



National
Qualifications
SPECIMEN ONLY

S816/77/11

Computing Science

Duration — 2 hours 30 minutes

Total marks — 80

SECTION 1 — 20 marks

Attempt ALL questions.

SECTION 2 — 60 marks

Attempt ALL questions.

You may use a calculator.

Write your answers clearly in the answer booklet provided. In the answer booklet you must clearly identify the question number you are attempting.

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

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



* S 8 1 6 7 7 1 1 *

SECTION 1 — 20 marks

Attempt ALL questions

1. A new website is being developed for owners of electric cars.

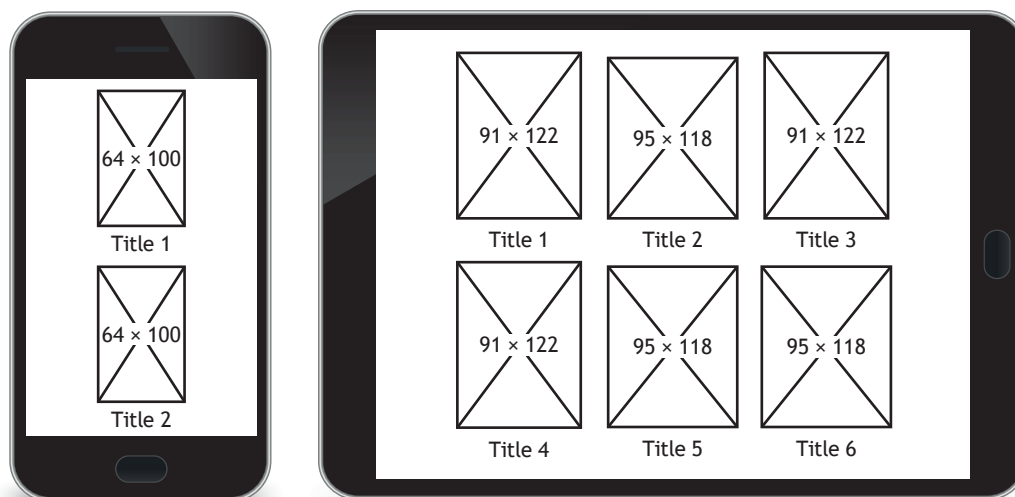
Unregistered users of the website will be able to see the location of public charging stations.

Registered users of the website will be able to connect to one of the chargers and pay for the use of the charger via the website. Once the charge has completed, registered users will be able to view their charging history with details of locations, prices and charge level after each charge.

Draw a use-case diagram for this website.

3

2. Wireframes are created to show how a website would be viewed on different devices.



Explain the purpose of the following code.

```
.column {
  float: left;
  width: 33%;
}

@media screen and (max-width: 600px) {
  .column {
    width: 100%;
  }
}
```

2

3. Convert the hexadecimal number CAB into its denary equivalent.

1

4. A teacher is creating a program to process the test results for her class. Results for the first three pupils are shown below.

firstName	surname	testMark
Karen	Black	23
Wladek	Grabinsky	26
Harry	Clark	15
...

She stores the test results of all 20 pupils in her class in an array of records called `pupilDetails`.

A module is used to sort the array `pupilDetails` into ascending order of `testMark`.

The incomplete code for this module is shown below.

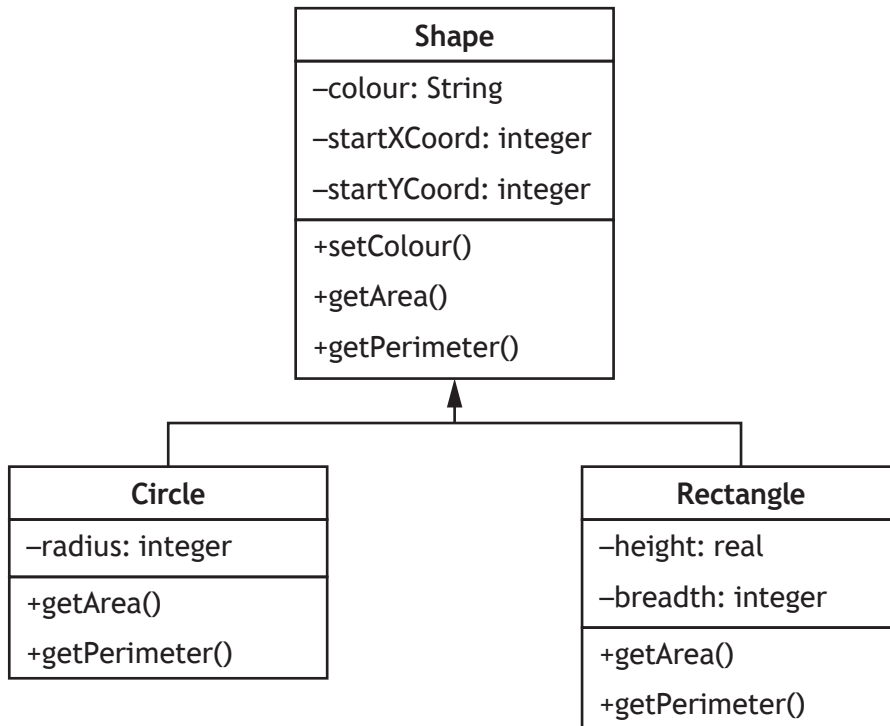
```

...
Line 31  PROCEDURE sort (ARRAY of Pupil pupilDetails)
Line 32      REPEAT
Line 33          SET swapped TO false
Line 34          FOR counter FROM 1 TO 19 DO
Line 35              IF _____
Line 36                  SET swapped TO true
Line 37                  < swap data >
Line 38              END IF
Line 39          END FOR
Line 40      UNTIL swapped = false
Line 41  END PROCEDURE
...

```

- (a) Name the sort algorithm used in the program. 1
- (b) Using a programming language of your choice, write the line of code required at Line 35. 1
- (c) The `sort` module requires testing. 2
 Name and describe an appropriate type of testing that could be used to check that the `sort` module is correct.

5. Consider the UML class diagram below.



(a) Using appropriate object-oriented terminology, explain why the following statement would be invalid.

```
SET shapel.colour TO "blue"
```

2

(b) The `getArea()` methods of the `Shape` and `Rectangle` classes are shown below.

Shape class

```
FUNCTION getArea() RETURNS REAL
    SET area TO 0.0
    RETURN area
END FUNCTION
```

Rectangle class

```
OVERRIDE FUNCTION getArea() RETURNS REAL
    SET area TO THIS.length * THIS.breadth
    RETURN area
END FUNCTION
```

Using appropriate object-oriented terminology, explain the use made of the `OVERRIDE` statement in the `getArea()` method of the `Rectangle` class.

2

6. A processor uses an 8-bit register to store the results of calculations.

(a) State the value stored in the register as a result of adding the 8-bit two's complement numbers 10011111 and 10101010.

1

(b) State why the value stored in the register is incorrect.

1

(c) During the execution of a calculation, the processor alters the values of the flags within the status register.

Copy and complete the table below to show the binary state of each flag after the addition in part (a) above has been completed.

2

Carry	
Overflow	
Sign	
Zero	

7. A company's database servers have received an SQL injection attack from its website. The SQL injection has corrupted or deleted most of the data being stored.

With reference to an SQL command that may have been used in the attack, explain what is meant by SQL code injection.

2

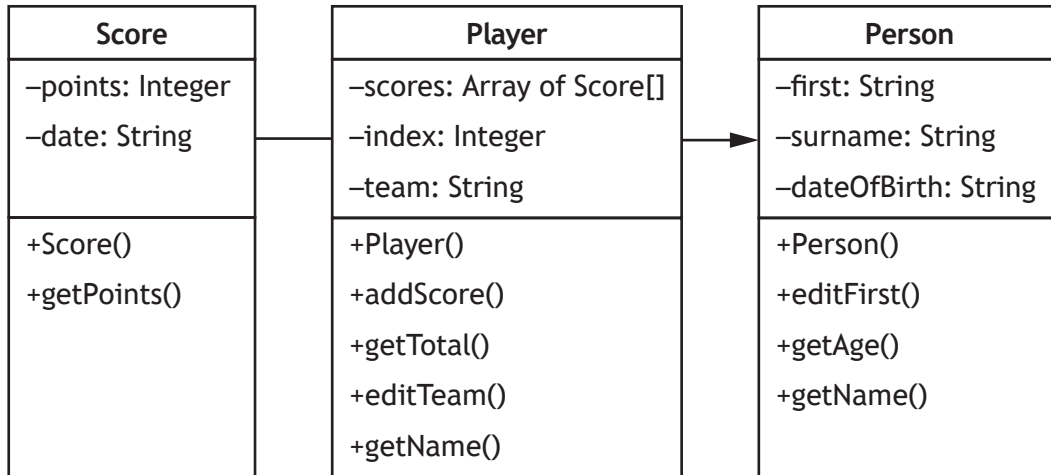
[END OF SECTION 1]

SECTION 2 — 60 marks

Attempt ALL questions

8. An object-oriented program is used to store and return statistics about basketball teams and their players.

A simplified version of the UML class diagram for the program is shown below.



Some of the program code is shown below.

```

...
Line 20  CLASS Person IS { STRING first, STRING surname,
          STRING dateOfBirth }

Line 21  METHODS

Line 22  CONSTRUCTOR ( STRING first, STRING surname,
          STRING dateOfBirth )

Line 23  DECLARE THIS.first INITIALLY first
Line 24  DECLARE THIS.surname INITIALLY surname
Line 25  DECLARE THIS.dateOfBirth INITIALLY dateOfBirth
Line 26  END CONSTRUCTOR

Line 27  PROCEDURE editFirst( STRING first )
Line 28  SET THIS.first TO first
Line 29  END PROCEDURE

...
...

Line 35  FUNCTION getName() RETURNS STRING
Line 36  DECLARE outputPhrase AS STRING
Line 37  SET outputPhrase TO "My name is " & THIS.first
          & " " & THIS.surname & " and I like basketball"
Line 38  RETURN outputPhrase
Line 39  END FUNCTION

Line 40  END CLASS
...

```

8. (continued)

```

...
Line 60  CLASS Player INHERITS Person WITH { ARRAY OF Score
        scores, INTEGER index, STRING team }

Line 61  METHODS

Line 62      CONSTRUCTOR ( STRING first, STRING surname,
        STRING dateOfBirth, STRING team )

Line 63      DECLARE THIS.first INITIALLY first
Line 64      DECLARE THIS.surname INITIALLY surname
Line 65      DECLARE THIS.dateOfBirth INITIALLY dateOfBirth
Line 66      DECLARE THIS.team INITIALLY team
Line 67      DECLARE THIS.scores AS ARRAY OF Score INITIALLY
        []
Line 68      DECLARE THIS.index INITIALLY 0
Line 69      END CONSTRUCTOR

...
...
Line 101  DECLARE person1 AS Person INITIALLY ( "Wayne",
        "Nowitzki", "19/06/1990" )
Line 102  person1.editFirst( "Dwayne" )
Line 103  SEND person1.getName() TO DISPLAY
...

```

- (a) Using appropriate object-oriented terminology, explain the operation and effect of
 - (i) Line 101 of the program 2
 - (ii) Line 102 of the program. 2

- (b) State the output generated by Line 103 of the program. 1

- (c) (i) Amanda Greene was born on 26th April 1987 and she has signed up to play basketball for the Burnside Braves.
 Using a programming language of your choice, write the line of code needed to instantiate a `Player` object called `player2` to store Amanda's details. 1

8. (continued)

- (c) (ii) The following line of code is added to the program.

```
player2.getName()
```

The output produced by the program is shown below.

My name is Amanda Greene and I play basketball for the Burnside Braves.

Explain the meaning of the term polymorphism by making reference to the `getName()` methods in this program.

2

- (d) The `addScore()` method of the `Player` class is shown below.

```
Line 70  PROCEDURE addScore(newPoints, when)
Line 71      SET result TO Score INITIALLY (newPoints, when)
Line 72      SET THIS.scores[THIS.index] TO result
Line 73      SET THIS.index TO THIS.index + 1
Line 74  END PROCEDURE
```

Using appropriate object-oriented terminology, explain the operation and effect of the following line of code.

3

```
player2.addScore(23, "27/01/2019")
```

- (e) The `getTotal()` method of the `Player` class is used to calculate and return the total score for an individual player.

Using a programming language of your choice, write the code needed to implement the `getTotal()` method.

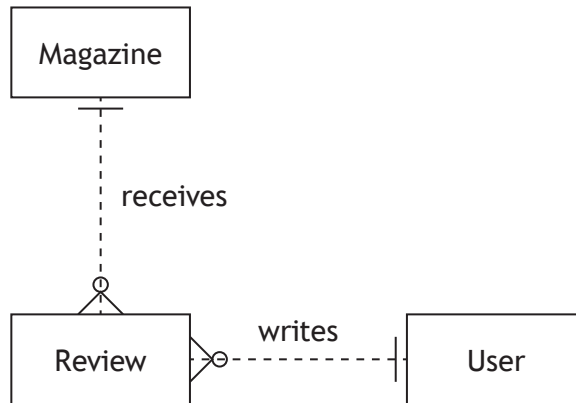
3

9. A new website called iLoveMags is being launched by a magazine publisher. Registered users of the site will be able to submit reviews of their favourite magazines.

Information on users and magazines is stored in an online database that consists of three related tables.

Magazine	User	Review
<u>magID</u>	<u>username</u>	<u>magID*</u>
magName	forename	<u>username*</u>
category	surname	<u>reviewDate</u>
	subscriptionType	reviewText
		rating

- (a) Look at the entity-relationship diagram below.



- (i) Explain the difference between weak and strong entities by referring to the `User` and `Review` entities in the iLoveMags database. 2
- (ii) Describe the relationship participation between the `Magazine` and `Review` entities in the iLoveMags database. 2

9. (continued)

- (b) Users who download a magazine will be able to submit a review using an HTML form based on the design below.

Some of the code used to implement this form is shown below.

```

...
Line 34 <form _____>
Line 35     <select name="mag">
Line 36         <option value="footy">iLoveFooty</option>
Line 37         <option value="rugby">iLoveRugby</option>
Line 38         <option value="bball">iLoveBBall</option>
Line 39     </select>
...

```

- (i) Write the missing attributes needed to complete Line 34 of the `form` element that allows users to securely send a review to a page called `submission.php`.
- (ii) The file `submission.php` will perform the following server-side tasks.
- Assign the form data to PHP variables.
 - Connect to a database server using the following credentials.
 - Server name: `magserver.com`
 - Database name: `Publications`
 - Username: `steven`
 - Password: `J4cks`
 - Create an SQL query to add the review to the `Review` table.
 - Execute the SQL query.

Using PHP, write the code for these server-side tasks.

2

4

9. (continued)

- (c) A decision is made to remove the
- `Review`
- table from the database.

Write the SQL code to delete the `Review` table.

1

- (d) The website will include a search facility as shown in the design below.

Magazine Search

Select a category...	▼	Search
----------------------	---	--------

When clicked, the Search button will activate a server-side process called `search.php` which will be used to

- search the database `Publications`
 - return the results to a variable called `$results`
 - display the search results on the screen.
- (i) Explain why `GET` is an appropriate method to use when submitting search criteria to a server-side process.
- (ii) The section of PHP code below will be used to display the search results on the screen using an HTML table.

1

.....

```

Line 23 echo '<table border="1"> <tr> <th>Category</th>
        <th>Magazine Title</th> </tr>';
Line 24 while ($magazine = mysqli_fetch_array($results))
Line 25 {
Line 26     echo '<tr> <td>'.$magazine['category'].'</td>
        <td>'.$magazine['magName'].'</td> </tr>';
Line 27 }
Line 28 '</table>';

```

...

Describe the table used to display the query results on the screen.

1

- (e) The
- `iLoveMags`
- website will be hosted on a server in a data centre.

Describe one feature of a data centre that could have a detrimental impact on the environment.

1

10. A company has 15 devices, consisting of laptops, tablets and desktop devices on its network. It is company policy that only these types of devices can be added to the network. Details of the network devices are stored in a relational database that consists of two tables, *Device* and *Manufacturer*.

Device

Attribute	Sample Data
macAddress	00-30-BD-11-A2-4C
deviceType	Laptop
dateOfPurchase	10/02/2017
hoursActive	5282
online	TRUE
manufacturerID	B11023

Manufacturer

Attribute	Sample Data
manufacturerID	B11023
manufacturerName	Belken
headOffice	Playa Vista, Los Angeles, California, USA

- (a) Write the SQL statement to create the *Device* table. Your statement should include the restricted choice applied to *DeviceType*. 4
- (b) Write the SQL query used to display the manufacturer name and number of laptops from each manufacturer, where the manufacturer has supplied at least 10 laptops. Your query should make use of the *HAVING* clause. 2
- (c) The company had a data integrity issue with its server and some of the records from the *Device* table were deleted. The table called *DeviceBackup* can be used to restore any missing records.

An SQL statement is used to copy any missing records from the *DeviceBackup* table to the *Device* Table.

```
INSERT INTO Device
SELECT * FROM DeviceBackup
WHERE _____ ;
```

Write the code needed to complete the *WHERE* clause that checks to ensure a record of the *DeviceBackup* table does not already exist in the *Device* table. 2

10. (continued)

(d) The company is monitoring the use made of each device on the network.

A single query is used to

- display the name of all manufacturers that don't have their head office in the USA
- count the number of devices from each of these manufacturers that have a greater than average number of hours active.

State the missing parts A, B and C to complete the query design below.

3

Field(s) / Calculation(s)		manufacturerName, COUNT(*)				
Table(s)		Device, Manufacturer				
Search criteria	A	Inner query	Field(s) / Calculation(s)	manufacturerName		
			Table(s)	Manufacturer		
			Search criteria	headOffice LIKE "*USA*"		
	AND	B	Inner query	Field(s) / Calculation(s)	C	
				Table(s)	Device	
				Search criteria		
Grouping		manufacturerName				

(e) The `macAddress` and `deviceType` of all 15 devices are selected from the database and stored within a program in a 2D array called `devices`.

<code>macAddress</code>	<code>deviceType</code>
00-40-96-4B-2A-33	Laptop
01-11-E1-A3-41-52	Tablet
00-30-BD-11-A2-4C	Laptop
.....

The details in the `devices` array are to be sorted into ascending order of `macAddress` using the insertion sort algorithm.

Write the pseudocode for this module of the program.

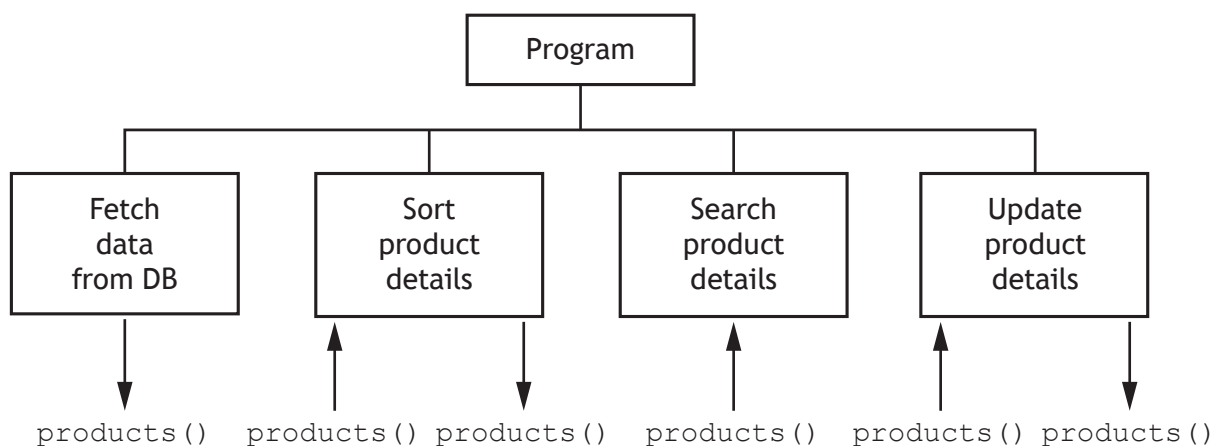
5

11. A company sells a range of 20,000 items on their website. The items can either be collected from a local store or can be delivered to a customer's home address.

A server-side program is used to provide the required functionality for several processes. Each of these processes makes use of an array of records called `products`. This variable stores the details of the 20,000 items that the company sells. A sample set of data stored in the array is shown below.

itemID	item	description	unitPrice	stockQuantity	discountItem
CH001	Folding chair	for use when camping, at the beach, picnics	12.99	12	false

The structure diagram below shows the top-level design of the program.



- (a) The data about each item on the website is fetched from the `Item` table of a relational database.

The following section of PHP code has been written to fetch the item details and store them in the array of records called `products`. You should assume that the PHP variable `$connection` represents a successful connection with the database server.

```

Line 21  $products = array();
Line 22  $query = "SELECT * FROM Item";
Line 23  $result = mysqli_query($connection, $query);
Line 24  while ($row = mysqli_fetch_array($products) {
Line 25      $products[] = $row;
Line 26  }
  
```

By referring to specific lines in this section of code, evaluate its fitness for purpose.

11. (continued)

- (b) Customers use the online search facility to search for items by entering the ID of the item required.

Use pseudocode to refine the ‘Search product details’ process to search and locate a desired item. You should make use of the binary search algorithm by assuming that the contents of `products()` have already been sorted into ascending order of `itemID`.

4

- (c) Pseudocode is used to design the login page used by customers who want to make purchases from the website.

1. start PHP session
2. use HTML to display login form
3. connect to DB server
4. authenticate username and password submitted by the customer
5. assign customer’s login details to PHP variables
6. assign contents of login variables to session variables

...

Describe the purpose of a PHP session with session variables in any website with a login facility.

2

- (d) The `itemID` of all chairs in the `Item` table starts with the letters ‘CH’. Each of these items is to be discounted.

The ‘Update product details’ process is used to

- alter the value of the `discountItem` field of all chairs in the `Item` table
- display the message ‘Record updated successfully’ or ‘Error updating record’ as appropriate.

Write the section of PHP code that would be used to update the required details in the `Item` table and display the appropriate message. You should assume that the PHP variable `$connection` represents a successful connection with the database server.

3

- (e) A new module is to be added to the program. This module will highlight all discounted items by displaying their names, one at a time, in a rectangular frame of asterisks. For example

```
*****
* Folding chair *
* Striped deckchair *
* Stacking chair *
* Folding chair *
*****
```

Use pseudocode to design a module to display the names of all discounted items as described above.

You should assume that each item name starts and ends with a non-space character.

5

[END OF SPECIMEN QUESTION PAPER]



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Marking Instructions

These marking instructions have been provided to show how SQA would mark this specimen question paper.

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General marking principles for Advanced Higher Computing Science

Always apply these general principles. Use them in conjunction with the detailed marking instructions, which identify the key features required in candidates' responses.

- (a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.
- (b) If a candidate response does not seem to be 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.
- (c) Award marks regardless of spelling, as long as the meaning is unambiguous.
- (d) Candidates may answer programming questions in any appropriate programming language or pseudocode. Award marks regardless of minor syntax errors, as long as the intention of the coding is clear.
- (e) For a **describe** question, candidates 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.
- (f) For an **explain** question, candidates must relate cause and effect and/or make relationships between things clear, in the context of the question or a specific area within the question.
- (g) Give credit where a labelled diagram conveys clearly and correctly the response required by the question.

Marking instructions for each question

Section 1

Question		Expected response	Max mark	Additional guidance
1.			3	<p>1 mark for 3 use cases.</p> <p>1 mark for registered and unregistered actors interacting with correct use cases.</p> <p>1 mark for any database actor (charger, bank or user) interacting with correct use cases.</p>
2.		<p>This enables the browser to respond differently to the screen size of the viewing device.</p> <p>With screens over 600px, content will be drawn in 3 columns.</p> <p>With smaller screens there will a single column.</p>	2	<p>1 mark for description of screens over 600px wide.</p> <p>1 mark for description of response to smaller screens.</p>
3.		$\text{CAB} = 12 * 256 + 10 * 16 + 11$ $= 3243$	1	
4.	(a)	Bubble sort	1	
	(b)	<pre>IF pupilDetails[counter-1].testMark > pupilDetails[counter].testMark THEN</pre>	1	Accept alternative/equivalent forms.
	(c)	<p>Component testing The <code>sort</code> module would be tested in isolation from other modules in the program. This makes it easier to identify and debug any errors that may arise.</p> <p>Integrative testing The <code>sort</code> module needs to be integrated within the program. Parameter passing would be checked to make sure all variables correctly passed and complete.</p>	2	<p>1 mark for naming an appropriate type of testing.</p> <p>1 mark for a description.</p> <p>Award marks only where the candidate gives a description as part of their response.</p>

Question		Expected response	Max mark	Additional guidance
5.	(a)	<p>Encapsulation has been used to restrict access to the <code>colour</code> variable.</p> <p>This variable can only be accessed using the <code>setColour()</code> method of the <code>Shape</code> class.</p>	2	<p>1 mark for encapsulation or use of private property.</p> <p>1 mark for method required to edit the contents of the variable.</p>
5.	(b)	<p>The <code>OVERRRIDE</code> statement is used to redefine the <code>getArea()</code> method that was inherited from the <code>Shape</code> class.</p>	2	<p>1 mark for use of <code>OVERRRIDE</code>.</p> <p>1 mark for inherited method.</p>
6.	(a)	01001001	1	
	(b)	<p>For example</p> <ul style="list-style-type: none"> the addition of two negative numbers should result in a negative number not a positive one the correct answer requires 9 bits but only 8 bits are available $-97 = (-86) = -183$ which is out of range. 	1	1 mark for any correct reason for the incorrect value.
	(c)	<ul style="list-style-type: none"> Carry = 1 Overflow = 1 Sign = 0 Zero = 0 	2	<p>1 mark for two or three flags correct.</p> <p>0 marks for no or one flag(s) correct.</p>
7.		<p>SQL injection is a type of web security vulnerability in which an attacker attempts to use an SQL query to access or corrupt database content.</p> <p>In this case, it may allow the attacker to <code>UPDATE</code>, <code>DROP</code>, or <code>DELETE</code> data stored in the back-end database - causing unauthorised data corruption or loss.</p>	2	<p>1 mark for description of SQL injection.</p> <p>1 mark for reference made to appropriate SQL statement.</p>

Section 2

Question			Expected response	Max mark	Additional guidance
8.	(a)	(i)	A new object of the <code>Person</code> class has been instantiated AND populated with a value for each instance variable in the class.	2	1 mark for instantiation of an object of <code>Person</code> class. 1 mark for assignment of values to instance variables of the <code>Person</code> class.
		(ii)	This code is used to invoke the <code>editFirst()</code> method of the <code>person1</code> object (with the value/actual parameter 'Dwayne'). Changes the value of the instance variable <code>first</code> (in the <code>person1</code> object) to Dwayne.	2	1 mark for invoking <code>editFirst()</code> method. 1 mark for updating the instance variable <code>first</code> of the <code>person1</code> object.
	(b)		My name is Dwayne Nowitzki and I like basketball.	1	
	(c)	(i)	<code>SET player2 AS Player INITIALLY ("Amanda", "Greene", "26/04/1987", "Burnside Braves")</code>	1	All four values must be used correctly.
		(ii)	Polymorphism refers to the ability to redefine the <code>getName()</code> method of the <code>Player</code> subclass that has been inherited from the <code>Person</code> super class. The inherited code is overwritten meaning that the subclass and class respond differently to any message received.	2	1 mark for ability to redefine the inherited <code>getName()</code> method. 1 mark for ability to respond differently to the same message.
	(d)		A new element (consisting of a score and date) is added to the array of <code>Score</code> objects that belongs to the <code>Player</code> object called <code>player2</code> . The index of the <code>scores</code> array (the array of <code>Score</code> objects) is incremented by adding one to the class variable <code>numberGames</code> that belongs to the <code>Player</code> class.	3	1 mark for correct use of the array of <code>Score</code> objects in explanation. 1 mark for correct relationship between <code>Score</code> and <code>Player</code> objects used in explanation. 1 mark for appropriate reference to indexing of the <code>scores</code> array by incrementing the class variable.

Question		Expected response	Max mark	Additional guidance
8.	(e)	<pre> FUNCTION getTotal() RETURNS INTEGER DECLARE totalScore INITIALLY 0 REPEAT FROM 0 TO THIS.index - 1 DO SET totalScore TO totalScore + scores.getPoints[THIS .index] END REPEAT RETURN totalScore END FUNCTION </pre>	3	<p>1 mark for initialising and correctly updating the local variable <code>totalScore</code>.</p> <p>1 mark for loop making correct use of the instance variable <code>index</code> and returning the calculated <code>totalScore</code>.</p> <p>1 mark for correct use of <code>getTotal()</code> method of the <code>scores</code> array.</p>
9.	(a)	(i) <p>The <code>User</code> entity is a strong entity; it is complete by itself and doesn't depend on any other entity in the system.</p> <p>The <code>Review</code> entity is a weak entity; it cannot be identified independently without its owner entities and its primary key is formed using primary keys from the <code>User</code> and <code>Magazine</code> entities.</p>	2	<p>1 mark for correct identification and description of <code>User</code> entity (strong).</p> <p>1 mark for correct identification and description of <code>Review</code> entity (weak).</p>
		(ii) <p>Each review must refer to exactly one magazine - this side of the relationship is mandatory</p> <p>whereas</p> <p>a magazine may or not be reviewed - this side of the relationship is optional.</p>	2	<p>1 mark for description of <code>Review</code> participation.</p> <p>1 mark for description of <code>Magazine</code> participation.</p>

Question			Expected response	Max mark	Additional guidance
9.	(b)	(i)	<pre>action="submission.php" method="post"</pre>	2	<p>1 mark for correct action.</p> <p>1 mark for correct method.</p>
		(ii)	<pre>\$dbhost = 'magserver.com'; \$dbuser = 'steve'; \$dbpass = 'J4cks'; \$dbname = 'publications'; \$conn = mysqli_connect(\$dbhost, \$dbuser, \$dbpass,\$dbname); \$magID = \$_POST["mag"]; \$review = \$_POST["review"]; \$rating = \$_POST["rating"]; \$sql = "INSERT INTO Review ('magID', 'reviewText', 'rating') VALUES ('\$magID', '\$review', '\$rating'); mysqli_query(\$conn, \$sql); mysqli_close(\$conn);</pre>	4	<p>1 mark for <code>\$conn</code> with correct credentials.</p> <p>1 mark for assigning values posted from form.</p> <p>1 mark for correct query.</p> <p>1 mark for execution of SQL query.</p>
	(c)		<pre>DROP TABLE Review;</pre>	1	
	(d)	(i)	<p>GET parameters are stored in the browser history meaning that the results can be cached and bookmarked.</p>	1	<p>1 mark for explanation that includes the reason why the search results can be bookmarked.</p>
		(ii)	<p>The search results will be displayed in an HTML table with two columns. The heading of the first column is 'Category' and the heading of the second column is 'Magazine Title'.</p>	1	<p>1 mark for accurate description.</p>
	(e)		<p>Descriptions could refer to</p> <ul style="list-style-type: none"> energy needed for cooling purposes will increase amount of carbon emissions energy used to run servers 24 hours a day will increase amount of carbon emissions. 	1	<p>1 mark for description that refers to detrimental impact of data centres on the environment.</p> <p>Accept other valid answers.</p>

Question		Expected response	Max mark	Additional guidance
10.	(a)	<pre>CREATE Table Device(macAddress VARCHAR(17), deviceType VARCHAR(7), dateOfPurchase DATE, hoursActive INTEGER, online BOOLEAN, manufacturerID VARCHAR(6), CONSTRAINT deviceType CHECK(deviceType = "Laptop" OR deviceType = "Tablet" OR deviceType = "Desktop"), Primary Key (macAddress), Foreign Key (manufacturerID) REFERENCES Manufacturer(manufacturerID));</pre>	4	<p>1 mark for all fields with appropriate SQL data types.</p> <p>1 mark for constraint on deviceType field.</p> <p>1 mark for PK.</p> <p>1 mark for FK.</p>
	(b)	<pre>SELECT manufacturerName, COUNT(*) AS [Number of Laptops] FROM Manufacturer, Device WHERE Manufacturer.manufacturerID = Device.manufacturerID AND Device.deviceType = "Laptop" GROUP BY Manufacturer.manufacturerID HAVING COUNT(*) >= 10;</pre>	2	<p>1 mark for correct SELECT statement making use of COUNT() function with the correct equi-join and correct GROUP BY clause.</p> <p>1 mark for correct use of HAVING.</p> <p>Note alias is not essential in the SELECT clause.</p>
	(c)	<pre>WHERE NOT EXISTS (SELECT * FROM Device WHERE Device.macAddress = DeviceBackup.macAddress);</pre>	2	<p>1 mark for correct use of NOT EXISTS.</p> <p>1 mark for correct subquery.</p>
	(d)	<p>A: manufacturerName not in</p> <p>B: hoursActive ></p> <p>C: AVG(hoursActive)</p>	3	1 mark each correct.

Question		Expected response	Max mark	Additional guidance
10.	(e)	See possible answer below.	5	<p>1 mark for correct indexing of 2D array.</p> <p>1 mark for outer loop with assignment of initial current values and current index.</p> <p>1 mark for correct condition used for inner conditional loop NOTE: accept <code>devices[back][0] > devices[forward][0]</code>.</p> <p>1 mark for decrementing back to move backwards down to start of array.</p> <p>1 mark for correct update of both values in the array.</p>
		<p>Possible answer (alternative answers are acceptable).</p> <p>It is assumed that the first dimension of the 2D array is indexed from 0 to 14.</p> <pre> for i = 1 to 14 value1 = devices[i][0] value2 = devices[i][1] index = i while (index > 0) and (value1 < devices[index-1][0]) devices[index][0] = devices[index-1][0] devices[index][1] = devices[index-1][1] index = index - 1 end while devices[index][0] = value1 devices[index][1] = value2 end for </pre>		

Question		Expected response	Max mark	Additional guidance
11.	(a)	<p>The query is not fit for purpose.</p> <p>The wrong parameter has been passed to the <code>mysqli_fetch_array()</code> function at Line 24.</p> <p>Instead of the <code>\$products</code> array, the function should be applied to the variable <code>\$results</code> which receives the query answers returned at Line 23.</p>	2	<p>1 mark for use of incorrect parameter with the <code>mysqli_fetch_array()</code> function.</p> <p>1 mark for making appropriate reference to the lines of code provided.</p>
	(b)	See possible answer below.	4	<p>1 mark for initialisation.</p> <p>1 mark for conditional loop with correct complex condition. NOTE accept also loop until upper > lower or found = true.</p> <p>1 mark for correct comparisons and appropriate updates.</p> <p>1 mark for setting found = true.</p>
		<p>Possible answer (alternative answers are acceptable).</p> <pre> low = 0 high = 19999 found = false enter target repeat set mid = (low + high) / 2 if target = products[mid].itemID then set found to true else if target > products[mid].itemID set low = mid + 1 else set high = mid - 1 end if until (found is true) OR (low > high) </pre>		

Question		Expected response	Max mark	Additional guidance
11.	(c)	<p>A session begins when a customer logs in to a website and terminates when they log out.</p> <p>For the duration of their visit to the site, a customer's login credentials are stored in session variables so that they can be accessed by multiple pages of the site.</p>	2	<p>1 mark for description of a PHP session.</p> <p>1 mark for use of login details across multiple pages of the site.</p>
	(d)	<pre> \$sql = "UPDATE Item SET discountItem ='True' WHERE itemID like 'CH*'; if (mysqli_query(\$connection, \$sql)) { echo "Record updated successfully"; } else { echo "Error updating record"; } </pre>	3	<p>1 mark for use of UPDATE query with correct WHERE statement.</p> <p>1 mark for execution of query using \$connection.</p> <p>1 mark for output of correct error message.</p>

Question		Expected response	Max mark	Additional guidance
11.	(e)	See possible answer below.	5	<p>1 mark for checking for discounted products.</p> <p>1 mark for finding and storing the length of the longest product name.</p> <p>1 mark for correct number of asterisks in the first and last row. (use of longestName + 4)</p> <p>1 mark for displaying first and last row of the output.</p> <p>1 mark for correctly displaying additional spaces needed to align the right-hand column of asterisks.</p>
		<p>Possible answer (alternative answers are acceptable).</p> <pre> set longestName = 0 loop from 0 to 19999 if discountItem of the product = true then if length of itemName > longestName then set longestName = length of itemName end if end if end loop display first row of output with longestName + 4 asterisks loop from 0 to 19999 if discountItem of the product = true then display asterisk & space & itemName & space (longestName - length of itemName) extra spaces & asterisk end if end loop display last row of output with longestName + 4 asterisks </pre>		

[END OF SPECIMEN MARKING INSTRUCTIONS]

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Change since last published:

Changes to marking instructions (Question: 11 (e))