Please check the examination details below before entering your candidate information

Candidate surname	Other names

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

Centre Number | | | | | | |

Learner Registration Number | | | | | | | | |

Friday 15 January 2021

Afternoon (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 Fred has been employed to develop a program for a car repair business. The business provides MOTs and servicing for customers' cars. The business owner would like a program to calculate customers' bills.

(a) Fred will use pattern generalisation and abstraction to identify the variables to be used in the program.

Give **three other** parts of a programming problem that will be identified using pattern generalisation and abstraction.

(3)

1 .....

2 .....

3 .....

(b) Fred has written an algorithm using pseudocode to calculate and output customers' bills.

He has used the information in **Figure 1** in the Information Booklet and would like some feedback on his algorithm.

```
BEGIN
MotCost = 79.99
TotalBill = 0
OUTPUT (Has the customer's car had an MOT?)
INPUT Mot
IF Mot = "yes" THEN
        TotalBill = MotCost
END IF
OUTPUT (Has the customer's car had a service?)
INPUT Service
IF Service = "yes" THEN
        TotalBill = Service
END IF
```

Identify **three** reasons why the algorithm will not work as expected.

(3)

Reason 1

.....

.....

Reason 2

.....

.....

Reason 3

.....

.....

(c) Fred is going to use built-in functions when producing the code for his program.

State **two** benefits of using built-in functions when creating program code.

(2)

Benefit 1

.....

.....

Benefit 2

.....

.....

(d) Fred will use validation checks for the MOT and service inputs within his program.

Explain **two** types of validation checks that would be suitable for these inputs.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

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QUESTION 1(e) BEGINS ON THE NEXT PAGE.

(e) The business uses a set of rules to follow when processing card payments.

- Payments have to be above £10.
- The card must be checked with the appropriate bank to make sure that:
  - it is valid
  - enough funds are available.
- Receipt must be printed.
- Transaction must be marked as completed.
- There must be an option to process another payment.

Draw a flowchart that meets the rules when processing card payments.

(8)

(Total for Question 1 = 20 marks)

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

2 A programmer is developing code that will include a binary search.

(a) Explain **two** benefits of producing code with good readability.

(4)

Benefit 1

Benefit 2

(b) Complete the table for the values used in the algorithm in **Figure 2** in the Information Booklet.

(5)

val	left	right	mid	arr[mid]

(c) Explain why the binary search algorithm shown in **Figure 2** in the Information Booklet would not work when [48, 1, 26, 56, 15, 6] is in the array (arr).

(3)

(d) The programmer implementing the algorithm in **Figure 2** in the Information Booklet wants to create it as a subroutine with 'arr' as a parameter.

Explain **two** reasons why the programmer might implement the algorithm as a subroutine.

(4)

Reason 1

Reason 2

(e) The algorithm in **Figure 2** in the Information Booklet is not fully complete.

Write some pseudocode that will continue after line 14 and display a suitable message when a value is found or not found.

(4)

(Total for Question 2 = 20 marks)

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QUESTION 3(a) BEGINS ON THE NEXT PAGE.

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

Gerrard owns a limousine hire company. He wants to create a program that will calculate the hire cost of limousines.

3 (a) Develop an algorithm for this program using the rules shown in **Figure 3a** in the Information Booklet.

Write your answer using pseudocode.

(8)

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(b) **Figure 3b** in the Information Booklet shows the variables Gerrard plans to use when he writes the code for the program.

Discuss the implications of using functions with arguments instead of the global variables defined in **Figure 3b**.

(8)

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(c) Gerrard is considering developing the program using an object-oriented programming language.

Discuss the benefits and drawbacks of using an object-oriented language to develop this program.

(8)

(Total for Question 3 = 24 marks)

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

4 Amy is a games developer. She has come up with an idea for a new game aimed at children.

Figure 4 in the Information Booklet shows information about the new game.

(a) Explain why Amy would use decomposition and abstraction to help the development of the game.

(4)

Decomposition

Abstraction

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QUESTION 4(b) BEGINS ON THE NEXT PAGE.

(b) Analyse how Amy could use the features of event-driven languages to meet the requirements shown in **Figure 4** in the Information Booklet.

(10)

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(c) Amy has decided to create the game as a web application.

Evaluate the implications of Amy's decision to implement the game as a web application.

You should use examples appropriate to the scenario to support your evaluation.

(12)

(Total for Question 4 = 26 marks)

TOTAL FOR PAPER = 90 MARKS

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Friday 15 January 2021

Afternoon (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.

Figure 1 contains information about the charges for MOTs and servicing in a car repair business.

- There is a set price for MOTs
- There are two prices for car servicing depending on the type of service required
- A discount is given when a car has both an MOT and a car service

Charges

MOT

- Standard charge – £79.99

Servicing

- 50-point check – £99.99
- 80-point check – £159.99

Discount

- 15% of total cost when a car has both an MOT and a service.

Figure 1

SECTION 2

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

Figure 2 shows part of a binary search algorithm designed to search for a value stored in an array.

```
1.      val = 48
2.      arr = [2, 8, 18, 48, 29, 92, 98]
3.      left = 0
4.      right = LENGTH(arr) -1
5.      WHILE left <> right
6.        mid = (left + right) DIV 2
7.        IF val == arr[mid] THEN
8.          left=right
9.        ELSE IF val < arr[mid] THEN
10.         right = mid -1
11.       ELSE
12.         Left =mid + 1
13.       ENDIF
14.     ENDWHILE
```

Figure 2

SECTION 3

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

Figure 3a shows the rules the code must follow to calculate the hire cost of a limousine.

1. Input customer surname
2. Input journey distance in miles
3. Input number of passengers (minimum of 1 and maximum of 10)
4. The hire cost is calculated by:
   - Charging £5 for each passenger
   - Charging £2.50 for **every** mile of the journey
   - Charging an extra £30.00 if the journey is over 20 miles
5. These details are then output:
   - Customer surname
   - Number of passengers
   - Total journey distance in miles
   - Total hire cost

Figure 3a

Figure 3b shows the variables used to calculate the cost of limousine hire.

Variable type	Variable name	Purpose	Example data	Data type
Local	Variable_1	Used to store customer's surname	'Davies'	String
Global	Variable_2	Used to store distance in miles	10	Integer
Local	Variable_3	Used to store number of passengers in limousine	2	Integer
Global	Variable_4	Used to store total hire cost	117.50	Float

Figure 3b

SECTION 4

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

Figure 4 shows the requirements for a game that Amy is going to develop.

- The aim of the game is to care for a virtual alien by interacting with it.
- When the game starts the user must choose the colour of the alien and give the alien a name.
- The user will perform actions to keep the alien happy. These actions include:
  - Feeding it
  - Playing games with it
  - Teaching it tricks and actions.
- The game will display these statistics about the alien :
  - Happiness as a percentage up to a maximum of 100%
  - Hunger as a percentage up to a maximum of 100%
  - Boredom as a percentage up to a maximum of 100%
  - Intelligence as a number between 0 and 80.
- The happiness decreases by 5% with every tick of the timer.
- Hunger and boredom increase by 1% with every tick of the timer.
- When the 'feed' option is selected, hunger is reduced to 0 and happiness increases by 40%.
- When the 'play' option is selected boredom is reduced to 0 and happiness increases by 50%.
- When the 'teach' option is selected, intelligence is increased by 2 each time a trick or an action is performed. Happiness is also increased by 25%.
- If happiness or intelligence reach 0 the game is over.
- If boredom or hunger reach 100 the game is over.

Figure 4

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