

FOR OFFICIAL USE



National
Qualifications
SPECIMEN ONLY

Mark

SQ08/N5/01

Computing Science

Date — Not applicable

Duration — 1 hour and 30 mins



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 — 90

SECTION 1 — 20 marks

Attempt ALL questions in this section.

SECTION 2 — 60 marks

Attempt ALL questions in this section.

Read all questions carefully before attempting.

Write your answers in the spaces provided, using blue or black ink.

Show all workings.

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 — 20 marks
Attempt ALL questions

1. Convert the value 25 into an 8-bit *binary* number. Show your working. 1

2. Explain why the telephone number 07700 901012 should be stored as a *text field type* and not a *numeric field type*. 1

3. Name the *bus* used to transfer instructions from the main memory to the processor. 1

4. Companies must adhere to *health and safety legislation* for employees using computer systems regularly.

Adjustable workstation chairs allow computer users to change the height and seating position to prevent back ache.

- Name **one** other workstation feature and describe how it reduces a risk to health. 1

5. Describe the purpose of *JavaScript scripting language*. 2



6. Here is part of a database used to store information about cameras.

Brand	Model	Megapixels (mp)	Screen Size	Optical Zoom	Colour	Continuous Shooting (Fps)	Wide Angle	Price (£)
Yarxa	YX2300	16.6	3	21	Silver	14	21	£131.70
JK	JK1209	16	3	15	White	1.39		£95.99
Katichi	K1456AD	16	2.7	21	Red			£99.99
Gifipix	PH900	16	3	26	Black			£139.99
Yarxa	YX3500	14.1	3	21	Black	1	25	£129.99
Katichi	K2300WA	14	3	18	Black	1.2	28	£119.99
Gifipix	PH800	14	3	18	Black	1.2		£134.99
Katichi	K2800AD	14	2.7	26	Red			£139.99
Katichi	K2850AD	14	3	26	White			£142.99
Gifipix	PH500	14	3	24	Black	1.2	24	£147.99

Describe how the data has been sorted.

2



* S Q 0 8 N 5 0 1 0 3 *

7. The *pseudocode* below shows how a program could store and process the race times (in seconds) of the finalists in a 100 m sprint.

```

Line 1. SET alltimes TO [10.23, 10.1, 10.29, 9.9,
                        10.12, 10.34, 9.99, 9.58]
Line 2. SET fastest_time TO alltimes [0]
Line 3. FOREACH time FROM alltimes DO
Line 4.     IF time < fastest_time THEN
Line 5.         SET fastest_time TO time
Line 6. END IF
Line 7. END FOREACH
Line 8. SEND ["The winner's time was: ", fastest_time]
        TO DISPLAY

```

State the most suitable *data structure* and *data type* for storing the highlighted variable (*alltimes*) used above.

2

8. A web page can be found using the URL:
<http://www.thooons.co.uk/partymusic/party.html>
Identify the *file type* being accessed.

1

9. An online auction company has suffered a *Denial of Service attack*.

(a) Describe what is meant by a *Denial of Service attack*.

1

(b) Explain the effect it would have on *users*.

1

Total marks 2



* S Q 0 8 N 5 0 1 0 4 *

MARKS

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10. Describe **one** benefit of using *biometric sensors* for security.

1

11. Operating system design is developing to take account of smartphones and tablets. Describe **one** example of this.

1

12. A college has just upgraded all the computer equipment used by staff. Describe **one** issue that should be considered when disposing of the old equipment.

1

13. Describe the role of a *file server* in a *client server* network.

1



* S Q 0 8 N 5 0 1 0 5 *

14. Below is a section of code written in the programming language ALGOL.

```
begin
integer N;
Read Int(N);
begin
real array Data[1:N];
real sum, avg;
integer i;
sum:=0;
for i:=1 step 1 until N do
begin real val;
Read Real(val);
Data[i]:=if val<0 then -val else val
end;
for i:=1 step 1 until N do
sum:=sum + Data[i];
avg:=sum/N;
Print Real(avg)
end
end
```

State **two** techniques that the programmer could use to make this code more readable.

2

15. State **where** in a computer system the *binary* instructions are stored before they are executed.

1



SECTION 2 — 70 marks

Attempt ALL questions

16. An app is being developed for tourists to use to find out information about a holiday location such as: activities, how to get around, and the weather.

When a tourist uses the app a number of options are displayed for their current location.



- (a) Describe two advantages of running this app on a smartphone rather than a desktop PC. 2

- (b) Comment on the suitability of the user interface design shown above for use on a smartphone. 2

Question 16 (continued)

MARKS

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- (c) The temperature is displayed as 23.6 °C
State how this number would be stored by a computer system.

2

- (d) The app will store photographs of the tourist attractions.

(i) State a *standard file format* suitable for storing photographs.

1

- (ii) The resolution of the photographs is reduced to make the file size smaller.

Explain why the file size of the photograph is reduced when the *resolution* is reduced.

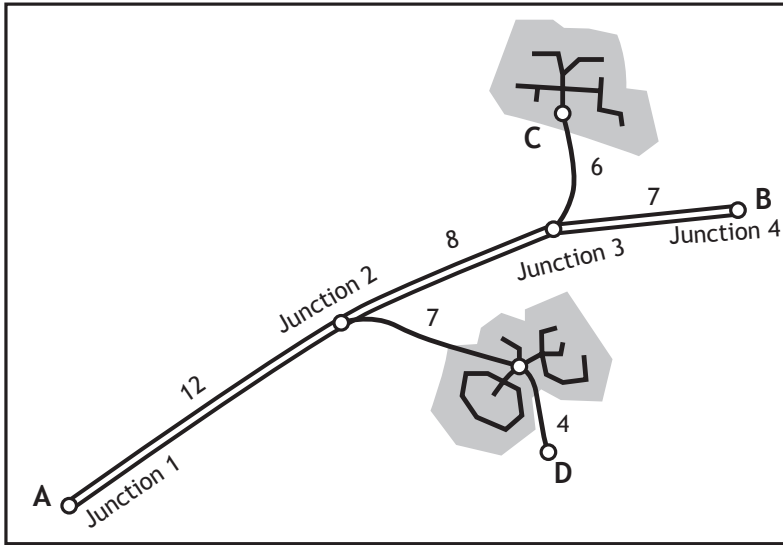
1

Total marks 8



* S Q 0 8 N 5 0 1 0 8 *

17. Road maps display the distance, in miles, between two points as a whole number.



To calculate the total length of a journey between two places on the map, all sections of the journey are added together.

In the map shown, it is 23 miles (12+7+4) from A to D.

A program is designed to calculate the total length of a journey from a list of map distances. Journeys always start at A.

```

Line 1.  SET total TO 0
Line 2.  RECEIVE destination FROM keyboard
Line 3.  REPEAT
Line 4.      RECEIVE distance FROM keyboard
Line 5.      SET total TO total + distance
Line 6.  UNTIL distance = 0
Line 7.  SEND ["The distance between A and
              ",destination," is ",total," miles"] TO
              DISPLAY
    
```

(a) (i) The above design was created using *pseudocode*. Name another *design notation* that could have been used instead. 1

(ii) Describe one advantage of using this *design notation* rather than *pseudocode*. 1

Question 17 (continued)

- (b) Identify the *variables* and state their *data types* used in the program design.

3

Variable	Data type
1. _____	_____
2. _____	_____
3. _____	_____

- (c) List the *test data* that should be entered to test that the program correctly calculates the distance from A to C.

2

- (d) Line 1. SET total TO 0
 Line 2. RECEIVE destination FROM keyboard
 Line 3. REPEAT
 Line 4. RECEIVE distance FROM keyboard
 Line 5. SET total TO total + distance
 Line 6. UNTIL distance = 0

The program above stops when the user enters 0.

The design is to be improved to display a warning message if the total is greater than 50.

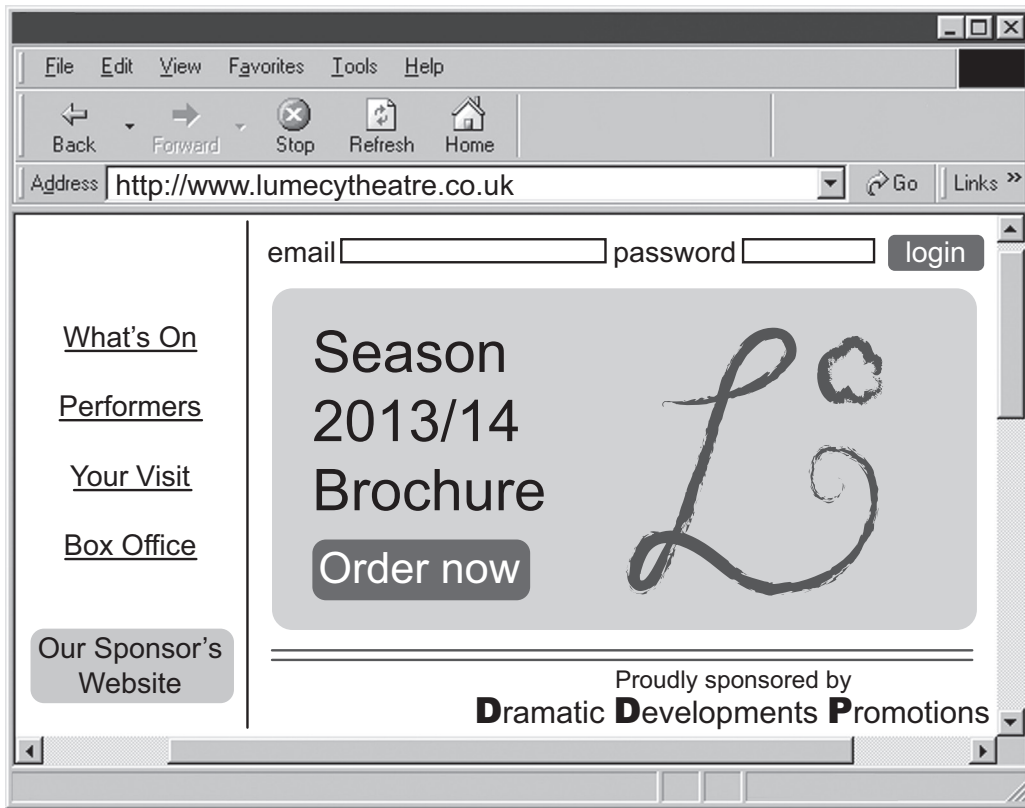
Use pseudocode or a programming language of your choice to show how this extra feature could be implemented.

3

Total marks 10



18. The Lumecy Theatre homepage is shown below. It provides access to the four main sections of their website – What’s On, Performers, Your Visit and Box Office. It also allows customers to go to the website of their sponsor.



- (a) The *hyperlinks* are checked to make sure each one leads to the correct web page.

Describe **one** other test that should have taken place when this **web page** was being developed.

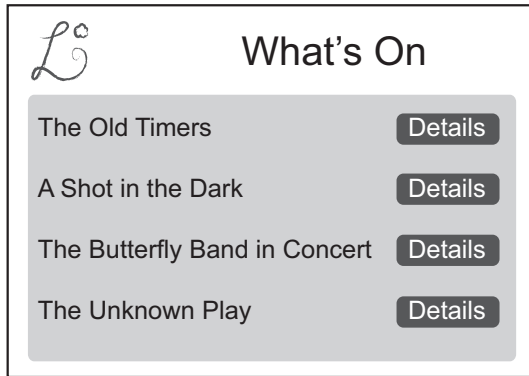
1

- (b) Explain, using examples from the web pages above, the difference between an *internal hyperlink* and an *external hyperlink*.

2

Question 18 (continued)

Here are two sample pages from the Lumecy Theatre website.



What's On web page



Box Office web page

(c) The two web pages above use different types of navigation.

Draw a diagram for each page to represent the navigation structure used. 2

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(d) Describe **one** element of good design that could be used to aid *accessibility* in the Lumecy website. 1

Question 18 (continued)

(e) Lumecy stores details of its customers on a database.

(i) State **one** principle Lumecy must comply with in terms of the **Data Protection Act**.

1

(ii) Explain why compliance with this principle is important to **customers**.

1

Total marks 8

19. Modern cars are fitted with embedded (built-in) computers that perform a variety of functions. One of the latest functions automatically activates the brakes if the car gets too close to the car in front. For safety reasons this function is only activated at low speeds.

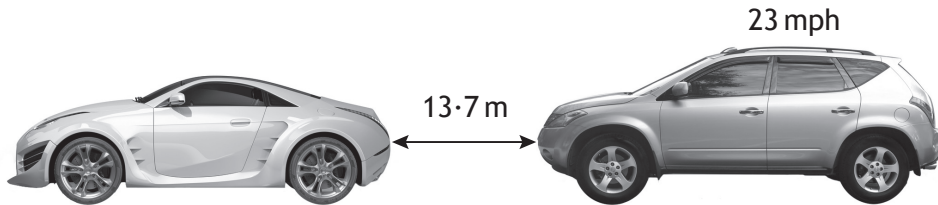
(a) Automatic braking requires sensors that measure the speed of the car and the distance between the two cars.

State the hardware that allows external devices to be connected to a computer system.

1

Question 19 (continued)

- (b) A program is required that will apply the car brakes if the distance between the two cars is less than 15 metres (m). For safety reasons, the brakes should only be activated if the speed of the car is less than 30 mph. The brakes should be kept on until the speed of the car is 0 mph.



The *pseudocode* below shows a design for the program.

There are two errors in the logic of the program design. Find and describe each error made.

2

```

Line 1. RECEIVE speed_of_car FROM (real) SENSOR
Line 2. RECEIVE distance_to_car FROM (real) SENSOR
Line 3. IF speed_of_car <30 OR distance_to_car<15 THEN
Line 4. REPEAT
Line 5.     SEND apply brakes TO car brakes
Line 6.     RECEIVE speed_of_car FROM (real) SENSOR
Line 7. UNTIL speed_of_car = 100
Line 8. END IF
    
```

Error	Line number	Description
1.	_____	_____
	_____	_____
2.	_____	_____
	_____	_____

Question 19 (continued)

- (c) A program is written and tested using the following *test data*.
- (i) Complete the table below to show four examples of *test data* and the type of each example. 3





Test data	Type of test data
car speed – 30 mph, distance – 15 m	
car speed – 14 mph, distance – 8 m	normal
car speed – 45 mph, distance – 17 m	
	exceptional

- (ii) Explain the purpose of fully testing a program using a variety of *test data*. 1
-

Total marks 7



20. Carlton Crafts employs a number of instructors to run courses for clients. Here is an example of the data stored about each instructor and the courses they run.

Instructor ID	First Name	Surname	Date of birth	Expertise	Photo	Course ref	Title	Level	Course day
INS186	Oliver	Jones	12/11/85	Painting		DR234	Basic Drawing	Beginner	Monday
INS187	Susan	Kyama	25/11/87	Enamel		CR657	Jewellery Gifts	Advanced	Tuesday
INS186	Oliver	Jones	12/11/85	Painting		DR254	Painting Landscapes	All levels	Wednesday
INS188	Andrew	Cheng	09/09/90	Pottery		PY675	Drawing	Beginner	Tuesday

A decision is made to store this data in a database.

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- (a) Describe one reason why a database with *linked tables* would be better than a *flat file* for storing this data.

1

- (b) A design with two tables is created—INSTRUCTOR table and COURSE table.

- (i) Identify a suitable *primary key* for each table.

2

- (ii) Explain why it is necessary to have a *foreign key*.

1



* S Q 0 8 N 5 0 1 1 6 *

Question 20 (continued)

MARKS

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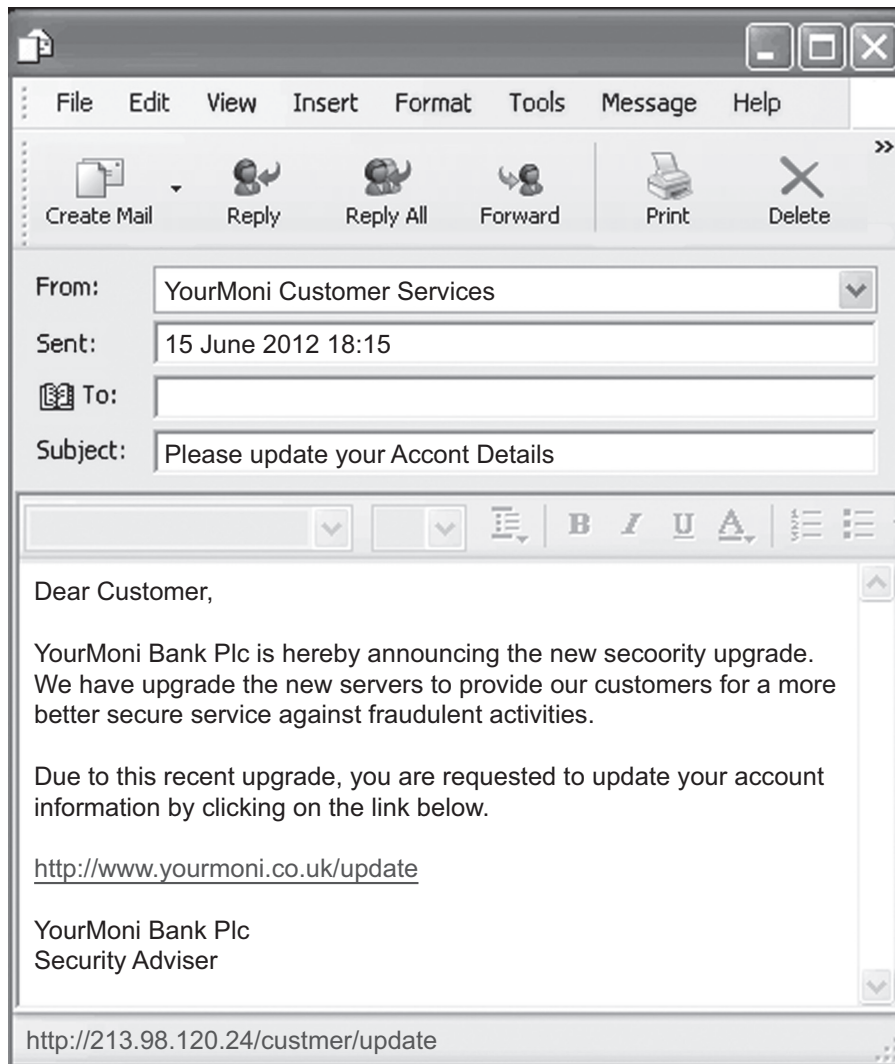
(c) Name **two** different *field types* required to store the data shown.

2

(d) Name and describe a type of *validation* that could be used on the field called "Course day".

2

The following e-mail is received by one of the instructors who is a registered customer of YourMoni Bank Plc.



MARKS

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Question 20 (continued)

- (e) Explain why the instructor might suspect this is not a genuine e-mail from the bank. Your explanation should refer to **two** features of the email which could cause suspicion.

2

- (f) Explain why such e-mails pose a security risk if the recipient clicks on the link.

2

Total marks 12



21. A programming language provides the following built-in functions.

- move(n) n = distance moved in pixels
- turn(d) d = degrees turned (positive means clockwise)
- pen_down() starts drawing line
- pen_up() finishes drawing line

These can be used by the programmer to draw lines.

An example program, its output and notes on the output are shown below.

<pre>pen_down() REPEAT 4 TIMES move(100) turn(-90) END REPEAT pen_up()</pre>	<p style="text-align: center;">OUTPUT</p> <p>Each movement is 100 pixels long</p>
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(a) Assuming the initial move direction is up the screen, draw the output that would be created by the following program. 3

<pre>pen_down() REPEAT 2 TIMES move(30) turn(90) move(60) turn(-90) END REPEAT pen_up()</pre>	<p style="text-align: center;">OUTPUT</p>
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Question 21 (continued)

MARKS

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- (b) State the **type** of loop shown in the design. Justify your answer.

2

- (c) Once the program has produced a drawing on screen, the user can save a drawing as a bitmap with a resolution of 600x600 pixels in 8 bit colour.

Calculate the *storage requirements* of one of these saved *bitmapped graphics*. Give your answer in appropriate units.

Show your working.

3

Total marks 8



22. The “Files in the Sky” website provides internet-based document storage. Before using the website, a user must set up a new account. The design for the new account input screen is shown below.

First name	Textfield 1		
Surname	Textfield 2		
Date of birth	Text3	Text	Text5
Choose a user name	Textfield 6	* required	
Create a password	Textfield 7	at least 8 characters	
Confirm your password	Textfield 8		
	Sign me up!		

- (a) (i) Using pseudocode or a language of your choice, show how a program could check that the password entered into textfield7 has at least eight characters.

3

23. A computer program is used to store a patient’s heart rate each day for a week. The seven readings are stored in an array of real numbers called “bpm”.

- (a) Using pseudocode or a programming language of your choice, write a short program to calculate the average heart rate of the patient over the seven days.

3

- (b) The pseudocode below shows how the heart rate is entered.

```
Line 1    REPEAT  
Line 2          RECEIVE bpm FROM keyboard  
Line 3          IF bpm < 35 THEN  
Line 4              SEND appropriate message TO display  
Line 5          END IF  
Line 6    UNTIL bpm >=35
```

Describe all the events that will occur if a user enters a negative value.

3



Question 23 (continued)

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(c) The completed program is translated into *binary* using a compiler.

(i) State the name given to binary instructions.

1

(ii) State **two** reasons why a *compiler* is used to translate the completed program.

2

Total Marks 9

[END OF SPECIMEN QUESTION PAPER]



* S Q 0 8 N 5 0 1 2 4 *