



# Cambridge IGCSE™

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## COMPUTER SCIENCE

0478/22

Paper 2 Problem-solving and Programming

February/March 2021

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. Any 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**

A program is needed for a quiz to help younger students to practise their multiplication tables. There needs to be two ways of using the quiz; testing and learning.

Testing: the student is given **one** attempt at answering each question and the score is calculated for the whole test.

Learning: the student is given up to **three** attempts to get their answer to each question correct. There is no scoring.

A student can choose which multiplication table, from 2 to 12, to use for the quiz. There are five questions in each quiz, each question must use the chosen multiplication table and a different whole number (from 1 to 12) as the multiplier.

Write and test a program or programs for a multiplication tables quiz.

- 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** – Testing a student

Students enter their name and choice of multiplication table. Each question is displayed on the screen one at a time, for example:

**Question 1**

**2 X 7 =**

Students enter their answer and move on to the next question. A running total of correct answers (score) is kept. At the end of the quiz the student's name and score are displayed with a personalised message related to the score, for example:

**Aarav your score is 5/5**

**Well done full marks**

**Diya your score is 3/5**

**Have another practice**

**Task 2** – Student learning

Students enter their name and choice of multiplication table. Each question is displayed on the screen as in **Task 1**. If an answer is correct, a personalised message containing the student's name confirms this, the quiz then moves to the next question. If an answer is incorrect, a personalised message containing the student's name and a hint is displayed, for example:

**Aarav your answer is too large**

Up to three attempts are offered to get each answer correct. After the third incorrect attempt, the correct answer is displayed and the quiz moves on to the next question.

**Task 3** – Varying the quiz

Modify **Task 1** to allow students to choose how many questions they would like in the test and if they would like a 'mixed' set of questions. A 'mixed' set means that each question can be from a different multiplication table; from 2 to 12.

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

(a) Identify the variable that you used to store the student's answer in **Task 1**. Give the most appropriate data type for this variable. Explain how your program ensured that any data entered for the answer was valid.

Variable .....

Data type .....

Validation .....

.....

.....

.....

[4]

(b) Identify and give the data type of a **different** variable, that you could have used in **Task 2**. State the use of this variable in **Task 2**.

Variable .....

Data type .....

Use .....

.....

[3]









## Section B

2 An algorithm has been written in pseudocode to:

- input 25 positive whole numbers less than 100
- find and output the largest number
- find and output the average of all the numbers

```

01  A ← 0
02  B ← 0
03  C ← 0
04  REPEAT
05    REPEAT
06      INPUT D
07    UNTIL D > 0 AND D < 100 AND D = INT(D)
08    IF D > B
09      THEN
10        B ← D
11    ENDIF
12    C ← C + D
13    A ← A + 1
14  UNTIL A >= 25
15  E ← C / A
16  OUTPUT "Largest number is ", B
17  OUTPUT "Average is ", E

```

(a) Give the line number for the statements showing:

Totalling .....

Counting .....

Range check .....

Calculating the average .....

[4]

(b) State an example for each type of test data needed to test the input of the number:

Normal test data example .....

Erroneous/abnormal test data example .....

Extreme test data example .....

[3]





- 4 This algorithm accepts weights of bags of cookies. Any cookie bag weighing between 0.9 and 1.1 kilograms inclusive is acceptable. Underweight bags weigh less than 0.9 kilograms and overweight bags weigh more than 1.1 kilograms. An input of a negative number stops the process. Then the total number of bags, the number of overweight bags and the number of underweight bags weighed are output.

```

Accept ← 0
Over ← 0
Under ← 0
OUTPUT "Enter weight of first cookie bag"
INPUT BagWeight
WHILE BagWeight > 0
    IF BagWeight > 1.1
        THEN
            Error ← 1
        ELSE
            IF BagWeight < 0.9
                THEN
                    Error ← 2
                ELSE
                    Error ← 0
            ENDIF
        ENDIF
    ENDIF
    CASE Error OF
        0 : Accept ← Accept + 1
        1 : Over ← Over + 1
        2 : Under ← Under + 1
    ENDCASE
    OUTPUT "Weight of next bag?"
    INPUT BagWeight
ENDWHILE
Total ← Accept - Over - Under
OUTPUT "Number of bags weighed ", Total
OUTPUT "Number overweight ", Over
OUTPUT "Number underweight ", Under

```



5 A database table, CHOCBAR, is used to keep a record of chocolate bars sold. Chocolate bars are categorised by:

- SIZE – small or large
- FILLING – brief description, for example mint crunch
- PRICE – price in Rupees, for example ₹2.50
- NUMBERSOLD – how many sold

A database management system uses these data types:

Text          Number          Currency          Boolean

(a) Select the most appropriate data type for these three fields from the four data types shown. Each data type must be different. State the reason why you chose the data type.

SIZE data type .....

Reason .....

.....

PRICE data type .....

Reason .....

.....

NUMBERSOLD data type .....

Reason .....

.....

[3]

(b) Complete the query-by-example grid below to display only the price, filling and number sold of small chocolate bars that have sold fewer than 10 bars.

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

[3]







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