FOR OFFICIAL USE

N5

National Qualifications 2016

Mark

X716/75/01 Computing Science

FRIDAY, 27 MAY

1:00 PM – 2:30 PM

X7167501

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.

SQA ©

X7167501 01

MARKS | DO NOT WRITE IN THIS MARGIN

SECTION 1 — 20 MARKS

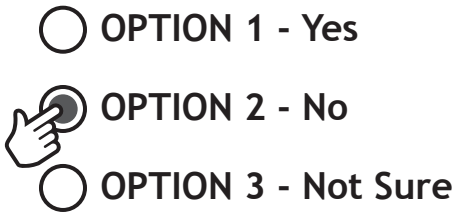
Attempt ALL Questions

1. Convert the decimal value 227 into the equivalent 8-bit binary number. **1**

2. Explain why it is important that program code is readable. **1**

3. Explain why a **database** should not be stored in ROM memory. **1**

4. Give **one** reason for using this type of selection.



1

5. State the function of a processor's registers. **1**

[Turn over

6. Anti-virus software may be included in a security suite.

State **two** other types of software which should be included in a security suite. **2**

1 _____

_____

2 _____

_____

7. Criminals can steal your identity by using keylogger programs. State **two** other ways in which identity theft can be carried out. **2**

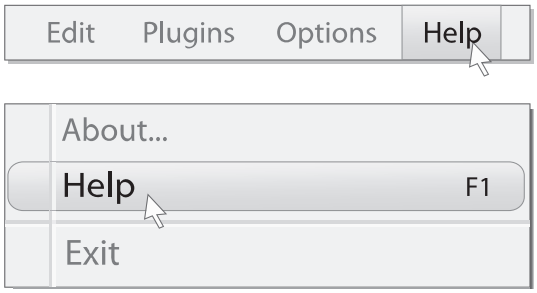
1 _____

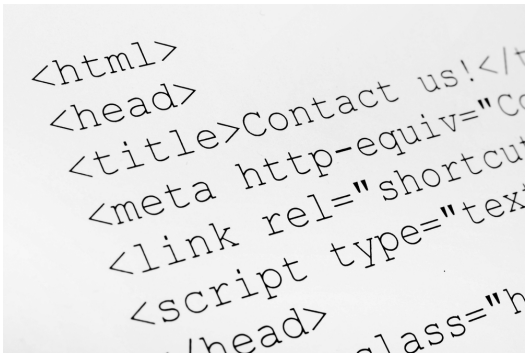
_____

2 _____

_____

8. A novice is one type of user of an information system.





State **one** other type of user. **1**

_____

9. This code design monitors the temperature of food as it is reheated.

```
Line 1    RECEIVE temperature FROM (REAL) <temperature sensor>
Line 2    WHILE temperature <  82 DO
Line 3        SEND "temperature too low: continue to reheat" TO DISPLAY
Line 4        RECEIVE temperature FROM (REAL) <temperature sensor>
Line 5    END WHILE
```

Explain what will happen in lines 2 to 5 if the sensor detects 63°. **2**

_____

_____

_____

_____

_____

_____

_____

10. Lucy is looking for a summer holiday online. She wishes to leave on 22nd July from her local airport, and early in the afternoon.

State which database operation is being carried out as she uses the website. **1**

_____

11. Translators are used to convert high level languages into machine code.

Identify each type of translator.

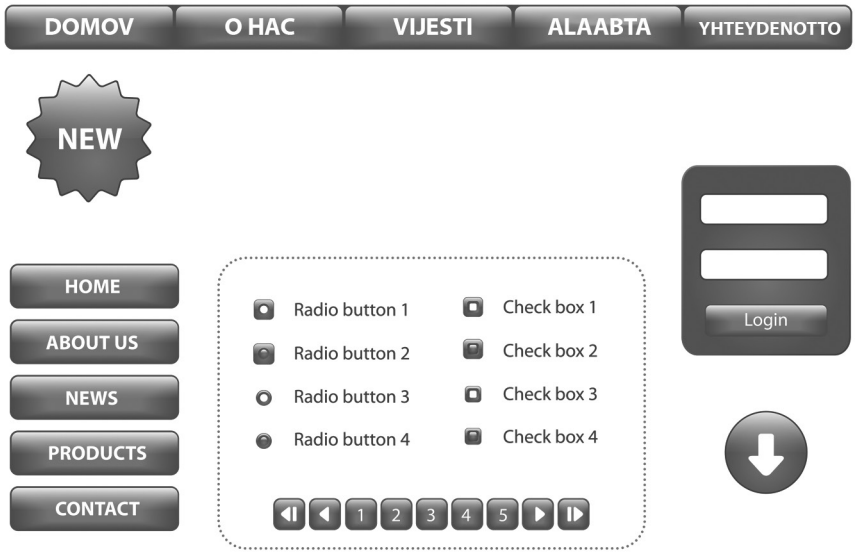
	Type of Translator
This translator program reports errors at the end of translation.	
This translator needs to be present in memory each time the program is executed.	

2

12. A running group has 16 members. They are taking part in a marathon.

Using pseudocode or a programming language of your choice, write the code which will take in each runner's time for the marathon. **2**

13. Before launching the website below, it is tested. The testers complain about the effectiveness of the website's navigation.



Identify **two** examples of poor navigation, stating what could be done to improve the situation. **2**

1 _____

_____

_____

_____

2 _____

_____

_____

_____

14. State the **type** of network which has no centralised storage. **1**

_____

[Turn over

SECTION 2 — 70 MARKS

Attempt ALL Questions

15. FlightCrazy is a new company offering a flight booking service to business customers. They want to set up a database to store flight details. A researcher starts to gather information from airport timetables about available flight times.

Route ID	Departure Airport	Destination Airport	Day	Departure Time	Duration (hrs)	Airline Ref	Airline Name	Flight Number	Aircraft Code
001	Edinburgh	Amsterdam	Monday	07:00	01:35	KL	KLM	KL1276	737
001	Edinburgh	Amsterdam	Monday	08:00	01:30	U2	Easyjet	U26921	319
001	Edinburgh	Amsterdam	Saturday	10:15	01:30	U2	Easyjet	U26921	320
001	Edin	Amsterdam	Monday	11:10	01:30	KL	KLM	KL1280	737
001	Edinburgh	Ams	Tuesday	07:00	01:35	KL	KLM	KL1276	737
003	Edinburgh	London Heathrow	Monday	08:00	01:35	BA	British Airways	BA1461	EQV
002	Edinburgh	London Gatwick	Mon	06:40	01:35	BA	British Airways	BA2931	EQV
002	Edin	London GAT	Sat	06:25	01:30	U2	Easyjet	U2802	EQV
003	Edinburgh	Heathrow	Monday	09:10	01:30	VS	Virgin Atlantic	VS3002	320

(a) If the full database is created as a flat file, explain why "RouteID" is not a suitable primary key for the table. **1**

15. (continued)

(b) Describe **two** problems in creating this as a flat file database. **2**

Problem 1

Problem 2

(c) FlightCrazy decided that using a flat file database is not suitable.
State a more suitable type of database. **1**

(d) State the **field type** that should be used for "Aircraft Code". **1**

[Turn over

15. (continued)

(e) During the development of this database the following input form is created.

(i) State **one** suitable type of validation for the Departure Airport field. **1**

_____

(ii) Complete the table below to show suitable data values to test the Number of travellers field. **2**

Type of Test data	Test data
Exceptional	
Extreme	

15. (continued)

(f) During the testing of the completed database all the flights from Glasgow to all airports in London on 8th June were found. The following output was produced.

11 flights match your search criteria				
From:	Glasgow	To:	London	
Date:	8th June			
Depart	Destination	Journey Time	Price	Airline
21:20	LTN	1h10	39	Easyjet
21:45	LGW	1h25	39	Easyjet
20:45	STN	1h20	40	Ryanair
06:30	STN	1h15	47	Easyjet
19:55	STN	1h15	47	Easyjet
21:00	LHR	1h15	47	British Airways
07:00	LTN	1h10	57	Easyjet
07:05	STN	1h20	57	Ryanair
09:20	LTN	1h10	57	Easyjet
10:25	STN	1h15	57	Ryanair
09:25	LGW	1h25	73	British Airways

Describe how the above results have been sorted. **2**

_____

_____

_____

[Turn over

16. A Maths game is designed for primary school pupils to test number ordering. In the game the pupil is asked to enter two integer numbers. A third integer number is then randomly generated and shown to the pupil.

The pupil must then state if the random number is:

lower (l) than the two entered numbers
higher (h) than the two entered numbers
in the middle (m) of the two entered numbers.

A design for the code is shown below.

```
Line 1    <enter the first number and assign to numOne>
Line 2    <enter the second number and assign to numTwo>
Line 3    <generate random number and assign to randNum>
Line 4    SEND randNum TO DISPLAY
Line 5    RECEIVE guess FROM (CHARACTER) KEYBOARD
Line 6    IF guess = "l" AND randNum < numOne THEN
Line 7        SEND "Correct it is lower" TO DISPLAY
Line 8        SET score TO score + 1
Line 9    END IF
Line 10   IF guess = "m" AND randNum >= numOne AND randNum <= numTwo
Line 11       SEND "Correct it is in the middle" TO DISPLAY
Line 12       SET score TO score + 1
Line 13   END IF
Line 14   IF guess = "h" AND randNum > numTwo
Line 15       SEND "Correct it is higher" TO DISPLAY
Line 16       SET score TO score + 1
Line 17   END IF
Line 18   <display incorrect message>
```

(a) When the two numbers are entered the program should ensure that numTwo is always a higher number than numOne.

Using pseudocode or a programming language of your choice, write several lines to represent this input validation for line 2. **4**

16. (continued)

(b) When the pupil enters the answer it is stored in a variable called "guess".
State the **data type** stored by the variable "guess". **1**

(c) The program is run with the following data.

Variables	Values
numOne	7
numTwo	15
randNum	10
guess	m

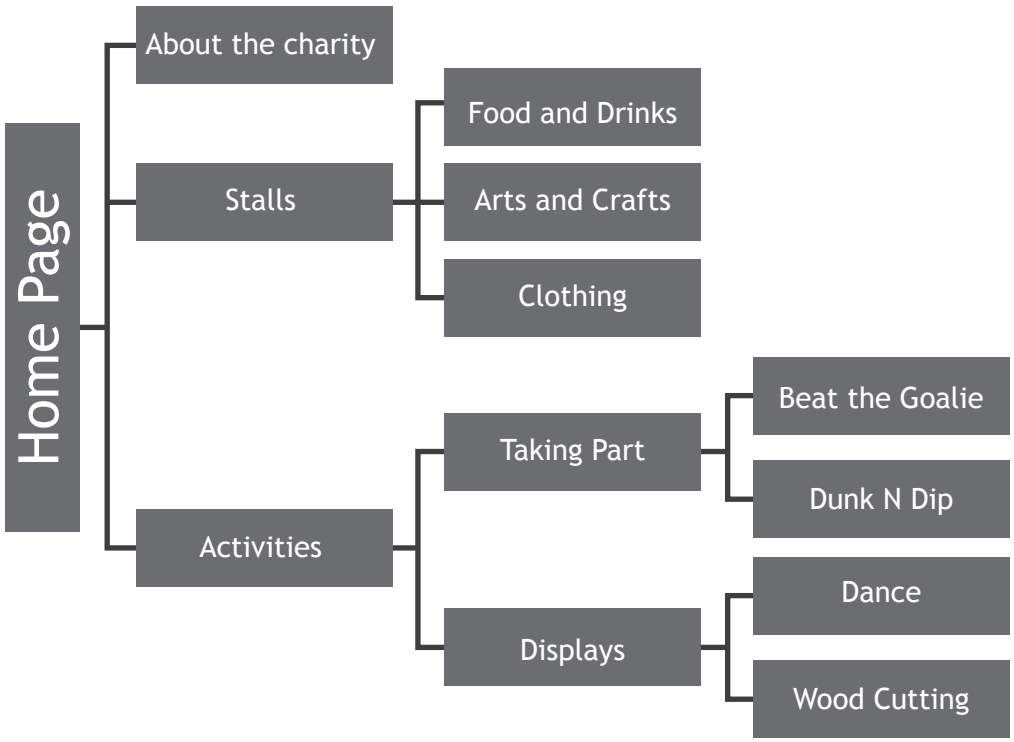
State the output from the program. **1**

(d) The program will have to make use of a pre-defined function.
State the pre-defined function used and describe its purpose. **2**

(e) Using line numbers, describe how the code could be adapted, allowing the pupil to play the game 10 times using the same values for numOne and numTwo but a different random number each time. **2**

17. John has been asked to design a website to promote an event being held to raise money for charity.

The organisers of the event provide this diagram showing the pages required and how they should be organised.



(a) What **type** of navigation structure is required for the website? **1**

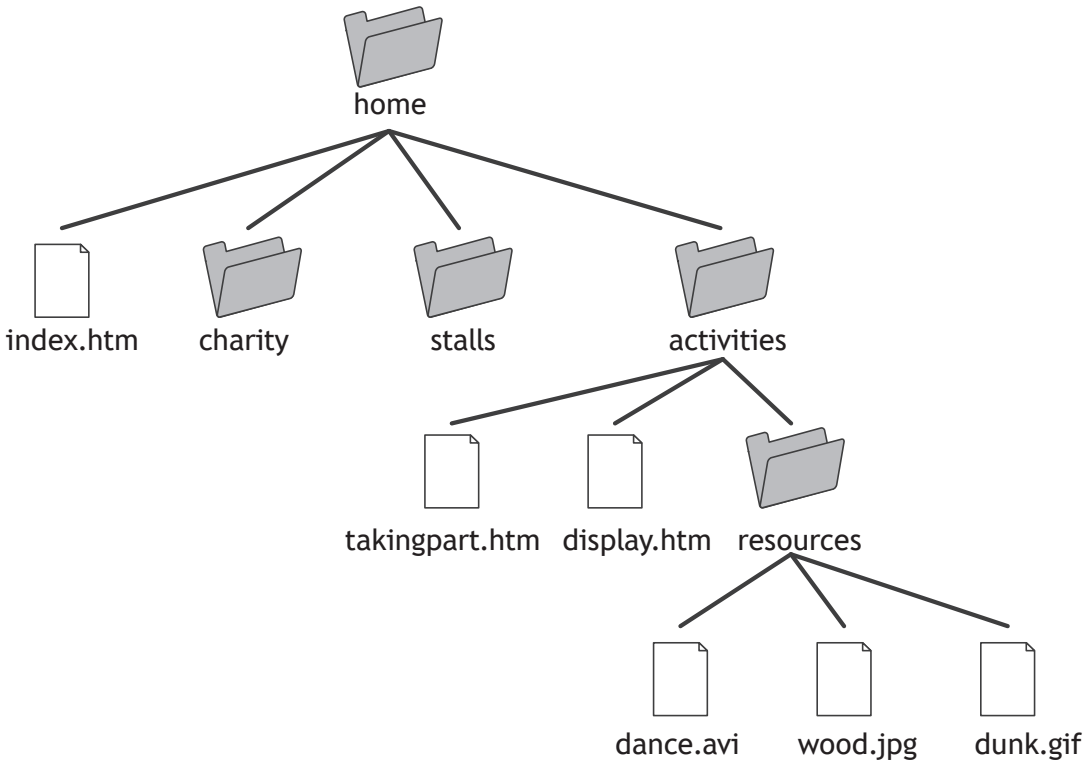
(b) State a design notation that John could use to design the layout of the pages. **1**

(c) The homepage contains hyperlinks. Describe the function of a hyperlink. **1**

17. (continued)

(d) John begins to build the website and stores all the files and resources on his hard disk.

Here is the file structure for the website.



MARKS DO NOT WRITE IN THIS MARGIN

(i) State the type of data you would expect to be stored in the dance.avi file. **1**

_____

(ii) State the **relative** address John should enter on the display.htm page to link to dunk.gif. **1**

_____

_____

[Turn over

17. (continued)

(e) John wants to include an external link to the charity and asks the event organisers to find out the URL.

(i) Explain what is meant by an external link. **1**

_____

_____

_____

_____

(ii) State what the letters URL stand for. **1**

U _____

R _____

L _____

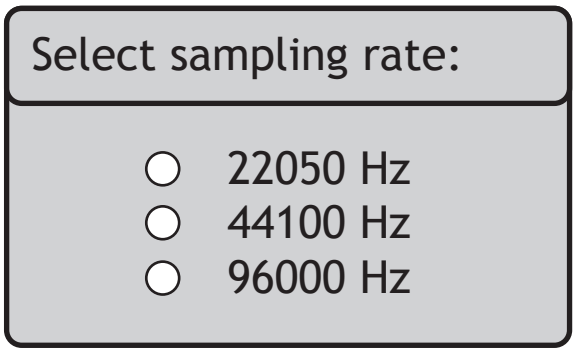
(iii) The organisers give John a photograph file from the charity which measures 5 inches by 7 inches with a resolution of 600dpi and 24-bit colour depth. Calculate the storage required for the photograph.

State your answer using appropriate units. Show all your working. **3**

18. A software development company decides to review staff knowledge of computer related legislation.

Mikal is asked to create an app covering a range of legal issues.

(a) When Mikal records an introduction using audio software, he is prompted to select the sample rate.



(i) Describe the effect on the size of the sound file if the highest sample rate is selected. **1**

_____

_____

_____

(ii) After recording, Mikal exports the file as a compressed file.

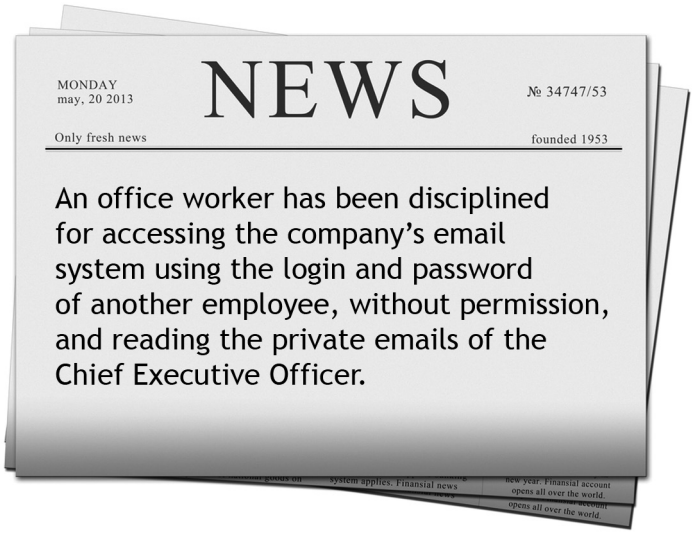
State a suitable standard file format he may have used. **1**

_____

[Turn over

18. (continued)

(b) Mikal develops an interactive quiz for the app to test the staff's knowledge of legislation. The first question is about this recent article from a newspaper.


MONDAY
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NEWS

№ 34747/53

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An office worker has been disciplined for accessing the company's email system using the login and password of another employee, without permission, and reading the private emails of the Chief Executive Officer.

(i) State the offence that has been committed under the Computer Misuse Act in this article. **1**

(ii) Describe another offence under the terms of this Act. **1**

18. (continued)

(c) The next question that Mikal creates for the quiz is about another article.

Name the law which may have been broken in this case. **1**

_____

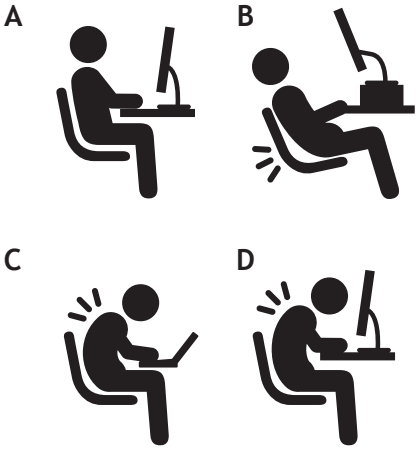
_____

[Turn over

18. (continued)

(d) In line with Health and Safety legislation, the company provides adjustable seating and guidelines on maintaining good posture.

Mikal finds graphics on a website that he can use to illustrate his next quiz question.



(i) Explain why he might need to seek permission to use the graphics legally. **1**

18. (d) (continued)

(ii) Mikal uses the graphics to create question 3 for the app.

Question: 3 **Total Score: 2**

Select the recommended workstation posture to avoid back problems.

A

B

C

D

Using pseudocode or a programming language of your choice, write the code to show how the total score is calculated when the user answers question 3 correctly. **2**

18. (continued)

(e) When a staff member runs the finished quiz, the app sends their details and their total score to a database file.

State **two** rights that a staff member has under the Data Protection Act with regard to their own data. **2**

19. Gillian designs a program to calculate how much it costs to get her dog Penny groomed. The design is shown below.

```
Line 1    SET total = 0
Line 2    DECLARE all costs INITIALLY [35.00, 36.00, 40.00, 35.00, 42.50]
Line 3    FOR EACH cost FROM all costs DUE
Line 4        SET total=total+cost
Line 5    END FOR EACH
Line 6    SEND "The total cost = £"&total TO DISPLAY
```

(a) Describe the data structure that has been used to store the individual costs. **2**

(b) Gillian writes and tests her program. It works perfectly calculating a correct total of 188.50.

(i) With reference to line numbers, explain how the program calculates the final total. **3**

(ii) Describe how the contents of the variable total would be stored in the computer's memory. **2**

[Turn over

19. (b) (continued)

(iii) Gillian edits the program with the following data:
[35.00, 36.00, 40.00, 35.00, 42.50, **45.00**]
The output is still 188.50.

A Explain why the output is still 188.50. **1**

B State how this error could be corrected. **1**

(c) Concatenation has been used in line 6.

State the purpose of concatenation. **1**

[Turn over for next question

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20. Sue uses a website called "Check your Defences!" to learn more about keeping her computer and data safe.

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

(b) Explain how encryption can help keep data safe. **2**

20. (continued)

When Sue tries to download the mobile app onto her tablet PC, she gets the following message:

She checks the specification for her tablet PC.

Size: 267 x 187 x 8 mm
Weight: 0·65 kg
1·83GHz/2GB RAM/16GB
Battery life: up to 8 hours
Display: 8·3" full HD, 10 point multi-touch
Operating system: Android 4·1
USB 3·0, micro HDMI, microSD card slot
3·5 MP camera
Microphone
Stereo speakers
Headphone jack
Wi-Fi

(c) (i) Sue's tablet has a range of input and output devices. Identify **one** of each of these items on Sue's tablet. **2**

Input device _____

_____

Output device _____

_____

(ii) Identify **one** interface type on Sue's tablet. **1**

Interface type _____

_____

20. (c) (continued)

(iii) Describe **one** function of an interface. **1**

(iv) Give **two** reasons why the app is incompatible with Sue's tablet PC. **2**

Reason 1

Reason 2

20. (continued)

(d) Sue's friend Jack views the website on his smart phone but the home screen looks different to the desktop version Sue had been using.

Smartphone version

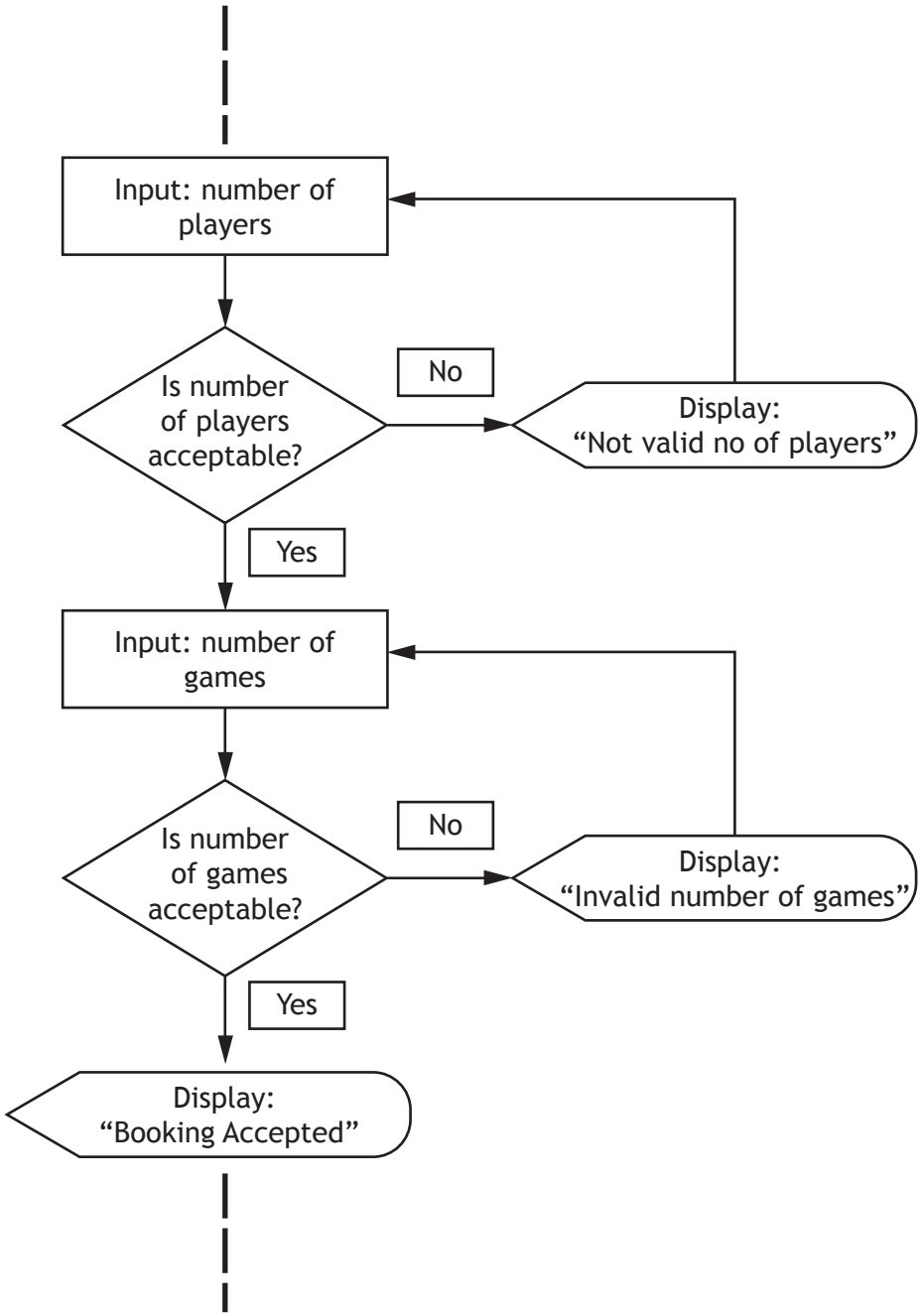
Desktop version

Describe **one** reason why the user interface on the smartphone version is designed differently to the version Sue had used on her desktop. **1**

[Turn over

21. A software developer is creating an online booking system for a bowling alley. Customers can book a bowling lane for a maximum of 4 people playing a maximum of 3 games.

The developer has used a flow chart to produce the program design. Part of the design is shown below.



(a) (i) State **one** benefit of using the design notation shown above instead of pseudocode. **1**

_____

_____

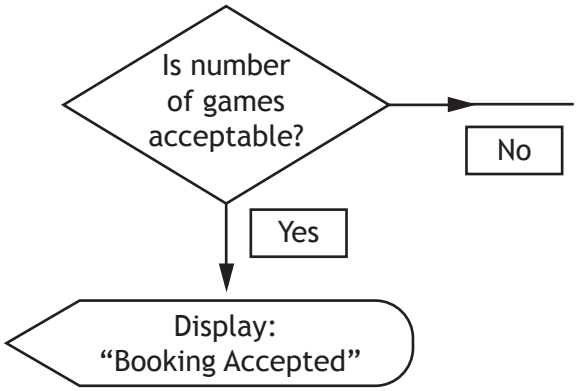
21. (a) (continued)

(ii) Name the algorithm illustrated in the bowling alley program design. **1**

_____

_____

(b)



Using pseudocode or a programming language of your choice, complete the conditional statement at Line 3 below to implement this section of the design. **3**

Line 3 _____ numPlayers _____ and

numGames _____

Line 4 SEND "Booking Accepted" TO DISPLAY

(c) The program is tested using a set of test data.

(i) Complete the table below to show three examples of test data types and the expected result for each type. **3**

Test data	Test data type	Expected Result
numPlayers = 3 numGames = 2	Normal	Booking accepted
numPlayers = 4 numGames = 3		Booking accepted
numPlayers = 6 numGames = 3		

21. (c) (continued)

(ii) The character "£" is entered as a test value for the number of players. This causes the program to crash.

State the **type** of error that would cause this crash. **1**

(d) Error detection and correction in a program is easier if the code is readable.

State **one** technique that can be used to ensure *readability* of code. **1**

[END OF QUESTION PAPER]

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