Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

COMPUTER SCIENCE **0478/21**

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 **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 insurance system allows customers to check how much it would cost to buy insurance for a car for twelve months. The starting price of the car insurance is $500. The actual price a customer pays for the car insurance changes depending upon this information:

- engine size of car
- value of car
- where car is kept overnight
- number of kilometres (km) driven a year
- age of driver
- years insured without an insurance claim

Engine size in litres	Price change
<=0.5	–5%
>0.5 to 1.0	0%
>1.0 to 2.5	+5%
>2.5	+10%

Value in $1000	Price change
<0.5	–5%
0.5 to 2	0%
>2 to 10	+5%
>10 to 20	+10%
>20	+15%

Kept over-night	Price change
Garage	–5%
Drive	0%
Street	+5%

1000 km driven a year	Price change
<5	–5%
5 to 20	0%
>20	+5%

Age of driver	Price change
18–20	+100%
21–25	+50%
26–30	+25%
31–70	0%
71–80	+10%
>80	+20%

Table 1

Years without claim	Price change
1	–10%
2	–20%
3	–30%
4	–40%
5	–50%
6	–60%
>6	–70%

Table 2

The actual price is calculated by:

- finding the total of the percentage changes for the customer using Table 1
- applying this total percentage change to the starting price of the car insurance
- applying the years without claim discount percentage for the customer using Table 2.

Write and test a program or programs to calculate the price for a customer to insure a car.

- 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 to insure a car.

Write a program to obtain the required information from a customer and calculate the price to insure the car. Display the price to insure the car. Display the total percentage change calculated from Table 1, and the years without claim discount percentage from Table 2 separately.

Task 2 – New customer discount.

Extend **Task 1** to include an additional discount of 10% off the price to any new customer who is aged between 26 and 70 inclusive, who also has 2 or more years without a claim. Display the amount of money this would save and the new price.

Task 3 – Adding an extra driver.

Customers can add one extra driver. The age of the extra driver may increase the price. The new price is calculated by applying the percentage price change for the age of the extra driver from Table 1 to the price. Extend **Task 2** to calculate and display the new price including an extra driver if required.

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

(a) Identify **one** array that you could have used for **Task 1**. Give the data type and state the use of the array.

Array .....

Data type .....

Use .....

.....

.....

[3]

(b) Data entered by a customer includes the age of the driver in **Task 1**.
Identify **two** different validation checks you could use for the age of the driver.
Justify your choice for each one.

Validation check 1 .....

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Justification .....

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Validation check 2 .....

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Justification .....

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[4]

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

[6]

(d) (i) 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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(ii) The car insurance system needs updating to record the percentage of customers who bought car insurance after obtaining a price to insure a car. Describe the changes required to your program.

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Section B

2 Describe the purpose of variables and constants. Use an example of each in your answer.

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3 This pseudocode algorithm calculates the weight and number of bags in a load of firewood. The weight in kilograms of each bag is input. The algorithm finishes when either 50 bags have been weighed, or as soon as the total weight exceeds 1000 kilograms. Only then are the total weight and the number of bags in the load output.

```
01  TotalWeight ⟵ 1000
02  BagCount ⟵ 0
03  MaxBag ⟵ 50
04  MaxWeight ⟵ 1000
05  REPEAT
06      OUTPUT "Please Enter weight of bag"
07      INPUT Weight
08      TotalWeight ⟵ TotalWeight + Weight
09      BagCount ⟵ BagCount + 1
10      OUTPUT "Number of bags in the load is ", BagCount
11  UNTIL TotalWeight > MaxWeight AND BagCount >= MaxBag
12  OUTPUT "Total weight of the load is ", MaxWeight
```

(a) Give the line number(s) from the algorithm of:

an assignment statement .....

a loop .....

a counting statement .....

a totalling statement .....

[4]

(b) Give the line numbers of the **four** errors in this pseudocode. Suggest a correction for each error.

Error 1 line number .....

Correction .....

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Error 2 line number .....

Correction .....

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Error 3 line number .....

Correction .....

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Error 4 line number .....

Correction .....

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[4]

(c) Explain how you could extend the algorithm to calculate and display the average weight of a bag of firewood in the load.

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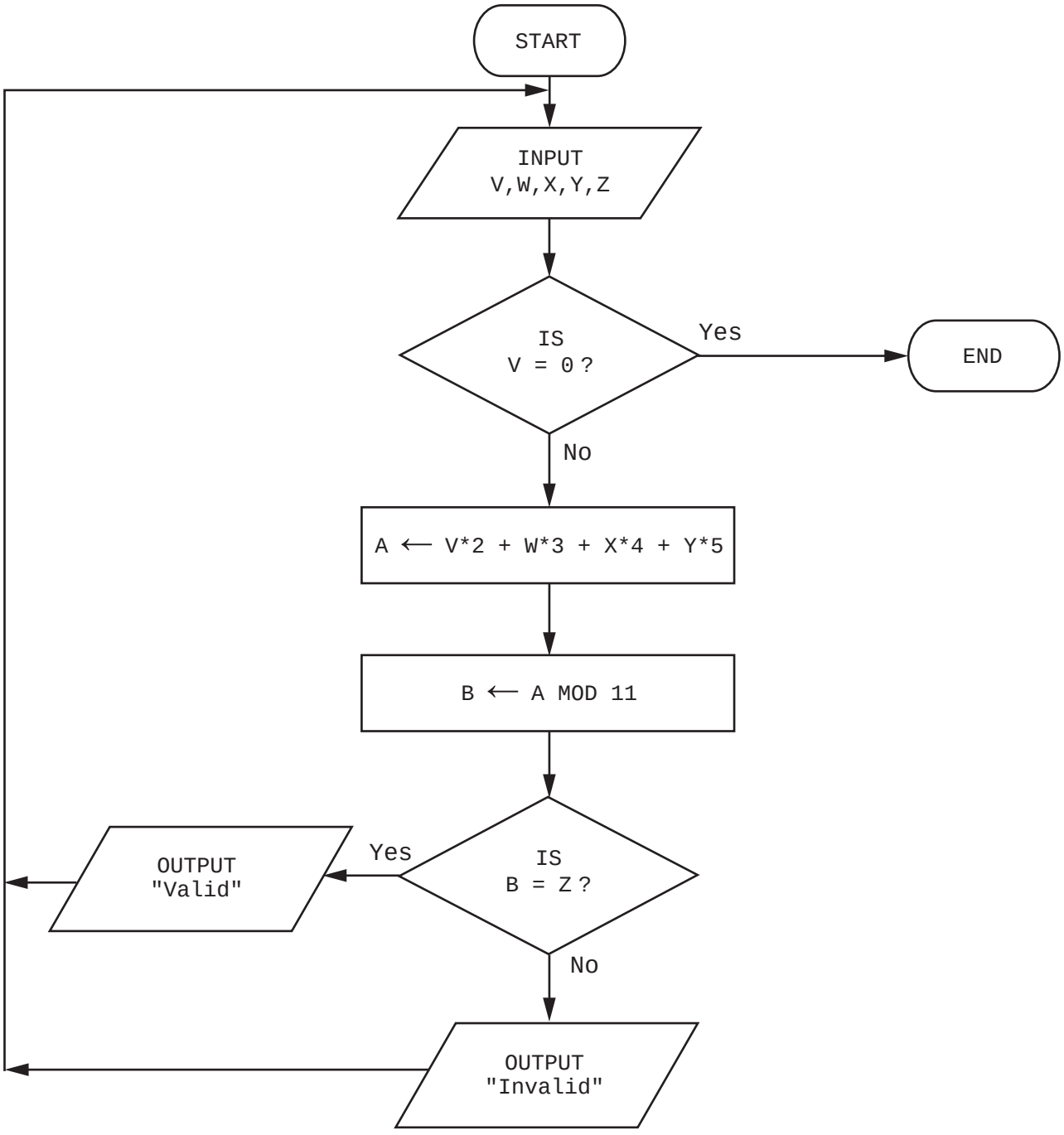
4 This flowchart inputs five numbers and performs a calculation.

The predefined function MOD finds the remainder from integer division for example
`R ← 25 MOD 11` gives R a value of 3



(a) Complete the trace table for this set of input data:
5, 4, 6, 2, 1, 9, 3, 2, 1, 6, 7, 6, 1, 5, 1, 0, 0, 0, 0, 0

V	W	X	Y	Z	A	B	OUTPUT

[4]

(b) Describe the purpose of this flowchart.

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5 A database table, AIRLINE, stores data used to compare airlines.

Code	Airline name	Number of employees	Number of countries	Head office	Share price
FJ	FastJet	60000	30	Europe	514.50
MA	MurphyAir	35000	8	Europe	152.67
JS	JetSeven	45000	22	Asia	257.44
K3	Koala3	22000	11	Australia	501.21
NS	NorthState	30000	4	America	108.22
SS	SouthState	30000	4	America	126.35
BJ	BlueJet	15000	7	Africa	215.45
SK	SkyKing	32000	27	Europe	506.12
PF	PandaFly	50000	35	Asia	317.88

(a) State how many fields and how many records are shown in the AIRLINE table.

Number of Fields .....

Number of Records .....

[2]

(b) Show the output that would be given by this query-by-example.

Field:	Airline name	Number of employees	Head office	Share price
Table:	AIRLINE	AIRLINE	AIRLINE	AIRLINE
Sort:				
Show:	☑	☐	☑	☐
Criteria:		< 35000		> 500.00
or:				

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..... [2]

(c) Complete the query-by-example grid to find every airline with a head office in Asia or Africa, and number of countries greater than 4. Only show the airline name and number of countries.

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

[4]

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