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

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 pay and bonuses for staff who work in Matthew's shop.

- All staff have a base pay of £50 per week.
- In addition to the base pay:
  - the manager receives £15 per hour
  - all other staff receive £10 per hour.

Bonuses

Manager

- If total weekly sales are more than £3500 and total number of customers served more than 300 a bonus of £50 can be awarded.

Other staff

- If the number of customers served by a member of staff is more than 120 a bonus of £30 can be awarded.

Figure 1

SECTION 2

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

A town contains 10 000 houses. Each house owner must pay council tax based on the value of their house. The local council wants to develop a program to calculate the council tax band for each house. The council tax band must be output for each house.

House value	Council tax band
over £250 000	3
£150 000 to £250 000	2
£80 000 to £149 999	1
less than £80 000	0

Figure 2 shows part of the pseudocode that will be used to develop the new program for the local council. The pseudocode contains some errors**.**

```
1.      FOR count 1 To 10
2.      INPUT house_value
3.      IF house_value < 250000 THEN
4.          taxband = 3
5.      ELSEIF house_value >= 150000 THEN
6.          taxband = 2
7.      ELSEIF house_value >= 80000 THEN
8.          taxband = 1
9.      ELSE
10.         taxband = 0
11.     ENDIF
12.
13.     OUTPUT house_value
```

Figure 2

SECTION 3

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

Figure 3 shows the rules the code must follow to calculate the number of pupils in each group for a school sports day.

1. There are 100 pupils.
2. Allow the user to enter a number (1 to 12) that relates to the birth month of each pupil. For example, enter 1 for January.
3. Decide which group the pupil is in:
   - Pupils born in January, February, March, or April are put into the Red group.
   - Pupils born in May, June, July, or August are put into the Green group.
   - All other pupils are put into the White group.
4. Keep a running total of how many pupils are in each group.
5. When all 100 pupils have had their details entered, output the number of pupils in each group.

Figure 3

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 Matthew owns a shop that sells sporting and movie memorabilia. Matthew would like to have a program to calculate the weekly pay and bonuses for staff.

(a) State **three** computational thinking skills a programmer can use when solving programming problems.

(3)

1 .....

2 .....

3 .....

(b) Matthew wants to use variables and constants when producing the code for his program.

Identify **two** variables and **one** constant Matthew can use for his program code.

(3)

Variable 1

.....

Variable 2

.....

Constant

.....

(c) Describe how the data types Integer and Boolean could be used in Matthew's program.

(4)

Integer

Boolean

(d) Explain **two** data validation checks Matthew could use in his program.

(4)

1

2

(e) Matthew needs to calculate the weekly pay and bonuses for staff.

The requirements of the program are:

- allow users to input:
  - employee name
  - job role (manager or other)
- calculate and output employees' pay (including bonus).

Draw a flowchart that meets the program requirements.

(6)

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(Total for Question 1 = 20 marks)

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

2 A local council wants to develop a program to calculate the council tax band each house will be in.

Figure 2 shows part of the pseudocode for this program.

(a) The pseudocode contains three errors. Because of the errors the algorithm does not meet requirements of the program.

Identify the line number of each error and write the correct pseudocode for each line.

(6)

Line number

.....

Correct pseudocode

.....

.....

Line number

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Correct pseudocode

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Line number

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Correct pseudocode

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(b) Explain why the variable 'taxband' should be declared as a string.

(3)

(c) Explain **one** reason why a 'FOR' loop has been used instead of a 'WHILE' loop.

(2)

(d) The program data will be stored in a record data structure.

Explain **one** benefit of using a record to store this data.

(2)

(e) The local council has decided to write the program using a procedural language.

Describe how blocks and procedures can be used when writing the code for this program.

(4)

Blocks

Procedures

(f) The local council wants to offer a version of this program on its website.

Discuss the implications of implementing the program on a web platform.

(6)

(Total for Question 2 = 23 marks)

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

3 A school organises pupils into groups for sports day based on the month that they were born.

The school wants to develop a program that will calculate the number of pupils in each group.

Figure 3 in the Information Booklet shows the rules for the program.

(a) Describe how branching and iteration could be used for this program.

(4)

Branching

Iteration

(b) Explain the role of Boolean and Relational operators when developing the program.

(4)

Boolean operators

Relational operators

(c) The school wants to include the code that decides the groups in a larger program.

Explain **two** benefits of implementing the code as a function.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(d) Write the pseudocode for a program that meets the rules shown in **Figure 3**.

(8)

(Total for Question 3 = 20 marks)

4 A programmer is writing a program to process reward points for an online retailer.

The reward points earned by a customer on their last 12 orders are stored in the array points.

14	7	2	12	5	23	36	15	11	8	4	19

(a) Explain why OUTPUT points[12] would return an error.

(2)

.....

.....

.....

.....

The programmer sorts the points array using a bubble sort algorithm.

(b) When writing the bubble sort algorithm, the programmer uses a Boolean variable called 'swaps'.

Describe how the 'swaps' variable would be used in the bubble sort algorithm.

(3)

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(c) Analyse why the programmer has chosen a bubble sort to sort the data in the points array rather than a quick sort.

(10)

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The programmer has been given a database of 500 000 customers and needs to create an algorithm to search through it to find a specific customer.

(d) Evaluate the efficiency of **both** linear and binary searching algorithms for a dataset of this size.

(12)

(Total for Question 4 = 27 marks)

TOTAL FOR PAPER = 90 MARKS

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