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COMPUTER SCIENCE

2210/22

Paper 2 Problem-solving and Programming

October/November 2020

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- **Do not attempt Tasks 1, 2 and 3** in the copy of the pre-release material on page 2; these are for information only.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **12** pages. Blank pages are indicated.

Section A

You are advised to spend no longer than 40 minutes answering this section.

Here is a copy of the pre-release material.

DO NOT attempt Tasks 1, 2 and 3 now.

Use the pre-release material and your experience from attempting the tasks before the examination to answer Question 1.

Pre-release material

An online computer shop sells customised personal computers. Every computer sold includes a basic set of components costing \$200 and additional items can be added from the table:

| Category | Item code | Description | Price (\$) |
|------------------------|-----------|-----------------------|------------|
| Case | A1 | Compact | 75.00 |
| Case | A2 | Tower | 150.00 |
| RAM | B1 | 8 GB | 79.99 |
| RAM | B2 | 16 GB | 149.99 |
| RAM | B3 | 32 GB | 299.99 |
| Main Hard Disk Drive | C1 | 1 TB HDD | 49.99 |
| Main Hard Disk Drive | C2 | 2 TB HDD | 89.99 |
| Main Hard Disk Drive | C3 | 4 TB HDD | 129.99 |
| Solid State Drive | D1 | 240 GB SSD | 59.99 |
| Solid State Drive | D2 | 480 GB SSD | 119.99 |
| Second Hard Disk Drive | E1 | 1 TB HDD | 49.99 |
| Second Hard Disk Drive | E2 | 2 TB HDD | 89.99 |
| Second Hard Disk Drive | E3 | 4 TB HDD | 129.99 |
| Optical Drive | F1 | DVD/Blu-Ray Player | 50.00 |
| Optical Drive | F2 | DVD/Blu-Ray Re-writer | 100.00 |
| Operating System | G1 | Standard Version | 100.00 |
| Operating System | G2 | Professional Version | 175.00 |

As well as the basic set of components every computer must include one case, one RAM and one Main Hard Disk Drive from the table.

A computer is supplied with or without an Operating System.

Write and test a program or programs for the online computer shop.

- Your program or programs must include appropriate prompts for the entry of data; data must be validated on entry.
- Error messages and other output need to be set out clearly and understandably.
- All arrays, variables, constants and other identifiers must have meaningful names.

You will need to complete these **three** tasks. Each task must be fully tested.

Task 1 – Setting up the system and ordering the main items.

Write a program to:

- use arrays to store the item code, description and price
- allow a customer to choose one case, one RAM and one Main Hard Disk Drive
- calculate the price of the computer using the cost of the chosen items and the basic set of components
- store and output the chosen items and the price of the computer.

Task 2 – Ordering additional items.

Extend TASK 1 to:

- allow a customer to choose whether to purchase any items from the other categories – if so, which item(s)
- update the price of the computer
- store and output the additional items and the new price of the computer.

Task 3 – Offering discounts.

Extend TASK 2 to:

- apply a 5% discount to the price of the computer if the customer has bought only one additional item
- apply a 10% discount to the price of the computer if the customer has bought two or more additional items
- output the amount of money saved and the new price of the computer after the discount.

1 All variables, constants and other identifiers must have meaningful names.

(a) (i) Identify **one** array you could have used for **Task 1** and state its purpose.

Array

Purpose

.....

.....

[2]

(ii) Identify **one** variable you could have used for **Task 2** and state its purpose.

Variable

Purpose

.....

.....

[2]

(iii) Identify **one** constant you could have used for **Task 3** and state its purpose.

Constant

Purpose

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[2]

(b) Explain the benefits of storing Price as a real data type.

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[6]

(e) Describe how you could alter your program to allow more than one computer to be bought.

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Section B

- 2 Tick (✓) **one** box in each row to identify if the statement about subroutines is **true** or **false**.

| Statement | true (✓) | false (✓) |
|--|-------------|--------------|
| A subroutine is called from within a program. | | |
| A subroutine is not a complete program. | | |
| A subroutine is a self-contained piece of code. | | |
| A subroutine must return a value to the code from which it was called. | | |

[2]

- 3 This pseudocode algorithm is used as a validation check.

```

PRINT "Input a number from 1 to 5000"
REPEAT
  INPUT Number
  IF Number < 1 OR Number > 5000
    THEN
      PRINT "Invalid number, please try again"
    ENDF
UNTIL Number >= 1 AND Number <= 5000
PRINT Number, " is within the correct range"

```

Identify **three** different types of test data. For each type, give an example of the test data you would use to test this algorithm and state a reason for your choice of test.

Type of test data 1

Test data

Reason

.....

Type of test data 2

Test data

Reason

.....

Type of test data 3

Test data

Reason

.....

[6]

4 This pseudocode algorithm allows 5000 numbers to be entered and stored in an array called Number.

```
FOR Count ← 1 TO 5000  
    INPUT Number[Count]  
NEXT Count
```

Extend and re-write the algorithm using pseudocode to also count and output how many of the numbers stored in the array are greater than 500, using the variable Higher. Only output Higher once with an appropriate message.

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5 This pseudocode represents an algorithm.

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REPEAT
  Flag ← 0
  FOR Count ← 0 to 3
    IF Num[Count] < Num[Count + 1]
      THEN
        Store ← Num[Count]
        Num[Count] ← Num[Count + 1]
        Num[Count + 1] ← Store
        Flag ← 1
      ENDIF
  NEXT Count
UNTIL Flag = 0
```

(a) The contents of the array at the start of the algorithm are:

| Num[0] | Num[1] | Num[2] | Num[3] | Num[4] |
|--------|--------|--------|--------|--------|
| 45 | 56 | 30 | 12 | 15 |

Complete the trace table for the algorithm using the data given in the array.

| Flag | Count | Num[0] | Num[1] | Num[2] | Num[3] | Num[4] | Store |
|------|-------|--------|--------|--------|--------|--------|-------|
| | | 45 | 56 | 30 | 12 | 15 | |
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[5]

(b) Describe the purpose of the algorithm.

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..... [2]

6 Draw a flowchart symbol to represent each of the following:

| Input/Output | Decision |
|--------------|----------|
| | |

[2]

Question 7 starts on Page 12.

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7 The table AUDIOPARTS stores the part number, description, cost and quantity in stock of the items sold by a music shop.

| PartNum | Description | Cost | Quantity |
|---------|----------------------------|--------|----------|
| A01 | Compact Amplifier Case | 50.00 | 15 |
| A02 | Deluxe Amplifier Case | 75.00 | 1 |
| A03 | Amplifier Standard | 79.99 | 48 |
| A04 | Amplifier Midrange | 149.99 | 50 |
| A05 | Amplifier Megablaster | 299.99 | 48 |
| S01 | Tweeter | 59.99 | 10 |
| S02 | Midrange Woofer | 99.99 | 0 |
| S03 | Subwoofer | 139.99 | 16 |
| S04 | Tower Speaker Basic | 159.99 | 25 |
| S05 | Tower Speaker Skyscraper | 219.99 | 9 |
| S06 | Centre Speaker | 149.99 | 25 |
| S07 | Soundbar | 89.99 | 2 |
| S20 | Soundbar | 129.99 | 0 |
| S21 | Ceiling Surround Speaker | 75.00 | 15 |
| S22 | Ceiling Full Range Speaker | 100.00 | 1 |
| S25 | Surround Speaker | 100.00 | 60 |
| T19 | Speaker Stands (Pair) | 75.00 | 60 |

(a) State the number of records in the table AUDIOPARTS

..... [1]

(b) Identify the field that is most suitable to be a primary key and give a reason for your choice.

Fieldname

Reason

.....

.....

[2]

(c) Complete the query-by-example grid to show the items where the quantity in stock is fewer than 10. Show all the fields from the database table in descending order of cost.

| | | | | |
|-----------|--------------------------|--------------------------|--------------------------|--------------------------|
| Field: | | | | |
| Table: | | | | |
| Sort: | | | | |
| Show: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Criteria: | | | | |
| or: | | | | |

[4]