

FOR OFFICIAL USE



National
Qualifications
2015

Mark

X716/76/01

Computing Science

WEDNESDAY, 6 MAY

9:00 AM – 11:00 AM



* X 7 1 6 7 6 0 1 *

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.

SECTION 2 — 70 marks

Attempt ALL questions.

Show all working.

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.



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SECTION 1 — 20 marks
Attempt ALL questions

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1. Convert the decimal number -120 to binary using 8 bits.

1

2. Tables can be related by different types of relationships. State the type of relationship between the two tables in each case below.

(a) People and Hobbies

1

(b) Jockeys and Horses in a horse race

1



3. An online company uses a computer program to display particular customer records. The algorithm of this program is shown below.

```

Line 1   SET found TO false
Line 2   RECEIVE search_name FROM (STRING) KEYBOARD
Line 3   FOR counter FROM 0 TO <End Of List> DO
Line 4       IF name[counter] = search_name THEN
Line 5           SET found TO true
Line 6           SEND name[counter] & counter TO DISPLAY
Line 7       END IF
Line 8   END FOR
Line 9   IF found = false THEN
Line 10       SEND "Name not found" TO DISPLAY
Line 11  END IF
    
```

The following data is stored in the name array:

Jimmy, Samina, Kate, Jimmy, Adam

State the output from the above program if Jimmy is entered at line 2 from the keyboard. 2

4. One feature of a declarative language is the use of facts. Three facts are shown in lines one to three below:

```

Line 1   human(einstein).
Line 2   human(pascal).
Line 3   human(lovelace).

Line 4   mortal(X):-human(X).
    
```

State the feature being used in line 4 and explain a benefit of its use. 2

[Turn over



5. A business is setting up a new communications network. Describe two implications of the Regulation of Investigatory Powers Act (2000) for this business.

2

6. Innes regularly uses a shopping website called Better Shop.



Scripting is used to generate parts of the website.

- (a) State **one** part of the website that is generated using client-side scripting.

1

- (b) State **one** part of the website that is generated using server-side scripting.

1



7. Craig has been asked to write an algorithm that will search for a target ID from a list of fifty receipts. Each receipt has a unique receipt ID. Part of the algorithm is shown below.

```

Line 1   SET found TO false
Line 2   SET counter TO -1
Line 3   RECEIVE target_id FROM (INTEGER) BARCODEREADER
Line 4   REPEAT
Line 5   SET counter TO counter + 1
Line 6       IF receipt_id [counter] = target_id THEN
Line 7           SET found TO true
Line 8       END IF
Line 9   UNTIL _____
    
```

Using pseudocode, or a language with which you are familiar, complete line 9 of the algorithm shown above.

2

8. Describe **two** benefits of prototyping when following a rapid application development methodology.

2

9. Explain how cache memory can improve system performance.

2

[Turn over



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2

10. Describe how usability testing could be carried out on a website.

11. A database table may have a compound key. State what is meant by the term compound key.

1



* X 7 1 6 7 6 0 1 0 6 *

[Turn over for SECTION 2 on *Page eight*]

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* X 7 1 6 7 6 0 1 0 7 *

SECTION 2 — 70 marks

Attempt ALL questions

12. A hardware company uses a relational database with the four tables shown below.

Customer	Item	Order	Sale
<u>Customer ID</u>	<u>Item ID</u>	<u>Order no</u>	<u>Order no *</u>
Customer name	Description	Customer ID *	Item ID *
Customer address	Cost	Date	Quantity
Customer email	Image		

- (a) Identify a suitable primary key for the **Sale** table. 1

- (b) Draw an *entity-relationship diagram* to illustrate the relationships between the four tables. 3

12. (continued)

(c) A report is produced each time a customer makes an order. An example is shown below.

Customer	<i>Mr D Gryffe</i>	Order no	<i>10728</i>
	<i>12 Gourock Crescent</i>	Date	<i>23/4/15</i>
Item	Number ordered		Cost
<i>Grease spray</i>	<i>1</i>		<i>£6.99</i>
<i>Bell wire (100m)</i>	<i>1</i>		<i>£8.50</i>
<i>Towel radiator</i>	<i>1</i>		<i>£121.50</i>
<i>Disposable mouse trap</i>	<i>2</i>		<i>£9.98</i>
Total			<i>£146.97</i>

This report is based on a query. State a list of the tables and fields that would be used in this query and any criteria that would be used to select the above data.

3

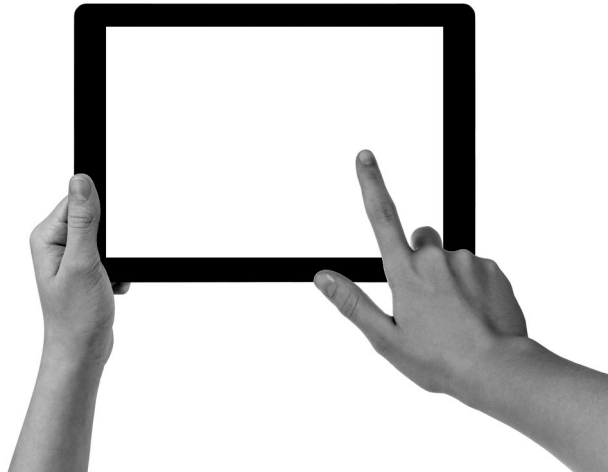
(d) The report includes a single total of £146.97 after the four subtotals. Describe how this can be done in the report.

3



13. EcoCaledonia are an energy company based in Scotland. Sales representatives visit people's houses in an attempt to gain business from new customers.

The sales representatives take a tablet device and often show video clips using apps and mobile websites.



(a) Describe how quad-core processors can be used to improve load times for web apps containing client-side scripts or multimedia. 2

(b) Describe how compression reduces the file size of videos. 3

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13. (continued)

- (c) EcoCaledonia plan to launch an app that will allow customers with Internet access to turn their heating system on using a mobile device.

Describe how EcoCaledonia could ensure that all customers could use the software regardless of the operating system on their device.

2

- (d) Customers of EcoCaledonia can sign in to their account to supply meter readings, pay bills and update contact details.

Explain how their details are secure when transmitted.

3

[Turn over



* X 7 1 6 7 6 0 1 1 1 *

13. (continued)

- (e) When signing in to their account customers have to enter details from their username and password as shown below.

Your username
Enter the following characters from your username

Enter the 3rd character

Enter the 4th character

Enter the 1st character

Your password
Enter the following characters from your password

Enter the 3rd character

Enter the 4th character

Enter the 1st character

← →

Explain why customers are asked to enter their details in a random order each time.

1

[Turn over for Question 14 on *Page fourteen*]

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* X 7 1 6 7 6 0 1 1 3 *

14. EcoCaledonia recruits employees using an online application form. Rowena completes her form and receives the feedback below:

Please correct the following information
* Indicates required fields

Title: * ▼

First name: *

Surname: *

Gender: * Male Female

Email address: *

Mobile phone number:
Please enter a valid mobile phone number

Are you happy to receive information from our partner companies

(a) State the most appropriate data type used to store the value of the “receive information” check box. 1

(b) Rowena accidentally entered an invalid mobile phone number and an error message is displayed. A valid mobile phone number will consist of a string of 11 digits.

Using pseudocode or a programming language of your choice, write the algorithm which would check that the mobile phone number is valid. 5

14. (continued)

(c) An algorithm is implemented to validate the applicant’s data from the application form opposite. There are two subprograms at lines two and three. The parameters for these subprograms are not shown.

```

Line 1    REPEAT
Line 2          Enter_applicant_data (...)
Line 3          Validate_form_data (...)
Line 4    UNTIL <form data is valid>

```

Name a parameter that should be passed at line 2, state the type of parameter passing used and justify your answer.

2

(d) EcoCaledonia has its own servers which need to be upgraded and is considering migrating to a hybrid cloud.

(i) Describe what is meant by a hybrid cloud.

1

(ii) State **two** advantages for EcoCaledonia of switching to a hybrid cloud.

2

[Turn over



15. A local hair salon has a desktop computer, a tablet computer and a printer. These devices are networked using a wireless connection.

(a) The hair salon needs to use software that is only available for an older operating system. State how the hair salon could run this software on their system.

1

(b) Staff can access all files on the network. Customers can only access a catalogue file of various hair styles. Describe how the operating system allows these restrictions to be set up.

2

(c) A digital camera is used to take the customer's photograph and then the camera is connected to the desktop computer using an interface.

(i) State **two** tasks undertaken by an interface when transferring these photographs to the desktop computer.

2

(ii) The photograph can then be edited so that the customer can view it with a range of hair styles and colours. This photograph could be a bitmap or vector graphic. Select one type of graphic and explain why it is suitable for this purpose.

2



15. (continued)

- (d) The hair salon also has some video clips stored on their computer that they use to train staff.

Calculate the uncompressed file size of one of these video clips which is 90 seconds long and was captured at 25 frames per second with a resolution of 260 by 200 pixels and 16 777 216 colours.

State your answer in appropriate units and show all working.

2

- (e) The manager of the hair salon is considering whether to buy new computers or to upgrade the existing ones.

- (i) Describe **one** environmental advantage of upgrading.

1

- (ii) Describe **one** environmental advantage of buying new computers.

1

[Turn over



16. Joseph has been asked to develop a website for the Glasburgh Safari Park where visitors can go to see animals including pandas. Joseph often makes use of cascading style sheets which can be internal or external.

(a) Describe the difference between an internal style sheet and an external style sheet.

2

(b) Explain why the use of external style sheets may result in optimal load times when compared to the use of internal style sheets.

2

(c) Joseph is using an external style sheet named “masterstyle”. Complete the HTML code that will successfully link to this stylesheet.

2

<link rel = _____ type= “text/css” href= _____>

(d) Joseph includes a rule in the external style sheet to make all the large headings appear in Tahoma font, blue and centred wherever they appear on each page.

Write a CSS rule to manage these large headings.

3



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16. (continued)

(e) Searching for the 'Glasburgh Safari' or 'pandas' on the World Wide Web with a search engine does not give a prominent result for this site. Describe **two** ways that Joseph can improve this without incurring any further costs.

2

(f) Customers can purchase tickets via the website. Explain how the use of a database driven website would allow the safari park to display a message if there were only a small number of tickets left on a certain day.

2

[Turn over



17. Chris wants a program to process information about each of the pupils in his class.

```

Line 1   RECORD Test_marks IS {STRING surname, INTEGER mark_1,
        INTEGER mark_2, INTEGER mark_3, STRING email}
Line 2   SET pupil[1] TO ("Smith", 67, 89, 91, "john@doodle.co.uk")
Line 3   SET pupil[2] TO ("Latif", 42, 91, 84, "fatima@doodle.co.uk")
Line 4   SEND pupil[1].mark_2 TO DISPLAY
    
```

(a) (i) Explain the purpose of line 2. 2

(ii) State the output from line 4. 1

(iii) Chris wants to calculate the average for the first pupil. Using pseudocode, or a language with which you are familiar, write the line to calculate this average. 2



17. (continued)

- (b) Chris calculates the average mark for each pupil and stores the average marks in an array. He writes the following pseudocode to count the number of grade A passes of 70 or more:

```

Line 1   SET list TO [74.33, 57.67, 73.33, 82.33]
Line 2   SET amount TO 0
Line 3   FOR counter FROM 0 TO 2 DO
Line 4       IF list[counter] >= 70 THEN
Line 5           SET amount TO amount + 1
Line 6       END IF
Line 7   END FOR
Line 8   SEND amount TO DISPLAY
    
```

When Chris tests the program, it outputs the wrong number of A passes.

- (i) State the output from the code above. 1
- _____
- (ii) State the name of this type of error. 1
- _____
- (iii) Identify and correct the line of the algorithm which contains the error. 2

[Turn over for Question 17(c) on *Page twenty-two*]



17. (continued)

- (c) Chris creates an algorithm that will search the array of average marks and return the smallest value present.

```

Line 1 SET list to [74.33, 57.67, 73.33, 87.33]
Line 2 SET minimum TO list [0]
Line 3 FOR counter FROM 1 TO 3 DO
Line 4   IF minimum > list[counter] THEN
Line 5     SET minimum TO list[counter]
Line 6   END IF
Line 7 END FOR
  
```

A trace table is used to record the change to a variable at the corresponding line number. Part of the trace table is shown below. State the values missing from the trace table below at A, B and C.

Line	list	minimum	counter
1	74.33, 57.67, 73.33, 87.33		
2		A	
3			B
5		C	
3

3

A _____

B _____

C _____

- (d) Explain how breakpoints could be used in conjunction with a trace table to locate errors in code.

2

[END OF QUESTION PAPER]



ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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