



X716/75/01

Computing Science

TUESDAY, 16 MAY

INSTRUCTIONS TO CANDIDATES

Candidates should enter their surname, forename(s), date of birth, Scottish candidate number and the name and Level of the subject at the top of their first answer sheet.

Total marks — 90

SECTION 1 — 20 marks

Attempt ALL questions.

SECTION 2 — 70 marks

Attempt ALL questions.

Show all working.

Write your answers clearly on your answer sheet.

Marks are shown in square brackets at the end of each question or part question.

Questions marked with an asterisk differ in some respects from those in the printed paper.

An OW in the margin indicates a new question.

SECTION 1 — 20 marks

Attempt ALL questions

1. Describe the difference between an internal and an external hyperlink. [2 marks]
2. Describe how a real number is stored in a computer's memory. [2 marks]
3. The validity of a password is checked as part of a program.

...

```
Line 8   SET passValid TO false
Line 9   RECEIVE userPassword FROM (STRING) KEYBOARD
Line10   IF userPassword = storedPassword THEN
Line 11       SET passValid TO true
Line 12   END IF
```

...

State the **data type** used to store the variable "passValid". [1 mark]

4. Describe how vector graphics are stored in a computer. [2 marks]
- * 5. A graphic of a dog is placed in front of a coloured rectangle.
State a suitable file format for the dog graphic. [1 mark]

6. An example of a URL (Uniform Resource Locator) is shown below.

<https://www.largebank.com/loanadvice.rtf>

Identify the standard file format that would be downloaded when this URL is selected.
[1 mark]

7. Part of a program is shown below.

```
Line 1:   DECLARE score AS REAL INITIALLY 0.0
Line 2:   RECEIVE score FROM KEYBOARD
Line 3:   IF score > 2.0 THEN
Line 4:       SEND "Congratulations. You are in the final" TO DISPLAY
Line 5:   ELSE
Line 6:       SEND "You have failed to qualify" TO DISPLAY
Line 7:   END IF
```

Describe what happens in Lines 3 to 6 when the value 1.4 is entered at Line 2. [2 marks]

- * 8. A company keeps a database for all its employees.
Each employee has a record within the database.
- (a) Explain why the Employee ID field requires a presence check. [1 mark]
- (b) Employee photographs are to be added to the database record.
State a field type which should be used to contain a photograph of each employee.
[1 mark]
9. State the component that enables a processor and a hard disk drive to communicate.
[1 mark]
10. Some digital video cameras allow videos to be downloaded to computer systems using both a wired and wireless connection.
State one advantage of each transmission media over the other when downloading video.
[2 marks]
- Wired advantage —
- Wireless advantage —
11. State the feature of a web browser that ensures that the history of websites visited by a user are not saved. [1 mark]

- *12. A complex condition is used to decide if hotel customers qualify for a free night's stay. Part of the program is shown below.

```
...  
Line 21  IF nightsBooked >= 6 AND (NOT (cardType = Bronze)) THEN  
Line 22      SEND custName TO DISPLAY  
Line 23  END IF  
...
```

This program section is tested with four sets of data.

State if any of the following sets of test data will produce output. [2 marks]

- a. custName = J Kerr
cardType = Gold
nightsBooked = 3
- b. custName = P Singh
cardType = Silver
nightsBooked = 8
- c. custName = R Kroon
cardType = Bronze
nightsBooked = 7
- d. custName = H Smith
cardType = Gold
nightsBooked = 6

- *13. State a graphical design notation that can be used to design the solution to a problem. [1 mark]

SECTION 2 — 70 MARKS

Attempt ALL Questions

- *14. Bike Scotland uses a flat file database to store details of its members and affiliated cycling clubs. The database has a field called Membership Number. The Membership field contains data with the following format.

011–423
192–033

- (a) State the **field type** used to store each Membership Number. [1 mark]
- (b) The database contains personal information.
- (i) State the **Act** with which Bike Scotland must comply. [1 mark]
- (ii) Describe what Bike Scotland must do to ensure it complies with this Act when collecting this information. [1 mark]

The Bike Scotland database is redesigned and implemented as a relational database with two linked tables to the stem.

- (c) Describe two advantages of using a relational database rather than a flat file database for storing the data. [2 marks]

14. (continued)

(d) * (i) Refer to the diagram for Question 14(d)(i).

The Cyclist table has been sorted on two fields.

Describe how the table has been sorted. [2 marks]

Membership Number	Forename	Surname	Date of Birth	Club Code
098-133	Tracy	Uttley	30/05/2000	12DW39
213-847	Salim	Hanif	09/06/1994	12DW39
624-536	Harry	Fence	01/02/1963	12DW39
011-423	Alojzy	Czajka	15/03/1979	24FW05
773-362	Maria	Amonte	02/11/1999	24FW05
018-253	Derrick	Smith	12/12/1970	77SU22
192-033	Donny	Carruthers	20/02/1982	77SU22
836-555	Fiona	Hewitt	20/02/1072	77SU22
983-543	Samantha	Wellbeck	18/09/1975	77SU22

* (ii) When adding a new member to the Cyclist table the following error message is displayed:

Membership Number **9833-528** is invalid, please re-enter

State the validation that has been applied to the field Membership Number.
[1 mark]

* (e) The field Club Code is in both the Cyclist and Club table.

Explain why the Club Code field is a primary key and a foreign key in the relational database. [2 marks]

15. A program is being developed to monitor the availability of parking spaces in a multi-level car park. The car park has three levels, each with 50 numbered spaces and a digital display board that shows the number of spaces available on each level.

Level	Numbered Spaces
Red	1–50
Black	51–100
Yellow	101–150

SPACES AVAILABLE	
Red Level	8
Black Level	25
Yellow Level	32

Part of the program is shown below:

```

Line 1  DECLARE redAvailable AS INTEGER INITIALLY 50
Line 2  DECLARE blackAvailable AS INTEGER INITIALLY 50
Line 3  DECLARE yellowAvailable AS INTEGER INITIALLY 50
...
...
          < vehicle is detected occupying a space >
...
...
Line 22 IF spaceNumber ≥1 AND spaceNumber ≤50 THEN
Line 23     redAvailable = redAvailable – 1
Line 24 END IF

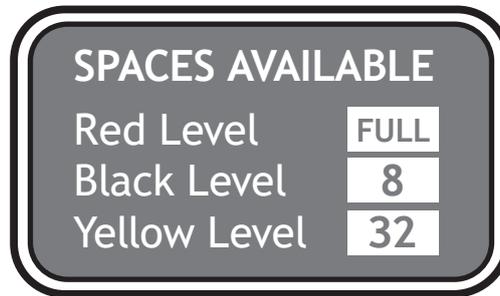
...
...

```

- (a) Explain why integer data types are used in Lines 1 to 3. [1 mark]
- (b) Name the part of the computer system that will carry out each of the following tasks during the execution of Line 23.
- Carries the location of redAvailable in main memory. [1 mark]
 - Transfers the value of redAvailable from main memory to the processor. [1 mark]
 - Calculates the new value of redAvailable. [1 mark]

15. (continued)

When a vehicle parks, the digital display board will be updated to show the number of available spaces on each level.



A digital display board with a dark grey background and a white border. The title "SPACES AVAILABLE" is at the top. Below it, there are three rows of text, each with a corresponding value in a white box:

SPACES AVAILABLE	
Red Level	FULL
Black Level	8
Yellow Level	32

- (c) (i) Complete the condition below, that will display the message “FULL” when all the spaces on the Red Level are occupied. [1 mark]

```
IF — THEN
    SEND “FULL” TO DISPLAY
END IF
```

- (ii) Each of the letters of the message **FULL** will be stored as an ASCII character. Calculate the number of bits required to store this message. [1 mark]

- (d) Each of the parking space numbers is stored in binary.

State the decimal equivalent of the binary number 01101100. [1 mark]

- (e) While the parking space program is being developed, it is executed using an interpreter.

- (i) State one advantage of using an interpreter rather than a compiler at the development stage of a program. [1 mark]

- (ii) The finished program is compiled.

State two advantages of executing a compiled version compared to an interpreted version. [2 marks]

- *16. Jenny works for a website design company. Her latest project is to design and implement a website for Go Universe.

She creates the website below.

Go Books		Go Universe		Type your search here <input type="button" value="Search"/>													
Online Retailer of Everything Go																	
Go Books		Downloads		My Account Login													
				Cart													
Home > Go Books > Go Books for Beginners																	
Publisher <input type="checkbox"/> Kisido Press <input type="checkbox"/> BGA <input type="checkbox"/> Nakuri Publications <input type="checkbox"/> Other		Go Books for Beginners <hr/> 2 items Sort By Popularity (high-low) ▼ <hr/> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Title</th> <th style="text-align: left;">Author</th> <th style="text-align: left;">Rating</th> <th style="text-align: left;">Price</th> </tr> </thead> <tbody> <tr> <td>Learn to play Go</td> <td>Lea Mahmood</td> <td>*****</td> <td>£7.99</td> </tr> <tr> <td>Go - The world's best board game</td> <td>Penny Holding</td> <td>*****</td> <td>£10.50</td> </tr> </tbody> </table>				Title	Author	Rating	Price	Learn to play Go	Lea Mahmood	*****	£7.99	Go - The world's best board game	Penny Holding	*****	£10.50
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- (a) Identify two features of the user interface that Jenny included to aid navigation.
[2 marks]
- (b) Identify one area of this website where Javascript has been used to add interactivity.
[1 mark]
- (c) Jenny used the simple template below when coding the HTML.

```

<!DOCTYPE html>
<html>
<head>
  <title> </title>
</head>
<body>
<div>
  <p>Page Heading</p>
</div>
</body>
</html>

```

Describe how the above HTML was edited to make the words “Go Books” appear at the top of the webpage. [1 mark]

16. (continued)

* (d) A logo is added to each page using the following code.

```

```

(i) The code contains the link to the stored graphic file.

State the type of addressing used. [1 mark]

(ii) The original graphic was saved with a colour depth of 24 bits.

Calculate, using appropriate units, the storage requirements of the graphic.
[3 marks]

(iii) Explain why compressing the graphic would benefit the **users** of the Go Universe website. [1 mark]

(e) State one test that could be carried out on the website. [1 mark]

17. An online pet supply retailer is offering a special deal to customers buying at least **two**, but not more than **six**, bags of pet food. If customers try to buy any other quantity, a message is displayed.

For example:

Input

Special Deal
Please enter the number of bags
of pet food you would like to
buy:

8

Output

Quantity not valid.
Please try again.

- (a) Show, using pseudocode or a programming language of your choice, how input validation could be used to ensure an acceptable number of bags is entered. [4 marks]
- * (b) Once the input validation has been implemented it is tested.
- (i) The number 4 is entered as test data. What type of test data is this an example of? [1 mark]
 - (ii) State the test data that should be used when testing for extreme data. [1 mark]
- (c) When testing the program using the data from the table, “Three” is entered. As expected, an error message appears.

Program cannot run!
Invalid data type

- (i) Name this type of error. [1 mark]
- (ii) Explain why this error occurred when testing the program. [1 mark]

17. (continued)

(d) A syntax error can occur when writing code.

(i) Explain what is meant by a syntax error. [1 mark]

(ii) Explain how the editing features in software development environments can help identify syntax errors. [1 mark]

18. Fass is an art dealer. When he visits an artist's studio, he uses a catalogue app on his mobile phone to store photographs and information about artworks he plans to sell.

(a) Fass has bought a new mobile phone.

Old Phone		New Phone	
Processor	Dual-core 2.5GHz	Processor	Quad-core 2.5GHz
Memory	1GB RAM	Memory	2GB RAM
Camera	16 Megapixel Rear 2 Megapixel Front	Camera	16 Megapixel Rear 2 Megapixel Front
Storage	32GB Solid State	Storage	32GB Solid State 1TB Free Cloud
Screen Size	1334x750 pixels	Screen Size	1920x1080 pixels
Additional Features	Biometric Security	Additional Features	Biometric Security Automatic Cloud Backup

(i) State one feature found on the new phone that may allow the catalogue app to run faster than on his old phone. [1 mark]

(ii) Fass uses cloud storage to store the photographs.

State one advantage and one disadvantage of cloud storage instead of his local phone storage. [2 marks]

(b) Explain why Fass must ask permission to store a digital copy of the artists' artwork. [1 mark]

(c) Fass can record video using his new phone.

State a standard file format for storing video on his mobile phone. [1 mark]

(d) State one biometric security method that would ensure that only Fass can access his mobile phone. [1 mark]

(e) While visiting an artist's studio, Fass asks permission to use the studio's wireless network.

State the Act that Fass would have broken if he had used the wireless network without permission. [1 mark]

(f) Fass is given a free laptop computer with his new phone.

(i) State one advantage of the phone's solid state storage compared to the magnetic hard disk drive in the laptop. [1 mark]

(ii) Fass sends his old phone for disposal.

Describe how the correct disposal of his old phone reduces environmental impact. [2 marks]

19. Louise is conducting a survey at her school to find out how many hours per week her class mates spend playing computer games. Louise will survey 100 pupils.

The program assigns 100 names to a 1-D array as shown below.

```
Line 1  DECLARE name AS ARRAY OF STRING INITIALLY []
Line 2  RECEIVE name[0] FROM KEYBOARD
Line 3  RECEIVE name[1] FROM KEYBOARD
Line 4  RECEIVE name[2] FROM KEYBOARD
...
...
Line 101 RECEIVE name[99] FROM KEYBOARD
```

- (a) Louise realises that writing the code to read the data into the array like this is time consuming and not good practice.

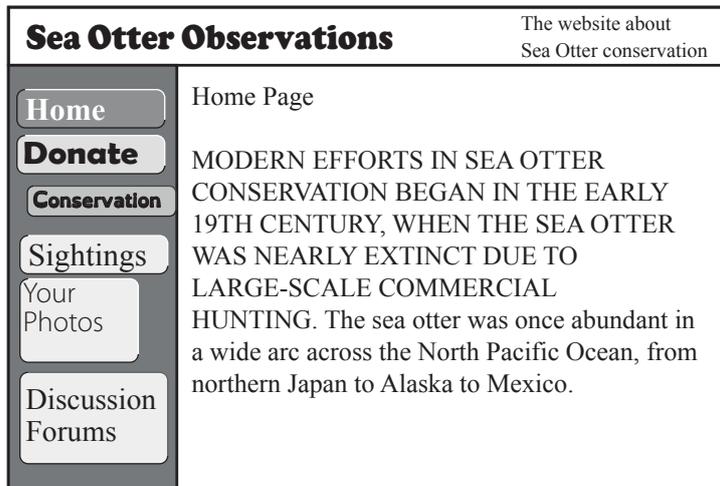
Write, using pseudocode or a programming language of your choice, the code to show how the data can be entered into the 1-D array using repetition. [3 marks]

- (b) Another section of the program is shown below.

```
...
Line 119 SET averageHours = totalHours / 7
Line 120 <use a pre-defined function to store averageHours to the
        nearest whole number>
Line 121 SEND "An average of " & averageHours & " hours" TO
        DISPLAY
```

- (i) Identify the operator used to concatenate in the program above. [1 mark]
- (ii) Explain why averageHours should be stored as a real data type. [1 mark]
- (iii) The program is executed. At Line 119 the value 4.26 is assigned to averageHours. Write the message that will be displayed when Line 121 is executed. [2 marks]
- (iv) State the pre-defined function that could be used when Line 120 is coded. [1 mark]
- (c) Louise gives a copy of her finished program to her friend who tells her that the program code is difficult to read.
- (i) Explain how indentation can help readability in the program. [1 mark]
- (ii) State one other programming technique used to improve readability of programs. [1 mark]

- *20. Sea Otter Observations use a simple website to provide information about otters. The home page for the website is shown below.



- (a) Identify two examples of poor consistency in the user interface above. [2 marks]
- (b) A high quality sound file of otters communicating with each other is edited for the website. The sound quality of the edited file is poor.
Describe one factor that has affected the quality of this sound. [1 mark]
- * (c) Referring to the home page and the links for Donations, Conservation, Sightings, Your Photos, Discussion Forums describe the navigation structure of the Sea Otter Observations website. [2 marks].
- * (d) When a user clicks on the 'Your Photos' button on the home page, they are directed to the page showing photographs.
(i) State two network hardware devices required to connect to the Internet to access the website. [2 marks]
(ii) A user of the website would like to look closely at the picture of an otter, especially its whiskers. State the feature of a browser that would enable a user to view a close-up of the otter's whiskers. [1 mark]
- * (e) A hacker alters a link from the home page. The altered link now directs the user to the hacker's version of the donations page.
State two items that a hacker could put on the donations page that could make the user suspect that it is not genuine. [2 marks]

[END OF QUESTION PAPER]