Pearson BTEC Level 3 Nationals Extended Certificate, Foundation Diploma, Diploma, Extended Diploma

Time 2 hours

Paper reference **31768H**

Computing

UNIT 1: Principles of Computer Science

Information Booklet

Do not return this Booklet with the question paper.

Instructions

- You will need the information in this booklet to answer some questions.
- Read the information carefully.
- You must **not** write your answers in this booklet.
- Only your answers given on the question paper will be marked.
- Do not return this Information Booklet with the question paper.

Turn over ▶

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SECTION 1

The information in this section should be used to answer Question 1.

Rules for the darts app.

At the start of the game the total remaining is set at 501 or 301 for both players.

Each player throws 3 darts per turn.

The score for each dart depends on where the dart lands on the dartboard:

- If a dart lands in the 'Inner bullseye' the score is 50
- If a dart lands in the 'Outer bullseye' the score is 25
- If a dart lands in the 'Double ring' the score is multiplied by 2
- If a dart lands in the 'Triple ring' the score is multiplied by 3.

The score for each dart is held in a stack in memory.

The scores for the three darts are added together to give the total score for that turn.

The total scored for each turn is subtracted from the total remaining.

The player to reach zero first wins the game.

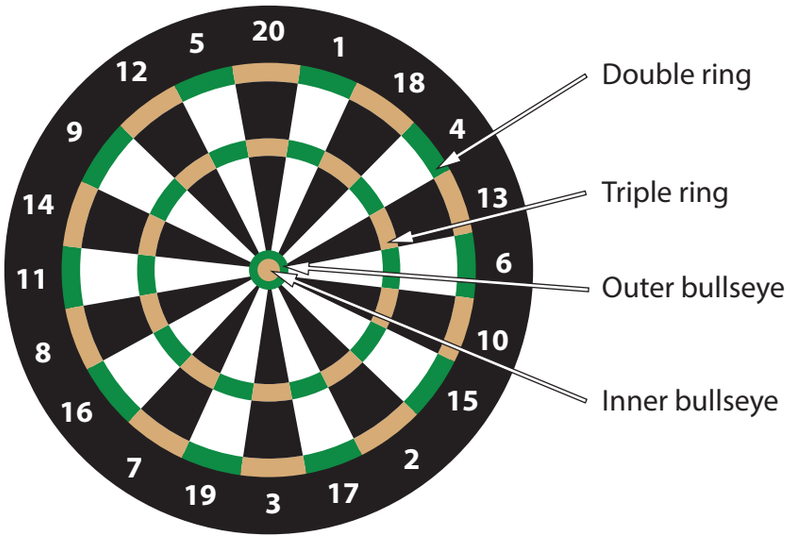

Figure 1 shows the screen interface for the darts app.

Figure 1

Figure 2 shows a section of pseudocode for the app.

```
1.  INPUT s
2.  IF double button pressed
3.  s = s*2
4.  IF triple button pressed
5.  s = s*3
6.  PUSH s
7.  INPUT s
8.  IF double button pressed
9.  s = s*2
10. IF triple button pressed
11. s = s*3
12. PUSH s
13. INPUT s
14. IF double button pressed
15. s = s*2
16. IF triple button pressed
17. s = s*3
18. PUSH s
```

Figure 2

SECTION 2

The information in this section should be used to answer Question 2.

The digital price sign uses four LED display units to show the price of fuel.

Each LED display unit has 8 LEDs that can be on or off.

Figure 3 shows an LED display unit used by a petrol station.

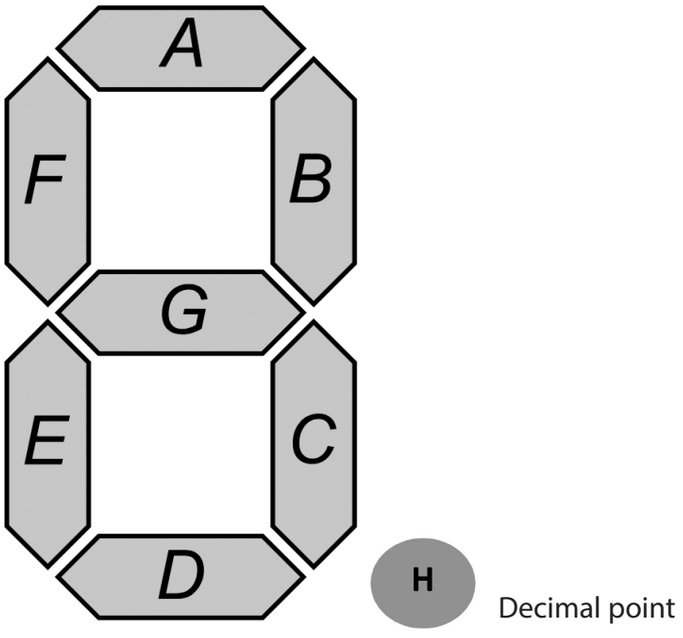

Figure 3

An array is used to store the data showing if each segment is on or off.

Figure 4 shows how the array to display the number 3 is set up.

A	B	C	D	E	F	G	H
on	on	on	on	off	off	on	off

Figure 4

SECTION 3

The information in this section should be used to answer Question 3.

Figure 5 shows the password rules for the database.

The password must:

- be between 8 and 15 characters in length
- contain at least one upper case letter
- contain at least one numeric character
- not be the same as the user ID.

Figure 5

SECTION 4

The information in this section should be used to answer Question 4.

Figure 6 shows pseudocode used to validate a date.

```
1.  INPUT date
2.  day = INT(date[0,1])
3.  month = INT(date[2,3])
4.  year = INT(date[4,7])
5.  IF month > 12 OR month < 01
6.      OUTPUT "date not valid"
7.  ELIF month = 1,3,5,7,8,10,12
8.      IF day > 31 OR day < 01
9.          OUTPUT "date not valid"
10. ELIF month = 4,6,9,11
11.     IF day > 30 OR day < 01
12.         OUTPUT "date not valid"
13. ELIF month = 2
14.     IF year % 4 = 0 OR (year % 100 != 0 and year % 1000 = 0)
15.         IF day > 29 OR day < 01
16.             OUTPUT "date not valid"
17.     ELSE
18.     IF day > 28 OR day < 01
19.         OUTPUT "date not valid"
```

Figure 6

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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Learner Registration Number

Pearson BTEC Level 3 Nationals Extended Certificate, Foundation Diploma, Diploma, Extended Diploma

Time 2 hours

Paper reference **31768H**

Computing

UNIT 1: Principles of Computer Science

You must have:
Information Booklet (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions. Write your answers in the spaces provided.

Please refer to Section 1 of the Information Booklet in order to answer Question 1.

1 A darts player has written an application (app) to keep score of a darts game.

(a) **Figure 2** on Page 4, in Section 1 of the Information Booklet shows part of the pseudocode for the app.

(i) Identify a line of code that performs a calculation.

(1)

.....

(ii) Identify a line of code that uses branching.

(1)

.....

(iii) Identify a line of code that places an item on a stack.

(1)

.....

(b) Identify **three** ways that the pseudocode in **Figure 2** could be improved.

(3)

1 .....

2 .....

3 .....

(c) State **two** inputs the app needs to calculate the total score for each turn.

(2)

1 .....

.....

2 .....

.....

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The app uses a stack.

(d) Describe how stacks handle data.

(2)

(e) The score for each dart thrown during a player's turn is held in a stack.

Write a section of pseudocode that will produce the total score using the three scores held in the stack.

You should make sure that your pseudocode is as efficient as possible.

(4)

Figure 1 in Section 1 of the Information Booklet shows the screen interface for the app.

The screen interface was created using an event-driven programming language.

(f) Explain the meaning of the term 'trigger function'.

(3)

(g) The interface uses a trigger function for the update score button.

Explain **one other** feature of event-driven programming that could be used in the app.

(3)

(Total for Question 1 = 20 marks)

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QUESTION 2 BEGINS ON THE NEXT PAGE.

Please refer to Section 2 of the Information Booklet in order to answer Question 2.

2 A petrol station uses a computer system to manage the fuel pumps and the digital price sign.

(a) Section 2 of the Information Booklet shows details of the LED display units and how they work.

Complete 'Array 3' and 'Array 4' to show how 115.8 would be stored.

(2)

Array 1

off	on	on	off	off	off	off	off

Array 2

off	on	on	off	off	off	off	off

Array 3

Array 4

(b) Describe **one** validation technique that could be used for the array.

(2)

.....

.....

.....

.....

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(c) Code needs to be developed to control the processes for dispensing fuel and charging customers.

The programmer has identified the variables that would be needed.

State **four other** parts of the system that need to be identified to solve the problem.

(4)

1 .....

2 .....

3 .....

4 .....

The computer stores the volume of fuel in litres dispensed by four pumps for the last 10 customers.

The array shows an example of this data. The data is stored in row major order.

62.4	8.7	88.8	55.1	23.2	81.6	97.0	77.0	23.7	10.3
66.4	20.7	25.7	79.4	62.0	55.5	12.1	40.3	91.3	63.6
29.2	33.3	42.8	28.3	51.8	32.9	5.8	95.6	20.7	35.5
50.8	6.3	83.9	7.7	19.7	51.7	28.5	57.8	31.1	74.9

(d) Give the output generated by the given pseudocode statements.

(2)

Output item (2,3)

.....

Output integer (item (1,2))

.....

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(e) The fuel pumps measure the volume of fuel dispensed to 2 decimal places. The programmer wants to use only 1 decimal place.

This can be achieved by using rounding or truncation.

The volume measured by the pump is 23.56 litres.

(i) State the result of rounding the volume.

(1)

.....

(ii) State the result of truncating the volume.

(1)

.....

(iii) Explain **one** possible drawback for the petrol station if the programmer chooses truncation as the method.

(2)

.....

.....

.....

.....

(f) A program is needed to find the total volume of fuel sold in the example data.

Write pseudocode to calculate the total volume of fuel sold. The results should be rounded to the nearest litre.

(6)

(Total for Question 2 = 20 marks)

Please refer to Section 3 of the Information Booklet in order to answer Question 3.

3 A school keeps records for school visits and trips. The staff use a database to store all the information about pupils, payments and costs.

The database will be available online to help parents and pupils keep track of their records.

Each user will have a user ID and a password.

(a) The user ID must be between 5 and 30 characters.

Complete the IF statement used to test the user ID length.

(3)

```
IF length(userid) >= 5 AND [          ] 30
        Output [                      ]
ELSE
        Output [                      ]
ENDIF
```

(b) Explain the importance of 'platform independence' for users of the online database.

(3)

(c) Users of the database must create a password. **Figure 5** in the Information Booklet shows the rules for an acceptable password.

Draw a flowchart that shows the process of checking that a user's password meets the rules.

(8)

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(d) Code is needed to allow users to access the database through the school website.

Analyse the security implications of implementing code that will manipulate the database on a web platform.

Your answer should include possible security issues and ways in which these could be reduced.

(10)

(Total for Question 3 = 24 marks)

Please refer to Section 4 of the Information Booklet in order to answer Question 4.

4 A hire shop is going to change the computer system it uses to keep records of the equipment it hires and the people who hire it.

(a) The hire shop must change the existing code so that it will run on new hardware.

Discuss the implications of developing the new code and the impact this will have on the hire shop.

(6)

(b) Equipment hire and return dates need to be validated. The pseudocode used to do this is shown in **Figure 6** of the Information Booklet.

Discuss the effectiveness of the code and any improvements that could be made.

(8)

(c) The hire shop wants to develop a website that customers can use to hire equipment. The website will use server side and client side processing and scripting.

Analyse how the features of server side and client side processing and scripting will meet the needs of the hire shop.

Your answer should include the uses and implications of identified features.

(12)

(Total for Question 4 = 26 marks)

TOTAL FOR PAPER = 90 MARKS

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