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National Qualifications SPECIMEN ONLY

Mark

S816/75/01 Computing Science

Date — Not applicable

Duration — 2 hours

S8167501

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day | Month | Year

Scottish candidate number

Total marks — 110

SECTION 1 — 25 marks

Attempt ALL questions.

SECTION 2 — 85 marks

Attempt ALL questions.

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

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

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

SQA ©

S8167501

SECTION 1 — 25 marks

Attempt ALL questions

1. Convert the following 8-bit binary number into denary. **1**

1011 0111

2. Explain why it may be necessary to return to the implementation stage of an iterative development process after the testing stage. **1**

3. State two implications of the Data Protection Act for a business that stores the personal details of its staff. **2**

Implication 1

Implication 2

4. The code below monitors the speed of a vehicle:

```
...
Line 5  RECEIVE speed FROM <sensor>
Line 6  WHILE speed <= 70 DO
Line 7  RECEIVE speed FROM <sensor>
Line 8  END WHILE
Line 9  SEND signal TO <alarm>
```

Describe what happens in lines 6 to 9 above if the sensor detects a value of 83 at line 5. **3**

5. The Bank of Aberdeen uses a firewall and encryption to ensure data is kept secure.

(a) Explain the purpose of a firewall. **1**

(b) Explain how encryption can keep data secure. **1**

6. An ASCII character set contains both control characters and printable characters.

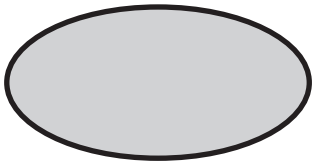
State one example of each. **2**

Control character _____

Printable character _____

7. Explain why web designers make use of low-fidelity prototyping. **1**

8. A vector graphic file stores objects and their attributes.



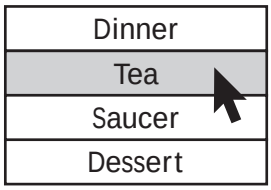
(a) State the name of the object shown above. **1**

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

Attribute 1 _____

Attribute 2 _____

9. A pottery shop's database allows users to choose a type of plate, as follows:



(a) State the type of validation shown above. **1**

(b) Describe why the database uses this type of validation. **1**

10. Jane is entering an online competition. She edits a recording of herself singing to save and upload to the competition's website.

Describe one advantage and one disadvantage of saving and uploading an MP3 file format rather than a WAV file format to the website. **2**

Advantage of MP3 file format _____

_____

Disadvantage of MP3 file format _____

_____

11. Switching off a computer system when it is not being used reduces energy use.

Describe two other methods of reducing the energy use of a computer system. **2**

Method 1 _____

_____

Method 2 _____

_____

12. The value 195 would be stored in a computer system using 'floating-point representation' as shown below:

$$0{\cdot}195 \times 10^3$$

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

Mantissa _____

Exponent _____

13. A web page can use both internal and external hyperlinks.

Explain the difference between an internal and an external hyperlink. **2**

_____

_____

_____

_____

_____

SECTION 2 — 85 marks

Attempt ALL questions

14. Mark writes a program to calculate a worker's average weekly wage.

The first part of the program asks the user to log in. They are given three attempts to enter the correct password which is 'Bingo'.

```
...
Line 6   SET attempts TO 0
Line 7   REPEAT
Line 8     RECEIVE password FROM KEYBOARD
Line 9     SET attempts TO attempts +1
Line 10  UNTIL _____________________________________________
...
```

(a) Complete line 10 of the code above. **3**

(b) State the data type of the variable `password`. **1**

_____

The following section of code calculates the average weekly wage:

```
Line 11  RECEIVE day1 FROM KEYBOARD
Line 12  RECEIVE day2 FROM KEYBOARD
Line 13  RECEIVE day3 FROM KEYBOARD
Line 14  RECEIVE day4 FROM KEYBOARD
Line 15  RECEIVE day5 FROM KEYBOARD
Line 16  RECEIVE day6 FROM KEYBOARD
Line 17  RECEIVE day7 FROM KEYBOARD
Line 18  SET weeklyAverage TO (day1 + day2 + day3 + day4 +
         day5 + day6 + day7)/7
Line 19  <display the seven days wages and average>
```

14. (continued)

(c) When evaluating this code, it is found to be inefficient.

Using a programming language of your choice, rewrite lines 11 to 18 of the code using more efficient constructs. **5**

15. Two golfers from a golf club are in the headline article of the 'Scotland Yesterday' newspaper.

SCOTLAND YESTERDAY

28th July 2017 Issue 290 20p

Fife Golfers Win National Pairs Trophy

On a dreich day in September, John Smart and his playing partner Anne Campbell (both of Levenbel Golf Club) took on the best of Scotland's mixed pairs teams in the annual **Mixed Amateur Playoffs** tournament.

The setting was the ever mighty Gleneagles golf course with its rolling hills, swaying rough and bunkers so deep they say you need stepladders to climb back out of them. The pair started poorly with bogeys on both the first and second holes leaving them trailing the earlier leaders from Glasgow by two shots.

As the day brightened so did the prospects of the Fife pair. A magnificent long drive on the fifth hole by Anne left John with a short pitch which he holed for a spectacular eagle. The pair then went from strength to strength holing long putts for birdies on the eighth, ninth and tenth holes successively.

John Smart

Anne Campbell

The Fife pair finally finished 7 under par taking the trophy by a clear 4 shots from their nearest competitors.

(a) The golf club wishes to add a new web page to the club's website, which will include:

- information from the newspaper article
- photographs of the golfers
- a video interview with the golfers.

Using this information, draw a wireframe design for the new page. **3**

15. (continued)

(b) A cascading style sheet (CSS) rule shown below is used to style the large headings in the golf club's website:

```
h1 { font-size: 20px;
     font-family: "Times New Roman";
     text-align: center;
}
```

Paragraph text in this website should be displayed on the left, using a Helvetica font that is half the height of the text used in the large headings.

Write a CSS rule that would style the paragraphs. **4**

(c) The golf club's website is tested by club members. Two members report that the video does not display correctly.

Describe two additional tests that could be performed on the website. **2**

Test 1 _____

_____

Test 2 _____

_____

[Turn over

16. Pam is creating an application that will find and display a person's tax rate based on their salary.

Salary	Tax rate
0–12000	0
12001–40000	20
40001 upwards	40

(a) Analyse the problem and identify the input, the process and the output. **3**

Input _____

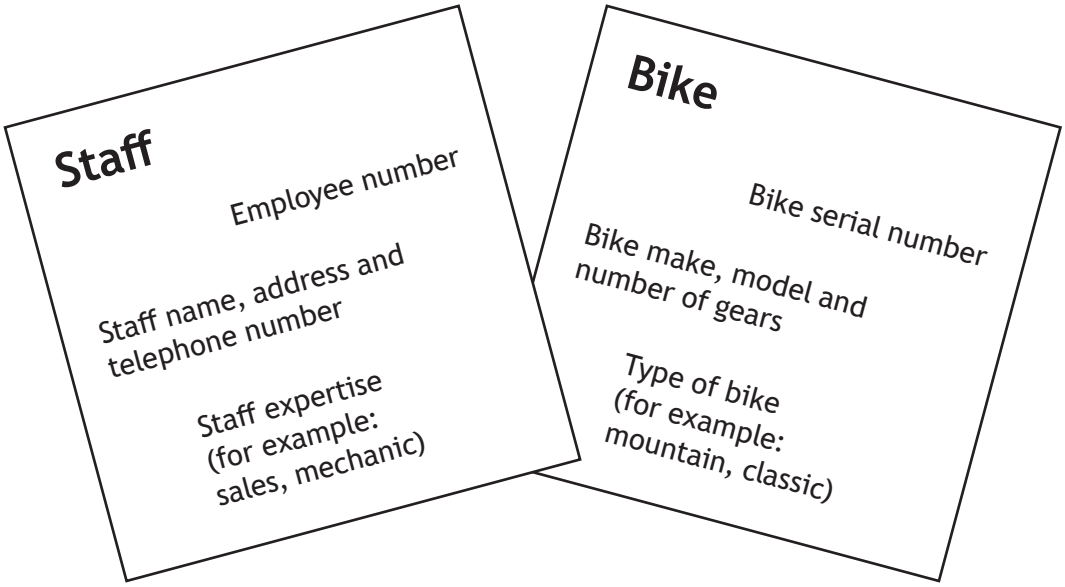
Process _____

Output _____

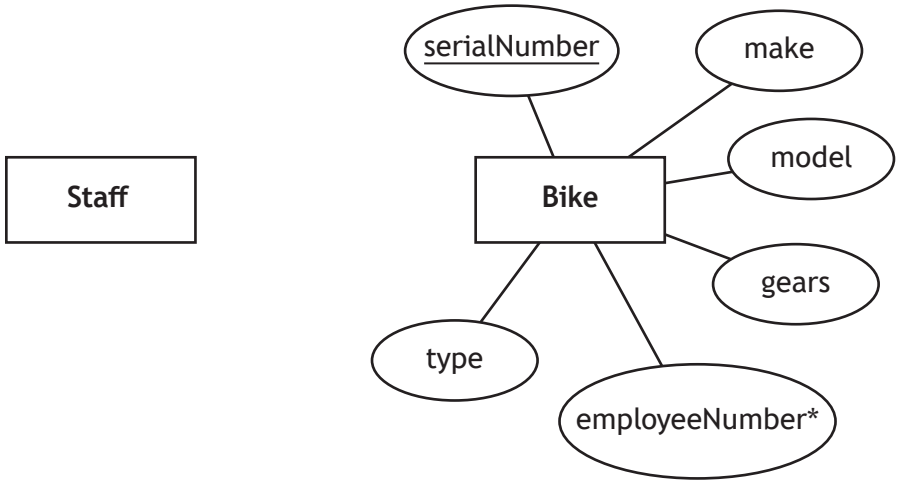
(b) Using a design technique of your choice, design an efficient solution to the problem of finding a person's tax rate. **4**

17. Angela works in a cycle shop. She decides to create a database to store information on staff and bikes. This would make it easier to record which staff member prepared each bike for sale.

Angela starts by analysing the problem. She looks at what information the store currently holds on paper and makes notes as follows:



(a) Complete the entity-relationship diagram below. **4**



[Turn over

17. (continued)

(b) Following implementation of the database, the 'Bike' table below contains 11 records.

serialNumber	make	model	type	gears	employeeNumber
20X5346F	Boardman	CX Team 14	Road	20	11
RAL09787	Raleigh	Cameo	Classic	7	9
RAL026356	Raleigh	Cuckoo	Classic	3	9
863345467	Carrera	Kraken	Mountain	27	10
20X62983	Boardman	MB Comp	Mountain	20	7
V0973647	Voodoo	Malice	BMX	1	7
30X6253J	Boardman	Team	Hybrid	21	9
V02377643	Voodoo	Malice	BMX	1	7
RAL97436	Raleigh	Cameo	Classic	7	12
RAL09944	Raleigh	Sprint	Road	21	11
30X76543	Boardman	CX Team 14	Road	20	11

Angela notices data entry errors. The two Raleigh Cameo bikes have 8 gears and not 7 as entered in the database.

She writes the following SQL statement to correct these errors.

```
UPDATE Bike
SET gears = 7
WHERE make = "Raleigh";
```

(i) Explain why Angela's SQL statement **would not** correct these errors. **1**

(ii) Explain why Angela's SQL statement would create additional errors in the database. **1**

17. (continued)

(c) Angela wishes to remove the following bike from the database.

Serial Number: 30X76543

Make: Boardman

Model: CX Team 14

Type: Road

Gears: 20

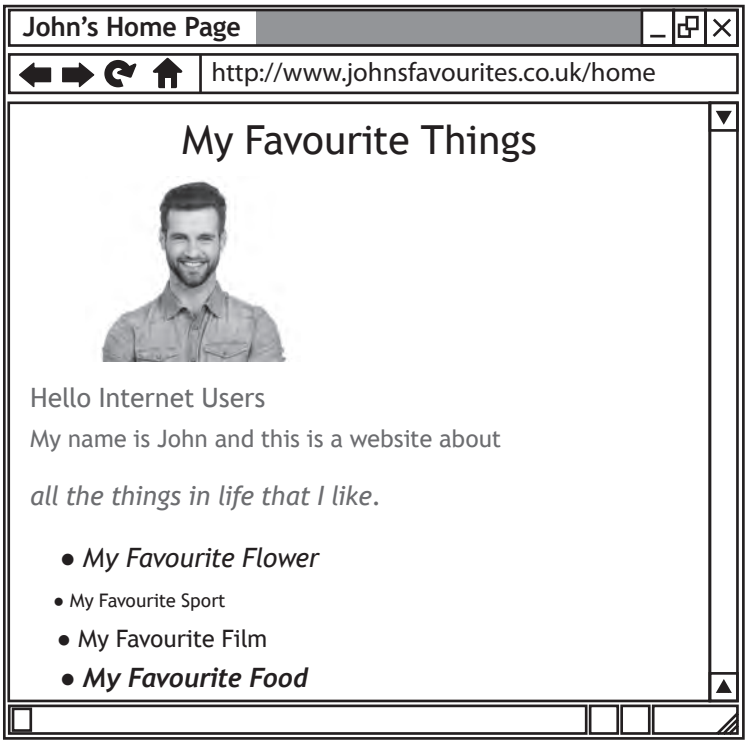
(i) Evaluate the effect of running the SQL statement below: **2**

```
DELETE FROM Bike
WHERE make = "Boardman" AND model = "CX Team 14";
```

(ii) Describe a better solution Angela could use to remove the bike from the database. **1**

[Turn over

18. John has created a website listing his favourite things. The home page of his website is shown below.



(a) John tests his website using a browser and notices a lack of consistency.

Explain why John's home page lacks consistency. **2**

18. (continued)

(b) John wishes to show his favourite sports as a bullet point list on his 'favourite sports' page. His list of favourite sports will be implemented using <ul> and <li> tags.

Add HTML <ul> and <li> opening and closing tags to the list below. **3**

Golf

Cricket

Ten Pin Bowling

[Turn over

18. (continued)

DO NOT WRITE IN THIS MARGIN

One of John's linked pages shows his favourite flower. When the HTML document below is displayed in a browser, it generates the web page shown.

HTML document

```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
<style>
h1 {font-size:20px;font-style:bold;text-align:center}
p {font-size:12px;color:DarkGreen;text-align:left}
#latin {font-size:10px;font-style:italic;color:LightGreen}
img {width:304px;height:300px;align-left}
</style>
</head>

<body>
<h1>My Favourite Flower</h1>

<p>My favourite flower is called a Magnolia. They are ancient flowers thought
to be around 20 million years old. A picture of a Magnolia in full flower is
shown below.<br>

<img id="photo" src="magnolia.jpg" alt="Magnolia Flower"
onmouseover="document.getElementById('photo').src='magnoliaFlower.jpg'"/>
</p>

<p ID="latin">Magnolioideae</p>

</body>
</html>
```

Web page

My Favourite Flower

My favourite flower is called a Magnolia. They are ancient flowers thought to be around 20 million years old. A picture of a Magnolia in full flower is shown below.

Magnolioideae

MARKS

DO NOT WRITE IN THIS MARGIN

(c) The <img> tag contains some additional code used to create dynamic content.

(i) State the language used to create dynamic content in web pages. **1**

(ii) The graphic changes when the mouse pointer is placed over it.

Identify the event in the code that causes the graphic to change. **1**

(d) The text in the web page uses internal style rules positioned in the <head>.

(i) State the type of CSS selector shown by the # symbol at the beginning of the CSS rule below. **1**

```
#latin {font-size:10px;font-style:italic;color:LightGreen;}
```

(ii) The CSS rules below contain three styles each.

```
p {font-size:12px; color:DarkGreen; text-align:left}
#latin {font-size:10px; font-style:italic; color:LightGreen;}
```

Both of these rules have been applied to the text below the graphic.

```
p ID="latin">Magnolioideae</p>
```

Describe how the text below the graphic will look when it is viewed in a browser. **3**

[Turn over

18. (continued)

(e) The favourite flower page includes an image tag linked to a bit-mapped graphic.

```
src="magnolia.jpg"
```

(i) Describe how a bit-mapped graphic is represented in a computer system's memory. **2**

(ii) State why the file type of the bit-mapped graphic is suitable for use on a web page. **2**

(f) John is advised to use an external cascading style sheet.

Describe what is meant by an external cascading style sheet. **2**

(g) John used a search engine to find a suitable graphic to use on each of his pages.

State one way John could ensure he does not breach the Copyright, Designs and Patents Act 1988. **1**

19. Read the following design for a solution to a problem.

Algorithm

1 Ask the user to enter their name

2 Ask the user to enter their flight details

3 Generate the holiday booking reference

4 Display the holiday booking reference

Refinements

1.1 Ask user to enter surname only

2.1 Ask user to enter first three letters of departure airport (for example: Edi for Edinburgh)

2.2 Ask user to enter first three letters of arrival airport

3.1 Store the booking reference as: arrival airport string + surname + departure airport string

(a) State which design technique has been used for the above solution. **1**

(b) State the output expected if the design is tested by Kate Bryant who is flying from Glasgow to Barcelona. **3**

(c) Refinement 3.1 stores the holiday booking reference.

State two programming constructs that would be required to implement this refinement. **2**

Construct 1 _____

Construct 2 _____

(d) When implementing the above solution, describe one advantage of using an interpreter and one advantage of using a compiler to translate the program code into binary. **2**

Interpreter _____

Compiler _____

19. (continued)

(e) Using a design technique of your choice, add input validation to refinement 2.1 to ensure that the user only enters a 3 character string. An error message should inform the user when their input is not valid. **4**

20. Scot Cars (a second-hand car company) has branches located in five different Scottish towns and cities. They maintain a database of all cars they have in stock. Some of the records from the relational database are shown below.

Table name: Branch

branchNumber	street	town	postcode	dateFounded
18536423	10 Glasgow Road	Hamilton	HA9 8FR	14/07/1962
29736453	13 Pretty Drive	Inverness	IN2 13GW	11/12/1970
99108663	194 Collinton Avenue	Edinburgh	EH28 1PK	28/02/1965
36352363	125 Milk Way	Glasgow	G2 3HJ	17/01/2010
28635491	243 Bents Road	Dundee	DN14 7CD	01/10/1997

Table name: Car

make	model	colour	registration	mileage	electricWindows	alloyWheels	branchNumber
Ford	Ka	White	SL23 GTD	37970	Yes	No	99108663
Volkswagen	Golf	Black	ST99 FDT	33200	Yes	Yes	18536423
Ford	Escort	Silver	X364 TNK	120665	No	No	28635491
Vauxhall	Corsa	Yellow	BH20 SWZ	4009	Yes	Yes	28635491
Nissan	Qashqai	Black	SH88 NNG	67118	Yes	Yes	18536423
BMW	3 Series	Blue	SH34 BNM	33200	Yes	Yes	29736453
Ford	Ka	Green	SL85 HDF	40029	No	No	29736453

MARKS DO NOT WRITE IN THIS MARGIN

(a) Scot Car's relational database contains primary and foreign keys.

(i) State the purpose of a foreign key in a relational database. **1**

_____

[Turn over

20. (a) (continued)

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

	Table	Field
Primary key		
Primary key		
Foreign key		

(iii) State the relationship that exists between the two implemented tables. **1**

_____

(b) State the output from the following SQL statement. **3**

```
SELECT make, model, registration
FROM Car
WHERE colour="Black"
ORDER BY make ASC;
```

20. (continued)

(c) Customers often visit Scot Cars looking for a particular make and model of car.

Design a search that would provide customers with an ordered list of cars, as shown below. **4**

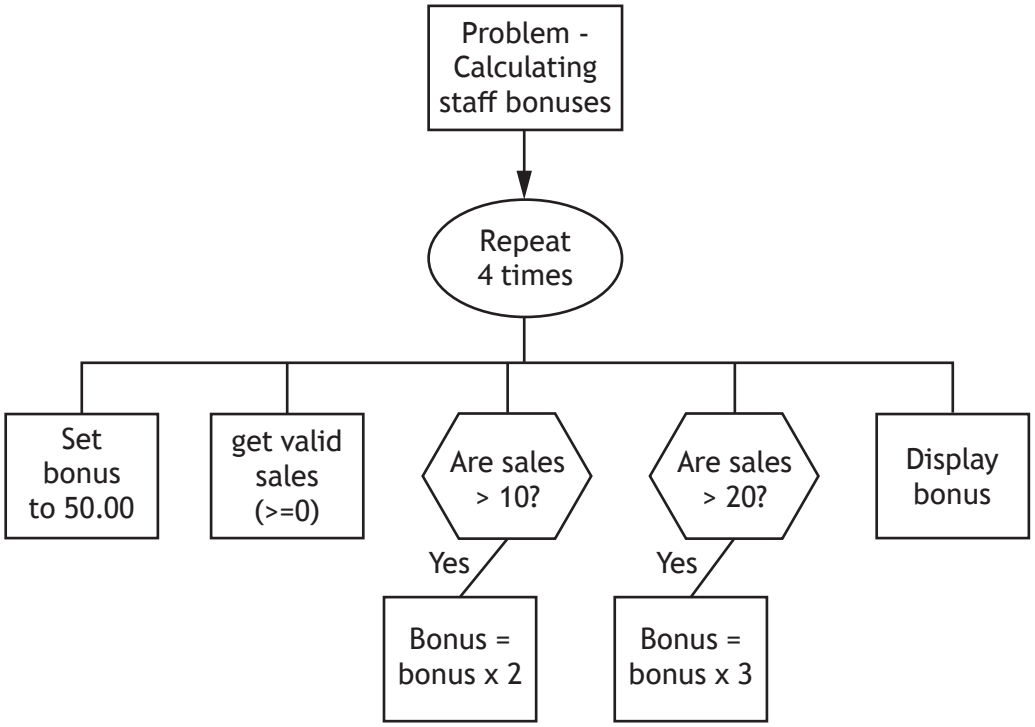
Model	Colour	Town	Mileage
Ka	White	Edinburgh	37970
Ka	Silver	Glasgow	38002
Ka	Green	Inverness	40029
Ka	Black	Dundee	43099
Ka	Green	Hamilton	50103
Ka	White	Edinburgh	52086
Ka	Brown	Edinburgh	78192

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

[Turn over

21. Arthur's Antiques sells old furniture. All staff receive a monthly bonus of £50, which is increased if they sell over 10 items of furniture. The bonus is increased further if they sell over 20 items of furniture.

A design for the program used to calculate the bonus payment for each of the four members of staff is shown below.



(a) List the variables and data types that would be required to implement the design.

The first one has been completed for you. **2**

Variable name	Data type
loop	integer

(b) The program is implemented to match the design.

State examples of exceptional and extreme test data that could be used when inputting staff sales. **2**

Exceptional _____

Extreme _____

21. (continued)

(c) The program is further tested with normal test data. The results are shown below.

	Sales input	Expected output	Actual output
Staff 1	6	Bonus is 50	Bonus is 50
Staff 2	10	Bonus is 50	Bonus is 50
Staff 3	15	Bonus is 100	Bonus is 100
Staff 4	22	Bonus is 150	**Bonus is 300**

The test data for Staff 4 shows there is an error in the design.

(i) State the type of error. **1**

(ii) Describe how this design error could be corrected. You may wish to write a description or re-draw part of the design. **2**

21. (continued)

(d) When the program is running it carries out the following tasks:

- stores the original bonus value of 50
- checks if sales > 10

(i) State the part of the processor that would temporarily store the value 50. **1**

_____

(ii) State the part of the processor that would compare the sales value to the value 10. **1**

_____

[END OF SPECIMEN QUESTION PAPER]

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ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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