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Pearson BTEC Level 3
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Centre Number

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Learner Registration Number

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Computing

Unit 1: Principles of Computer Science

Friday 19 January 2018 – Morning

Time: 2 hours

Paper Reference

31768H

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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P 5 1 8 0 1 R A 0 1 2 0



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

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

- 1 Oscar would like a program that will allow him to calculate how much his gas and electric energy bill will cost each week.

The rules that are used to calculate his energy bill can be seen in Section 1 of the Information Booklet.

- (a) Oscar has written an algorithm using pseudocode to calculate his energy bill. He wants some feedback on his algorithm.

BEGIN

INPUT GasUsed

INPUT ElectricDayUsed

GasBill = $(\text{GasUsed} * 0.20) + (7 * 0.50)$

ElectricBill = $(\text{ElectricDayUsed} * 0.35) + (\text{ElectricNightUsed} * 0.10)$

TotalBill = GasBill + ElectricBill

OUTPUT ElectricBill

END

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Identify **four** reasons the algorithm will not work as expected.

(4)

Reason 1

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Reason 2

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Reason 3

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Reason 4

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(b) Explain why Oscar should declare the variable 'TotalBill' as a float data type instead of an integer.

(3)

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(c) Identify the control structure of Oscar's pseudocode and describe how this would affect the way the code is executed.

(3)

Control structure

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Description

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(d) Oscar intends to use a data type validation check in the final program.

Explain why this check is suitable for Oscar's program.

(3)

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Oscar's energy provider is offering a promotion that will mean he will not pay for gas on the day he uses the least number of units.

The requirements for an algorithm to find the least number of units are:

- Allow the user to enter:
 - the number of units used on day one
 - the number of units used on day two
- Compare the values for days one and two
- Store the lowest of the two values
- Allow the user to enter the number of units used for days three to seven
- Compare the values for days three to seven against the current lowest value as they are entered and store the lowest of the two values
- Output the lowest value when all values have been entered.

(e) Draw a **flowchart** that meets the requirements for the algorithm.

(7)



Continue your flowchart on the next page

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(Total for Question 1 = 20 marks)



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

2 Alison runs a bingo evening at a local village hall once a week. She has created programming code that generates and stores bingo numbers in an array using Visual Basic. The programming code must ensure that the numbers between 1 and 90 are only output once.

(a) Explain what is meant by the term 'statement' when creating program code.

(3)

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(b) Alison has setup an array within the programming code.

The programming code can be seen in Section 2 of the Information Booklet.

Explain why Alison has defined 'previousNumbers' as a single dimensional array.

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This message is displayed when the programming code is run.

Exception thrown 'System.IndexOutOfRangeException' in BingoCaller.exe

(c) Identify which line in the programming code contains an error and explain why this error has occurred.

(4)

Line of code

Explanation

(d) Describe the purpose of the statement on line 7 of the programming code.

(2)

(e) Describe the purpose of the code in lines 11 to 15 of the program.

(2)



P 5 1 8 0 1 R A 0 9 2 0

(f) These numbers have been generated and added to the array.

11	6	70	46	12	18	74
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A player stops the game to ask if the number 70 has been generated.

Explain why a binary search may not be suitable for this task.

(6)

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

3 Siad manages a taxi company. He has a program that handles a large volume of bookings every day from customers. He would like to expand his program so that it will track the status of a booking.

The requirements and the design for the booking screen can be seen in Section 3 of the Information Booklet.

(a) Siad will expand his program using an event driven programming language.

Explain a benefit to Siad of using time driven features in his program.

(3)

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(b) Explain why a queue data structure should be used to store booking requests.

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(c) **Figure 3b** shows the variables Siad plans to use when he writes the code for the program.

Discuss the implications of using the variables as defined in **Figure 3b**.

(10)

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(d) Siad's taxi drivers are awarded performance points each month. The drivers' scores at the end of one month are shown in this list.

0	1	2	3	4	5	6	7	8
25	37	49	44	54	70	74	73	96

Siad uses a quick sort to put the scores into order.

He could use the **Leftmost/Rightmost Element** or the **Median of Three** method to choose a pivot.

Analyse how these methods of choosing a pivot would affect the performance of the sort.

(8)





Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 3 = 24 marks)

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

4 Paul is a DJ and wants a program that will automatically generate a playlist of songs for a particular event.

Paul would like to display the generated playlist on his website so that customers can add additional songs before an event.

(a) Explain why server side processing would be used to allow the customers to add songs to a playlist.

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(b) A selection of songs that Paul has stored and the rules that should be followed when generating a playlist, can be seen in Section 4 of the Information Booklet.

Develop an algorithm using pseudocode that meets the rules to generate a playlist.

(10)

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(c) Paul would like to add a payment feature to his website to allow customers to pay for an event.

He wants to ensure his customers' data is secure.

Evaluate how this will affect Paul's choices when creating the code for the website.

(12)



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(Total for Question 4 = 26 marks)

TOTAL FOR PAPER = 90 MARKS



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

Computing

Unit 1: Principles of Computer Science

Friday 19 January 2018 – Morning
Information Booklet

Paper Reference

31768H

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.

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SECTION 1

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

Figure 1 contains information about the current charges for gas and electric used by Oscar.

- He needs to pay for each unit of **gas** and each unit of **electric** that he uses
- There is one unit price for gas
- The unit price for electric depends on the time of day
- He pays standard daily charges for gas and electric
- He receives a discount each week

Charges

Gas

- Standard unit rate – £0.20
- Standard daily charge – £0.50

Electric

- Standard unit rate during the day – £0.35
- Standard unit rate during the night – £0.10
- Standard daily charge – £0.50

Discount

- £2 each week

Figure 1

SECTION 2

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

Figure 2 shows the programming code that Alison has created using Visual Basic.

```
1 Public Class MainScreen
2     Dim newNumber As Integer
3     Dim previousNumbers(0 To 79) As Integer
4     Dim i, x, y As Integer
5 Private Sub GenerateNumbers_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles GenerateNumbers.Click
6     GeneratedNumbers.Text = ""
7     For x = 0 To 89
8 Start:
9         Randomize()
10        newNumber = Int((90 * Rnd()) + 1)
11        For y = 0 To 89
12            If newNumber = previousNumbers(y) Then
13                GoTo Start
14            End If
15        Next y
16        previousNumbers(x) = newNumber
17    Next x
18    For i = 0 To 89
19        GeneratedNumbers.Text = GeneratedNumbers.Text & (previousNumbers(i)) & " , "
20    Next
21 End Sub
22
23 End Class
```


Figure 2

SECTION 3

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

Figure 3a shows the design for the booking screen for the taxi company.

Booking Screen



First Name:

Surname:

House No:

Postcode:

Booking Time:

Booking ID:

Status:

These details are automatically calculated when the SUBMIT button is pressed

Figure 3a

Program requirements

When the 'SUBMIT' button is pressed the following actions must take place:

1. The time of the booking should automatically be stored.
2. A booking ID is generated by combining the customer surname and the booking time.
3. A status is set to:
 - 'Waiting' automatically
 - 'Priority' if the taxi has not arrived after 10 minutes
 - 'Urgent' if the taxi has not arrived after 20 minutes
 - 'Complete' when the taxi has arrived.

Figure 3b shows the variables that will be used to handle a customer booking.

Type	name	Purpose	Example Data	Data Type
Local	Variable_1	Used to store the customer's firstname.	'Sandra'	String
Local	Variable_2	Used to store the customer's surname.	'Parker'	String
Local	Variable_3	Used to store the customer's house number.	46	String
Local	Variable_4	Used to store the customer's postcode.	'PR2 5TY'	String
Local	Variable_5	Used to store the generated bookingID.	Parker0855	String
Local	Variable_6	Used to store the time that the booking was made.	08:55	String
Global	Variable_7	Used to store the current progress (Waiting, Priority, Urgent, and Complete).	'Waiting'	String

Figure 3b

SECTION 4

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

Figure 4 shows a selection of the songs that Paul has stored.

SongID	Song Name	Artist	Length	Rating	Last Selected (Days Ago)
1	Jagged borders	Rob Smith	3 mins, 24 secs	3 Star	20
2	Last Minute	Sharpiee	2 mins, 45 secs	3 Star	19
3	It's gonna be great	Flybe	4 mins, 18 secs	5 Star	5
4	Chaos	Trouble Dodgers	5 mins, 2 secs	5 Star	9
5	Dreamin'	Rob Smith	3 mins, 34 secs	3 Star	16
6	Rock this	Ian Green	3 mins, 52 secs	2 Star	25
7	Let's party	Flyby	2 mins, 58 secs	4 Star	13
8	Lovin' life	Andrew Ford	4 mins, 17 secs	5 Star	1
9	Smile	Crazy	4 mins, 9 secs	3 Star	17
10	Keep it real	Story Tellers	3 mins, 48 secs	4 Star	11
11	Time	Various	3 mins, 52 secs	5 Star	4
12	Let's celebrate	Harry Bunn	4 mins, 9 secs	5 Star	7

Figure 4

Playlist rules

1. The duration of the playlist to be generated is entered in minutes (e.g. 60 minutes).
2. 25% of the playlist duration is left empty so Paul can add songs that customers request during an event.
3. A playlist is then generated for the remaining duration using the following rules:
 - 45% of the playlist duration must be '5 Star' rated songs.
 - 30% of the playlist duration must be '4 Star' rated songs
 - 25% of the playlist duration must be '3 Star' rated songs.
4. The songs with the greatest 'Last Selected' value should always be selected first.
5. When a song is added to the playlist then the 'Last Selected' is set to 0.

NOTE: '1 Star' and '2 Star' songs are NOT added to a playlist. They are still stored in case a customer requests them during an event.

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