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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8649838361

COMPUTER SCIENCE **0478/21**

Paper 2 Problem-solving and Programming **October/November 2019**

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

DO NOT ATTEMPT TASKS 1, 2 AND 3 in the pre-release material; these are for information only.

You are advised to spend no more than **40 minutes** on **Section A** (Question 1).

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 50.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

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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

You have been asked to write a program to calculate the area of a patio and the cost of the stone slabs needed to cover it. The program should work for any patio that can be represented as a rectangle, or group of rectangles that are joined together, and only one type of stone slab may be used.

Type of stone slab	Price per square metre
Dover	$30.00
Exeter	$35.00
London	$42.00
Portland	$49.50
Shaftesbury	$55.00
York	$62.75

Write and test a program or programs to calculate the cost of the stone slabs for a patio.

- 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 – Setting up the system for a simple rectangular patio.
Set up your program to:
- Store the type and price per square metre of the stone slabs using a suitable programming technique.
- Prompt and allow the user to input the length and width of their patio and the type of stone slab they would like.
- Calculate and display the number of square metres of stone slabs required, rounded up to the next whole square metre, and the total cost of the stone slabs.

Task 2 – Working on more complex shapes.
Assuming that a patio can be made up of a group of rectangles, extend your program to:
- Enter the number of rectangles making up the patio and the type of stone slab to be used.
- Allow the dimensions for each rectangle to be entered.
- Calculate and display the total area of the patio rounded up to the next whole square metre.
- Calculate and display the total cost of the stone slabs.

Task 3 – Allowing for waste.
It is likely that some of the stone will not be useable, so it is sensible to allow a percentage for wastage, for example, 10%. Alter your program to allow the user to input a percentage to calculate wastage and add this to the number of square metres of stone slabs to be purchased, rounded up to the next whole square metre. Display the revised total area and cost.

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1 **(a)** All variables, constants and other identifiers must have meaningful names.

Name **two** variables that you could have used for **Task 1**. State the data type and purpose of each variable.

Variable 1 name .....

Data type .....

Purpose .....

.....

Variable 2 name .....

Data type .....

Purpose .....

.....

[6]

(b) Describe how arrays could be used to store the data about the types and price per square metre of the stone slabs for **Task 1**.

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.....[2]

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[Turn over

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

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[5]

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

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(e) Name **two** validation checks that could be used when entering patio dimensions in **Task 1** or **Task 2** and describe their purpose.

Validation check 1 .....

Purpose .....

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Validation check 2 .....

Purpose .....

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[4]

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Section B

2 For each of the **four** descriptions in the table, place a tick in the correct column to show whether it describes a **Structure diagram**, a **Flowchart** or **Library routines**.

Description	Structure diagram	Flowchart	Library routines
A modelling tool used to show the hierarchy of a system.			
A collection of standard programs available for immediate use.			
A graphical representation used to represent an algorithm.			
A graphical representation to show how a system is broken into sub-systems.			

[4]

3 Examine the following pseudocode:

```
INPUT A
INPUT B
INPUT C
INPUT D
INPUT E
INPUT F
INPUT G
INPUT H
INPUT I
INPUT J
INPUT K
INPUT L
T ← A + B + C + D + E + F + G + H + I + J + K + L
OUTPUT "The average equals ", T/12
```

(a) Describe what happens in this pseudocode.

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(b) Describe how this pseudocode could be altered to allow any number of values to be input.

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(c) Re-write the given pseudocode to allow any number of values to be input.

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4 **(a)** Complete the trace table for this algorithm using the given input data.

```
Index ← 0
FOR Count ← 0 TO 7
  INPUT Value
  IF Value > 50
    THEN
      PassMarks[Index] ← Value
      Index ← Index + 1
  ENDIF
NEXT Count
PRINT "Number passed ", Index
```

Input data: 58, 40, 67, 85, 12, 13, 75, 82

Index	Count	Value	PassMarks								OUTPUT
			[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	

[6]

(b) Give the purpose of the algorithm shown in **part (a)**.

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.....[1]

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5 A car manufacturer makes a range of car models named Pegasus, Apollo and Cupid. It keeps a database to store the records of its range and the different options for each car model. Within the table CAR_RANGE, the following data needs to be stored:

1. Car model
2. Body style – saloon, hatchback or estate
3. How many doors it has
4. Whether it uses petrol, diesel or batteries as fuel
5. An identifier for a specific car.

(a) Complete the table to show suitable field names and an example of appropriate data for each field in the database table CAR_RANGE.

Field name	Example of data

[3]

(b) State which of your fields would be most appropriate for a primary key and give a reason for your choice.

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.....

.....[2]

(c) Complete the query-by-example grid to provide a list of car models using petrol and the number of doors these cars have, in alphabetical order of car model. Display only the car models and the number of doors.

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

[3]

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