SELECT type, COUNT(stock)
FROM Snack
GROUP BY type;
```

Re-write the SQL statement to produce the expected output.   **3**

(d) Write the SQL statement to remove all records of snacks that include 'Salt' in any part of their product name.   **2**

12. A holiday rental shop rents a range of items to customers. It uses a relational database consisting of three linked tables storing data on items, customers and rentals.

When initially designing the Rental table for this database, the primary key was designed using a compound key of customerID and itemID.

Rental
customerID*
itemID*
startDate
noOfDays

An example of the data to be stored in the Rental table is shown below.

Rental			
customerID	**itemID**	**startDate**	**noOfDays**
AM974	CB001	26/06/2021	14
AM974	KB001	30/06/2021	3
DR734	MS003	05/07/2021	7
AM974	RB002	30/06/2021	3
JS003	KB002	04/07/2021	2
JS003	KB002	10/07/2021	1
JS003	RB001	04/07/2021	2
KW001	WH001	10/07/2021	14
RB435	MS003	15/07/2021	14
SP234	CB001	02/08/2021	7
DR734	KB001	06/07/2021	6
DR734	IR001	07/07/2021	2
...	...	...	...

(a) Explain why a compound key of customerID and itemID would mean that the table is not fit for purpose.

1

12. (continued)

(b) The `Rental` table was re-designed with a primary key called `rentalID`.

Extracts from the three tables are shown below.

Rental				
rentalID	**customerID**	**itemID**	**startDate**	**noOfDays**
REN14	AM232	EK001	01/08/2021	14
REN1	AM974	CB001	26/06/2021	14
REN2	AM974	KB001	30/06/2021	3
...	...	...	...	...

Customer				
customerID	**firstName**	**surname**	**hotel**	**resort**
AM232	Amy	Moore	Esmerelda	Caleta
AM974	Amy	Moore	Labranda	Jandia
DR734	Darcia	Rycroft	Arenas	Corralejo
...	....	...	...	...

Item			
itemID	**itemType**	**itemModel**	**dailyRentalPrice**
CB001	Children's buggy	Basic	£6.00
CB002	Children's buggy	Mid	£7.00
CB003	Children's buggy	Deluxe	£9.00
EK001	Kettle	Mid	£4.00
IR001	Iron	Mid	£3.00
KB001	Kid's bike	Basic	£14.00
...	...	...	...

[Turn over

12. (b) (continued)

A list is required to show details of all rentals with a start date in July 2021. The list should display the calculated rental cost for each rental, as shown below.

customerID	itemType	startDate	Rental Cost
JS001	Manual wheelchair	02/07/2021	£32.00
JS003	Road bike	04/07/2021	£40.00
JS003	Kid's bike	04/07/2021	£30.00
DR734	Mobility scooter	05/07/2021	£126.00
DR734	Kid's bike	06/07/2021	£84.00
DR734	Iron	07/07/2021	£6.00
AM974	Road bike	08/07/2021	£42.00
KW001	Manual wheelchair	10/07/2021	£112.00
JS003	Kid's bike	10/07/2021	£15.00
KW001	Kettle	12/07/2021	£48.00
RB435	Mobility scooter	15/07/2021	£252.00

Design a query to produce this sorted output.　　　　**4**

Field(s) and calculation(s)	
Tables(s) and query	
Search criteria	
Grouping	
Sort order	

12. (continued)

(c) A query was created to display the highest daily rental price. This query was saved as 'MaxRental'.

Max daily rental
23.00

Using the 'MaxRental' query, complete the SQL statement below to display the item type and item model of any item matching this highest price.

2

```
SELECT itemType, itemModel
```

[END OF SECTION 2]

SECTION 3 — WEB DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

13. The HTML code and JavaScript function below changes the colour of text when the mouse moves over it.

```
<script>
      function displayRed(my_text)
      {my_text.style.color='red';}
</script>

<p onmouseover="displayRed(this)">Sale now on</p>
```

   (a) Write an additional JavaScript function to change the colour of `Sale now on` to black. **1**

   (b) Re-write the paragraph element to include a call to your function from part (a), so that the text can also be changed to black when the mouse moves away. **2**

14. Some CSS properties for a website are implemented as follows.

```
header {margin-right:10px; margin-left:10px;}
nav {margin-right:10px; margin-left:10px;}
#event {width:700px; margin-left:10px;}
#gaminglogo {width:75px; height: 75px; float:right; margin-
right: 20px;}
#eventlogo {float:right; width:75px; height:75px;
margin-right:20px;}
#floorplan {margin-left:10px; width:700px;}
footer {margin-left:10px; margin-right:10px;}
```

Using grouping selectors to remove any repetition, re-write the code to make it more efficient.

3

[Turn over

15. Music Tutor is a company that offers music lessons. They are creating a website to advertise the business.

A 'Contact Us' page will contain a form where customers supply their details and make an enquiry.

The HTML code for the form is shown below.

```
<form>
      Name: <br>
      <input type="text" name="name"><br><br>

      Email Address:<br>
      <input type="text" name="email"><br><br>

      Mobile Number:<br>
      <input type="text" name="mobile"><br><br>

      Instrument:<br>
      <select name="instrument" size="3">
            <option value="clarinet">Clarinet</option>
            <option value="flute">Flute</option>
            <option value="trumpet">Trumpet</option>
            <option value="tuba">Tuba</option>
            <option value="violin">Violin</option>
      </select>
      <br><br>

      Contact Method:<br>
      <input type="radio" name="contact"
      value="Phone">Phone Call<br>
      <input type="radio" name="contact"
      value="Email">Email<br>
      <input type="radio" name="contact" value="Text">Text
      Message<br>
      <br>

      Additional Comments:<br>
      <input type="textarea" name="comments" rows="10"
      cols="30">
      <br><br>


</form>
```

15. **(continued)**

(a) (i) State which essential HTML form element is missing from the form. **1**

_____

(ii) Write the additional line of HTML code to add the missing form element. **1**

```



```

(b) (i) During usability testing of the form, feedback indicated that the preferred default contact method should be email.

State the attribute that should be added to the email option to achieve this. **1**

_____

_____

(ii) A customer wants to select both violin and flute but the form does not allow this.

Re-write the line of HTML code to allow this. **1**

```




```

(c) A range of personas are used when conducting usability testing of the website.

State one suitable persona and explain why adopting this persona is helpful when conducting usability testing. **2**

Persona _____

Explanation _____

_____

_____

[Turn over
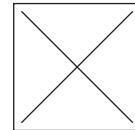
15. (continued)

When designing the website the image and heading are to be on the same line as shown below.

Music tuition since 2006

The following HTML and CSS code is used.

```
<head>
    <style>
        img {float: right;}
    </style>
</head>

<body>
    <h1>Music tuition since 2006 </h1>
    <img src="musicnote.jpg" width = 200>
…
```

However, the image appears on the line beneath the heading, as shown below.

Music tuition since 2006

The following CSS rule is added.

```
h1 {display: inline;}
```

(d) Explain why the display property of the `h1` element had to be changed to achieve this layout.
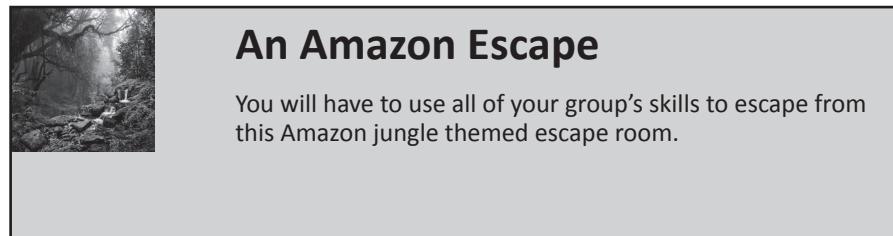
2
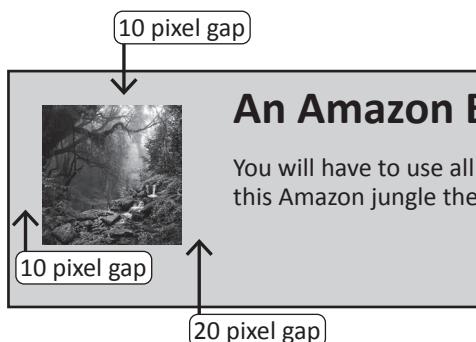
16. Pranav runs an escape room company that uses a website to promote the different themed escape rooms.

(a) Part of the information page of the company's website is shown below.

The image is too close to the top left of the section element.

An Amazon Escape

You will have to use all of your group's skills to escape from this Amazon jungle themed escape room.

The layout should be as below. The gaps above and to the left of the image are 10 pixels. The gap to the right is 20 pixels.

10 pixel gap

An Amazon E

You will have to use all
this Amazon jungle the

10 pixel gap

20 pixel gap

Complete the appropriate CSS rule for this image.

2

```
.eventimage {
```

[Turn over

16. (continued)

Pranav wants to add a new web page with a form where customers can contact his company to enquire about bookings.

Customers are required to enter a contact name, email address, date of booking and the party size (max of 6).

Customers will have to choose a theme from Amazon Escape, Mayan Mayhem or Aztec Anarchy. They can also provide any additional information.

(b) Draw a suitable wireframe for this form which indicates validation.

4

16. (continued)

(c) The wireframe is then used to create a low-fidelity prototype.

Describe one benefit for the developer and one benefit for the client of using this low-fidelity prototype.

2

Developer benefit _____

_____

Client benefit _____

_____

(d) The navigation bar for the website is as shown below.

| • | **Amazon Escape** • | **Mayan Mayhem** • | **Aztec Anarchy** • | **Contact Us** |

(i) This version of the navigation bar used the code below.

```
nav {height:35px; background-color: darkgrey}
nav ul li {float:left;width:150px;text-align:center;}
nav ul li a {display:block; padding:8px;}
```

Complete the CSS rule to remove the bullet points from the navigation bar.

1

```
nav ul {                                              }
```

(ii) Explain why the unordered list in the navigation bar will display differently from any other unordered list in the website.

2

_____

_____

_____

_____

[END OF SECTION 3]

[END OF SPECIMEN QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL SPACE FOR ANSWERS

General marking principles for Higher Computing Science

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this paper. These principles must be read in conjunction with the detailed marking instructions, which identify the key features required in candidate responses.

(a) Marks for each candidate response must **always** be assigned in line with these general marking principles and the detailed marking instructions for this assessment.

(b) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted.

(c) If a candidate response is not covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.

(d) Award marks regardless of spelling, as long as the meaning is unambiguous. This applies to all responses, including code. Award marks as per the detailed marking instructions, regardless of syntax errors, if the intention of the coding is clear.

(e) For questions where candidates are asked to design or write code, a sample response is shown in the detailed marking instructions. This will not be the only valid response. You must use the detailed marking instructions and additional guidance to ensure that you consider alternative approaches and nuances of different programming languages. If in doubt you should refer to your Team Leader.

(f) If a candidate puts a score through a response and makes a further attempt, you should only mark the further attempt. If no further attempt is made and the original is legible, you should mark the original response.

(g) Where an incorrect response is carried forward and used correctly in a following part of the question, you should give credit for subsequent responses that are correct with regard to the original error. Candidates should not be penalised more than once for the same error.

(h) Only award marks for a valid response to the question asked. Where candidates are asked to:
- **Identify**, **name**, **give** or **state,** they need only name or present in brief form.
- **describe**, they must provide a statement or structure of characteristics and/or features. This will be more than an outline or a list. It may refer to, for example, a concept, process, experiment, situation, or facts, in the context of and appropriate to the question. Candidates must make the same number of factual/appropriate points as there are marks available in the question.
- **explain**, they must relate cause and/or effect and/or make relationships between things clear, in the context of the question or a specific area within the question.
- **write code,** they must write recognisable code, not prose nor a diagram.
- **design,** they must use a design technique appropriate to the problem. Award marks as per the detailed marking instructions, regardless of errors in the exemplification of the technique, if the intention of the design is clear.

(i) In the marking instructions, if a word is underlined then it is essential; if a word is in brackets() then it is not essential. Words separated by / are alternatives.

Marking instructions for each question

Section 1 — Software design and development, and Computer systems

Question			Expected response	Max mark	Additional guidance
1.	(a)		1111 0111	**1**	
	(b)		-128 to 127 **OR** -2^7 to 2^7-1	**2**	
2.	(a)		• increase the number of cores • increase width of data bus • add cache/increase cache • any other valid response	**1**	Award 1 mark for any one bullet.
	(b)		Matching explanation: • multiple instructions simultaneously • more bits transferred in a single operation • reduces number of accesses to slower main memory • any other valid response	**1**	Award 1 mark for bullet that matches method stated in part (a). Do not award the mark for increasing clock speed as it is in the stem.
3.			• autonomous driving (1) is more fuel efficient due to system controlling accelerating/ decelerating and detecting/anticipating braking (1) • intelligent route planning (1) reduces driving time by monitoring external factors such as accidents/volume of traffic which reduces fuel consumption (1) • tracking parking (1) reduces driving time searching for space and therefore fuel consumption (1) • engine management system (1) optimises engine efficiency reducing fuel consumption (1) • intelligent road traffic management systems (1) adjusting speed limits to optimise traffic flow reducing fuel consumption (1) • any other valid response	**2**	Award 1 mark for feature and 1 mark for justification related to fuel.

Question			Expected response	Max mark	Additional guidance
4.			• Communication/feedback between client and developer occurs throughout the process • Prototypes/software available (for review) • Repeated testing/evaluation • Reduced documentation • Communication within the development team	**2**	Award 1 mark for each bullet. Maximum 2 marks.
5.			• Initialise and update total • Loop for length of password and get ASCII value of current character • Use of mod 11 to get remainder • Concatenate remainder to original password	**4**	

	Question		Expected response	Max mark	Additional guidance

6.	(a)	(i)	• record structure with name
			• four fields specified
				2	Record structure could be Type, Structure, Class, Named Tuple, Record name IS
					
					Example Answers:
					
					SQARL
					`RECORD competitorData IS ( STRING name, STRING club, STRING event, REAL distance)`
					
					VB
					`Private/Public/Structure Type competitorData`
					`      name as string`
					`      club as string`
					`      event as string`
					`      distance as single`
					`END TYPE`
					
					Livecode
					`Global CompetitorDATA`
					` Put empty into CompetitorData[1][name]`
					`Put empty into CompetitorData[1][club]`
					`Put empty into CompetitorData[1][event]`
					`Put empty into CompetitorData[1][distance]`
					
					Python Class method
					`class Competitor ():`
					`   def __init__(self):`
					`      self.name = ""`
					`      self.club = ""`
					`      self.event = ""`
					`      self.distance = 0.0`
					
					Python Dataclass method
					`Class Competitor:`
					`      name: str = ""`
					`      club: str = ""`
					`      event: str = ""`
					`      distance: float = 0.0`

	Question		Expected response	Max mark	Additional guidance

6.	(a)	(ii)	• array structure
			• using data type created in (i)
				2	Example answers:
					
					Python
					`competitors=[datatype_a()`
					`for x in range (800)]`
					
					VB
					`DIM competitors(799) AS`
					`datatype_a`
					
					Livecode
					`Set the data of EventData`
					`to CompetitorData`

	(b)		• open and close file
			• loop traversing the array with termination
			• IF with condition event="Javelin"
			• AND condition distance>=70
			• writing name and club to file
				5	Example answer:
					
					Open file
					  Loop for all 800/to end of array
					    If event="Javelin" AND
					    distance>=70 then
					        Write name, club to file
					    End if
					  End loop
					Close file

	Question		Expected response	Max mark	Additional guidance
6.	(c)		• ask for searchName/searchEvent and their use in the IF statement • loop that traverses correctly with termination IF condition with: • correct use of array variable • comparison of current name and event fields to targets • display if found with correctly concatenated message • display if not found using any suitable flag, for example -1 or found is false	**6**	Candidates' solutions will vary in terms of efficiency but marks are awarded for any correct implementation.

Example answers:

```
RECEIVE searchName FROM KEYBOARD
RECEIVE searchEVENT FROM KEYBOARD
DECLARE found INITIALLY false
SET counter TO -1
REPEAT
  counter=counter+1
  IF searchName=competitors[counter].name AND
searchEvent=searchName=competitors[counter].event then
    SET found TO true
  END IF
UNTIL found=true OR counter=799
IF found =true THEN
  SEND competitors[counter].name & "threw "
&competitors[counter].distance & "in the " &
competitors[counter].event TO DISPLAY
ELSE
  SEND " Competitor not found" TO DISPLAY
END IF
```

Using a fixed loop:

```
RECEIVE searchName FROM KEYBOARD
RECEIVE searchEVENT FROM KEYBOARD
DECLARE found INITIALLY false
FOR index FROM 0 TO 799 DO
  IF searchName=competitors[index].name AND
searchEvent=competitors[index].event then
    SEND competitors[index].name & "threw " &
competitors[index].distance & "in the " &
competitors[index].event TO DISPLAY
    SET found TO true
  END IF
END FOR
IF found =false THEN
    SEND 'Competitor not found' TO DISPLAY
END IF
```

Question			Expected response	Max mark	Additional guidance
6.	(d)		• Unauthorised access • Intent to commit (a further) offence • Unauthorised modification	**2**	Award 1 mark for each bullet. Maximum 2 marks.

Question			Expected response	Max mark	Additional guidance
7.	(a)		STEP 2 IN: password STEP 3 IN: randPos1, randPos2, randPos3, password	**2**	Award 1 mark for each step
	(b)		Returns a value	**1**	
	(c)		The data flow informs parameter passing.	**1**	The mark is for identifying the relationship to parameter passing. Candidates that use actual or formal incorrectly here should not be penalised as part (d) assesses the use of formal and actual parameters.
	(d)	(i)	• correct identification of any formal parameter • corresponding actual parameter	**2**	<table><tr><td>Formal</td><td>Actual</td></tr><tr><td>word</td><td>password</td></tr><tr><td>first</td><td>ranPos1</td></tr><tr><td>second</td><td>ranPos2</td></tr><tr><td>third</td><td>ranPos3</td></tr></table>
		(ii)	Local / only in the getLetters sub-program	**1**	Award mark if candidate references appropriate line numbers.
		(iii)	• use of conditional loop • use of comparison to number(s) already generated	**2**	
	(e)		• A public key is used to encrypt data. • A private key is used to decrypt data.	**2**	

	Question		Expected response	Max mark	Additional guidance
8.	(a)		• count number of matching restaurants • find highest rated restaurant	**2**	
	(b)		• initialising total and incrementing total by 1 • loop that traverses array with termination IF statement with • condition for food type AND • condition for city	**4**	
	(c)	(i)	• A=4.12 • B=4.99 • C=false	**3**	
		(ii)	• a breakpoint will halt execution of the code at a predefined point (various line numbers are suitable) • then the values of variable can be inspected to compare with trace table values/expected values	**2**	Award second mark if candidates refer to stepping through the code to compare with trace table values as this is another expression of second bullet point.
		(iii)	Change > to < **OR** swap highest and list[index]	**1**	
	(d)		• function called correctly with parameter • assigning result to myHighest	**2**	`SET myHighest TO findMax(rating)`

Section 2 — Database design and development

Question			Expected response	Max mark	Additional guidance
9.			See entity-relationship diagram below.	3	Award 1 mark for each relationship • Courier – Manufacturer (1:M) • Manufacturer – Product (1:M) • Product – Category (M:1)
10.			• grouping on rating • corresponding values for each rating • sort in descending order	3	<table><tr><td>**rating**</td><td>**Longest movie**</td></tr><tr><td>PG</td><td>143</td></tr><tr><td>12A</td><td>130</td></tr><tr><td>15</td><td>119</td></tr></table>
11.	(a)		Field(s) and Calculation(s) • Use of both type and alias [Most Expensive Item] • Maximum aggregate function on the price field Search Criteria • Use of complex condition / wildcard Grouping • type	4	Search criteria can also use a wildcard, for example type LIKE "*bag" Allow use of % for wildcard. Allow use of 'maximum' in the design of a query.

Example answer:

Field(s) and calculation(s)	type, MAX(price) AS [Most Expensive Item]
Tables(s) and query	Snack
Search criteria	WHERE type = "Multi-bag" or type="Family bag"
Grouping	type
Sort order	
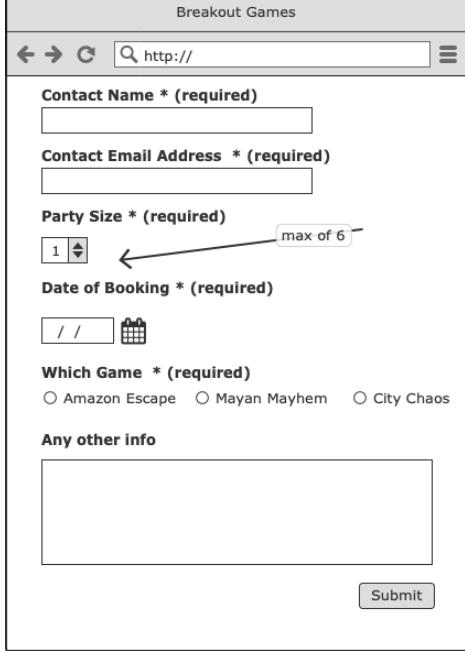
Question			Expected response	Max mark	Additional guidance

11.	(b)		• UPDATE Snack table
			• SET price to new value (price*0.5 OR price/2)
			• WHERE criteria based on stock level
				3	Example answer:
					
					`UPDATE Snack`
					`SET price = 0.5*price`
					`WHERE stock > 500`

	(c)		• SELECT clause with type and SUM(stock)
			• Alias as [Total Stock] with FROM and GROUP BY unchanged
			• ORDER BY with sum(stock) in descending order
				3	Example answer:
					
					`SELECT type, sum(stock) AS`
					`[Total Stock]`
					`FROM Snack`
					`GROUP BY type`
					`ORDER BY sum(stock) DESC`

	(d)		• DELETE FROM Snack
			• WHERE criteria on product name uses both wildcards
				2	Example answers:
					
					`DELETE FROM Snack`
					`WHERE productName LIKE`
					`"*Salt*";`
					
					`Delete FROM Snack`
					`WHERE productName LIKE`
					`"%Salt%";`
					
					Note `"*salt*"` or "%salt%" is allowed.

	Question		Expected response	Max mark	Additional guidance
12.	(a)		A customer may rent the same item more than once (which would not be unique).	1	
	(b)		Field(s) and Calculation(s) • Use of three fields customerID, itemType and startDate, and the calculated field (noOfDays * dailyRentalPrice) Tables • Two tables i.e. Rental, Items Search Criteria • Use of complex condition OR of wildcard for July 2020 dates Sort order • startDate with correct sort order Example answer:	4	Equi-join not needed in design. Search criteria could be expressed as startDate>="01/07/2020" AND startDate<="31/07/2020" Allow use of # around date. As SQL defaults to sorting by ascending order, ASCs does not need to be specified.

	(c)		• FROM clause includes Item and MaxRental
			• WHERE clause is dailyRentalPrice = [Max daily rental]
				2	Example answer:
					
					`SELECT itemType, itemModel`
					`FROM Item, MaxRental`
					`WHERE dailyRentalPrice =`
					`[Max daily rental];`

Example answer table (within 12(b)):

Field(s) and calculation(s)	customerID, itemType, startDate, (noOfDays * dailyRentalPrice)
Tables(s) and query	Rental, Item
Search criteria	AND startDate LIKE "*/07/2020" **OR** AND startDate LIKE "%/07/2020" (AND Item.itemID = Rental.itemID AND Customer.customerID = Rental.customerID)
Grouping	
Sort order	startDate ASC

Section 3 - Web design and development

Question			Expected response	Max mark	Additional guidance
13.	(a)		• Appropriate function name with parameter in brackets and subsequent use of parameter for colour change to black	1	Example answer: `function displayBlack(my_text) { my_text.style.color="Black"; }`
	(b)		• Add onmouseout event to element • Match function name to name created in part (a)	2	Example answer: `<p onmouseover="displayRed(this)"` **`onmouseout=" displayBlack (this)"`** `> Sale now on</p>`

14.			• Grouping of floorplan and event to width 700px
			• Grouping gaminglogo and eventlogo to width/height 75 px, float right and margin-right 20 px
			• Implementing the 10 px margins in any of the grouping selectors
				3	Example answers:
					
					`Header,nav,footer { margin-left 10px;margin-right: 10px;}`
					`#gaminglogo,eventlogo { width: 75px; height: 75px; float:right; margin-right: 20px;}`
					`#event,#floorplans {width: 700px; margin-left: 10px; }`
					
					OR
					
					`Header, nav, footer{margin-right:10px}`
					`Header, #event, footer, nav, #floorplan{margin-left:10px}`
					`#gaminglogo, #eventlogo{width:75px; height:75px; float:right; margin-right:20px}`
					`#floorplan, #event{Width:700px}`

Question			Expected response	Max mark	Additional guidance
15.	(a)	(i)	Submit (button)	**1**	
		(ii)	`<input type="submit">`	**1**	Additional attributes for the input are not required.
	(b)	(i)	Checked	**1**	
		(ii)	`<select name="instrument" size="3" multiple>`	**1**	
	(c)		• persona may be that of a non-technical, reading ability, accessibility issue • allows developer to assess/observe/gain feedback on aspects of the website for example navigation, use of form, visual layout etc.	**2**	Do not accept young, elderly or age on its own.
	(d)		• the heading is a block element • which takes up all of the width of its container element • changing it to an inline element allows the heading and the image to take up the width it requires	**2**	Award 1 mark for each bullet Maximum 2 marks

	Question		Expected response	Max mark	Additional guidance

16.	(a)		`.eventimage { margin-top: 10px; margin-left: 10px ; margin-right: 20px ;}`
			
			OR
			
			`.eventimage { padding-top: 10px; padding -left: 10px ; padding -right: 20px ;}`
				2	All 3 properties for 2 marks
					Any 2 properties for 1 mark

	(b)		• submit button And • text fields with validation indicated e,g, required or use of * for contact name, email and also with text area for additional information • date with validation, for example date picker or dd/mm/yyyy or similar • numeric field with validation for party size i.e. max 6 • radio buttons/select element (drop-down) for game theme	4	Award 1 mark for submit **AND** Award 1 mark for each subsequent bullet to a maximum of 3 marks.
`	(c)		• **developer benefit** - changes based on feedback can be made by the developer before development or implementation time has been wasted • **client benefit** - can provide feedback on matching their requirements/fitness for purpose and suggest changes	2	
	(d)	(i)	`nav ul {list-style-type:none}`	1	
		(ii)	• use of the descendant selector • only selects unordered lists within the nav element/doesn't affect other unordered lists not within a nav element	2	

[END OF SPECIMEN MARKING INSTRUCTIONS]