Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

4643399244

COMPUTER SCIENCE **0478/22**

Paper 2 Problem-solving and Programming **February/March 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 **16** pages. Blank pages are indicated.

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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

A car buying service helps customers calculate the price of buying a new car from Snazzy Autos. There are three models of car available: hatchback, saloon and estate. A car can be bought with optional extras.

Model	Price
Hatchback	Rs 5.35 lakh
Saloon	Rs 4.95 lakh
Estate	Rs 6.25 lakh

Optional extra	Price
Set of luxury seats	Rs 45000
Satellite navigation	Rs 5500
Parking sensors	Rs 10000
Bluetooth connectivity	Rs 350
Sound system	Rs 1000

Snazzy Autos customers buying a new car can trade in an old car. Offers from Rs 10000 to Rs 1.00 lakh can be made for an old car. If an old car is not traded in, then a discount of 5% is taken off the price of the new car and any optional extras. In addition, repeat customers are offered a discount of 10% off any optional extras and 10% off the price of the new car before trade-in.
Customers can either pay for the new car in full or make monthly payments over several years.

Write and test a program or programs for the car buying service.

- 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 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 – Calculate the price

Customers choose the model of car and select any optional extras required. Only valid choices can be accepted for the model and the extras. The customer is asked if they are an existing customer and if they have an old car to trade in. If the customer trades in an old car the amount offered by Snazzy Autos is entered. The price of the new car including model and extras is displayed. Any discount or trade-in amounts are displayed and the total price to pay is calculated and displayed.

Task 2 – Calculate the payment(s)

Extend **Task 1** to display these payment methods:

- full amount paid now customer receives cashback of 1% on the total price
- equal monthly payments are made over four years with no extra charge
- the total price is increased by 5%; equal monthly payments are made over seven years.

For each payment method display: the total amount to pay, the amount of each payment, the number of payments and cashback where appropriate.

Task 3 – New full amount payment offer

Extend **Task 2** to offer customers who decide to pay the full amount now either the 1% cashback or the chosen optional extras free. Customers are shown the offer that is the best value first and the other as an alternative. Details of each offer must be displayed in full.

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

(a) State the name of **one** constant that you could have used for **Task 1**. Give the value that would be assigned to the constant. State the use of this constant.

Constant name .....

Value .....

Use .....

.....

[3]

(b) State the name of the variable that you used to store the amount offered for the trade-in of an old car in **Task 1**. Give the most appropriate data type for this variable. Explain how your program ensured that any data entered for the trade-in offer was valid.

Variable name .....

Data type .....

Validation .....

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[4]

(c) Snazzy Autos has decided to add another model to the cars available in **Task 1**. The new model is a convertible, price Rs 6.75 lakh. Explain the changes required to your program for **Task 1**.

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(d) Write an algorithm for **Task 2**, using **either** pseudocode, programming statements **or** a flowchart. Assume that **Task 1** has been completed.

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(e) Explain how your program completed **Task 3**. Assume that **Task 2** has been completed. Any programming statements used in your answer must be fully explained.

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Section B starts on page 8.

Section B

2 **(a)** An algorithm has been written in pseudocode to input 50 numbers. Positive numbers are stored in the array `PosNum[ ]`. Negative numbers are stored in the array `NegNum[ ]`. Zeros are not included in the positive and negative counts.

```
Count ← 0
PosCount ← Count
NegCount ← Count
REPEAT
    INPUT Number
    IF Number > 0
      THEN
        PosCount ← PosCount + 1
        PosNum[PosCount] ← Number
      ELSE
        NegCount ← NegCount + 1
        NegNum[NegCount] ← Number
    ENDIF
    Count ← Count + 1
UNTIL Count >= 50
OUTPUT "There are ", PosCount," positive numbers"
OUTPUT "There are ", NegCount," negative numbers"
```

Describe the error in the pseudocode and write the correction for this error.

Error .....

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Correction .....

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[4]

(b) The algorithm needs to be changed so there is no limit to how many numbers can be input. When the number 9999 is input, the algorithm stops more numbers being input and outputs the results. The number 9999 is not to be stored nor counted as a positive number.

Explain how you would change the algorithm.

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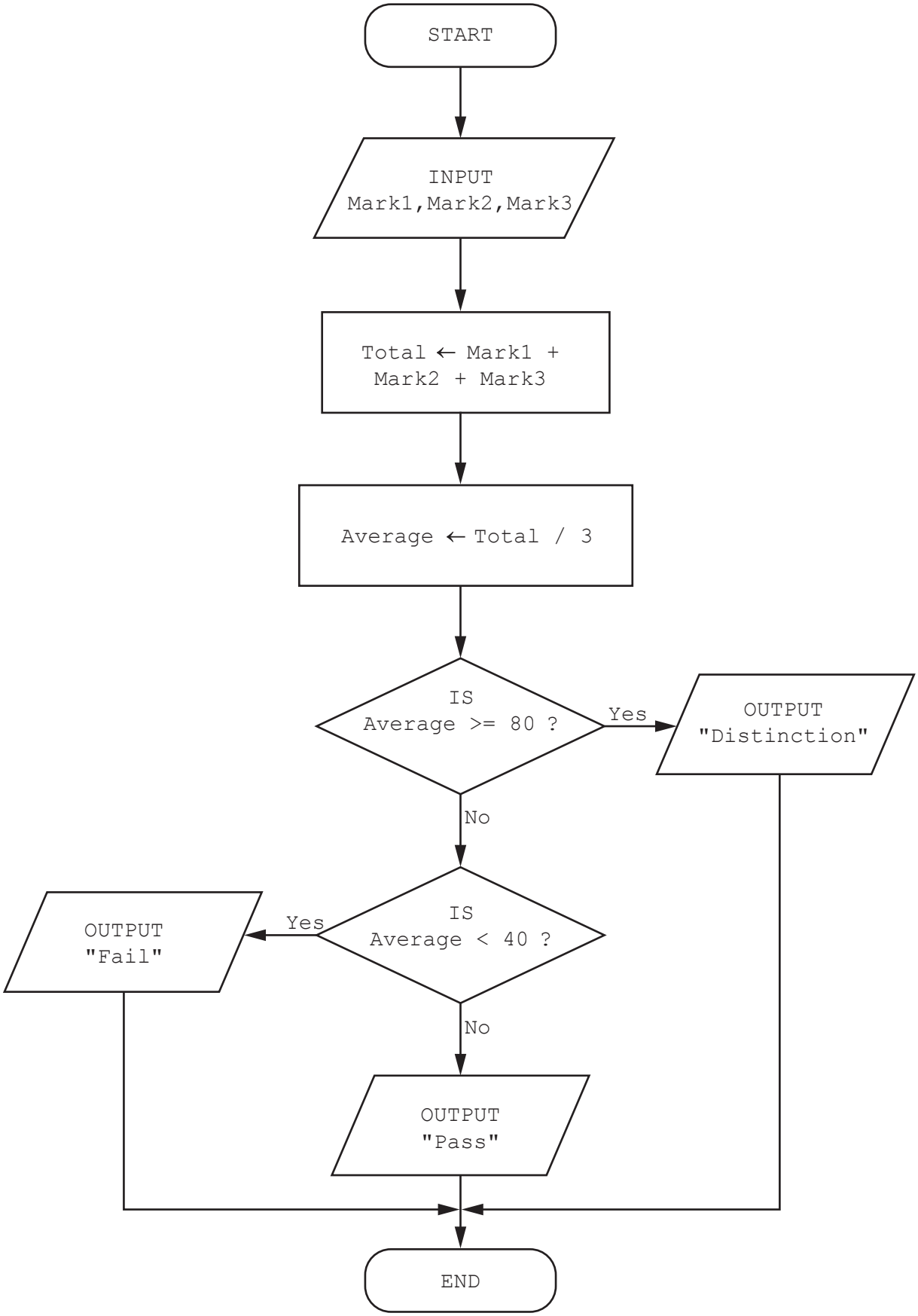
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3 This flowchart inputs student percentage marks for three examinations. If the average of these marks is 80% or over then a distinction grade is awarded. If the average of these marks is less than 40% then a fail grade is awarded. Otherwise a pass grade is awarded.



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(a) Complete a trace table for each set of input data:

Set 1: 88, 74, 60

Mark1	Mark2	Mark3	Total	Average	OUTPUT

Set 2: 20, 33, 67

Mark1	Mark2	Mark3	Total	Average	OUTPUT

Set 3: 79, 91, 70

Mark1	Mark2	Mark3	Total	Average	OUTPUT

[5]

(b) It has been decided to include an extra grade of Merit when the average of the marks is 60% or more, and less than 80%. Describe the changes that will need to be made to the flowchart.

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4 Explain why validation and verification checks are needed when data is input.
Include an example of each type of check in your answer.

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Question 5 starts on page 14.

5 A database table, BOX, is used to keep a record of boxes made and sold by a craftsman. Boxes are categorised by:

- SIZE – small, medium or large
- SHAPE – brief description for example 'star shaped'
- WOOD – maple, beech, walnut or ebony
- PRICE – price in $
- SOLD – whether the box is sold or not.

A database management system uses these data types:

Text Number Currency Boolean

(a) Select the most appropriate data type for each field from the four types shown. State the reason why you chose the data type.

SIZE data type .....

Reason .....

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SHAPE data type .....

Reason .....

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WOOD data type .....

Reason .....

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PRICE data type .....

Reason .....

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SOLD data type .....

Reason .....

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[5]

(b) (i) Complete the query-by-example grid below to only display the price of small walnut boxes.

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

[3]

(ii) The query-by-example grid from part **(b)(i)** needs to be changed to show both walnut and beech boxes and display the wood used. Only one column needs to be changed. Write the changed column.

Field:	
Table:	
Sort:	
Show:	☐
Criteria:	
or:	

[2]

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