Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3419194803

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.

© UCLES 2020

[Turn over

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.

© UCLES 2020

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 .....

.....

.....
[2]

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

.....

.....

.....

.....

.....

.....

..... [2]

(c) Write an algorithm to show how you completed **Task 1**, using **either** pseudocode, programming statements **or** a flowchart. It is not necessary to show initialisation or setting up of arrays in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(d) Explain how your program completes **Task 3**. Any programming statements used in your answer must be fully explained.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

.... [4]

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [2]

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"
  ENDIF
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.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

5 This pseudocode represents an algorithm.

```
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	

[5]

(b) Describe the purpose of the algorithm.

.....

.....

.....

..... [2]

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

Input/Output	Decision

[2]

Question 7 starts on Page 12.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

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:	☐	☐	☐	☐
Criteria:				
or:				

[4]

© UCLES 2020