Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

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| CANDIDATE NAME | |
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*3838769992*

**COMPUTER SCIENCE** **0478/23**

Paper 2 Problem-solving and Programming **October/November 2015**

**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.

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.



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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**

Write and test a program to complete the **three** tasks.

The temperature in an apartment needs to be kept between 22°C and 24°C. This is done by the use of an automatically controlled air-conditioning system, which monitors the temperature every five minutes. The temperature of the apartment is recorded, to one decimal place, in degrees Celsius. The cooling is activated when the temperature reaches 24.5°C and the heating is activated when the temperature reaches 21.5°C.

**TASK 1**

To simulate the monitoring required, write a routine that allows entry of the apartment's temperature in degrees Celsius. The routine checks whether the temperature is within the acceptable range, too high or too low and outputs a suitable message in each case.

**TASK 2**

Write another routine that stores, in an array, the temperatures taken over a period of five hours. This routine calculates the difference between the highest temperature and the lowest temperature. Then it outputs the highest temperature, the lowest temperature, and the difference between these temperatures.

**TASK 3**

Write a routine to find out how often the temperature was out of the acceptable range during the five hours and whether the temperature was too high or too low; output a suitable message showing a summary of the problem.

Your program must include appropriate prompts for the entry of data. Error messages and other outputs need to be set out clearly and understandably. All variables, constants and other identifiers must have meaningful names. Each task must be fully tested.

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

**(i)** When you performed the tasks, you used variables.

Write suitable declarations for **two** of these.
State what you used each one for.

Variable 1 .....

Use .....

.....

Variable 2 .....

Use .....

.....[4]

**(ii)** When you performed the tasks, you may have used constants.

Write suitable declarations for **two** of these.
State what you used each one for.

Constant 1 .....

Use .....

.....

Constant 2 .....

Use .....

.....[4]

**(b)** Write an algorithm to complete **Task 2**, using **either** pseudocode, programming statements **or** a flowchart. You should assume that the temperatures taken over the five hours are already stored in an array.

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.....[5]

**(c) (i)** Explain how you completed **Task 3**. You should assume that Task 2 has been completed. You can include pseudocode or programming statements as part of your explanation.

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.....[6]

**(ii)** Comment on the efficiency of your design for **Task 3**.

.....

.....

.....[1]

## Section B

**2** Read this section of program code that should input 50 numbers and then output the average of the positive numbers only.

```
1   Total = 0
2   PosCount = 0
3   FOR Counter = 1 TO 50
4     INPUT Num
5     IF Num < 0 THEN Total = Total + Num
6     IF Num > 0 THEN Counter = Counter + 1
7     Average = Total/PosCount
8   NEXT Counter
9   PRINT Num
```

There are **four** errors in this code.

Locate these errors and suggest code corrections to remove each error.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

.....[4]

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**Question 3 begins on page 8.**

**3** **(a)** This pseudocode inputs an integer. The predefined function `DIV` gives the value of the division, e.g. `Y ← 10 DIV 3` gives the value `Y = 3`. The predefined function `MOD` gives the value of the remainder, e.g. `Y ← 10 MOD 3` gives the value `Y = 1`.

```
INPUT X
WHILE X > 15
  DO
  T1 ← X DIV 16
  T2 ← X MOD 16
  CASE T2 OF
    10:OUTPUT A
    11:OUTPUT B
    12:OUTPUT C
    13:OUTPUT D
    14:OUTPUT E
    15:OUTPUT F
    OTHERWISE OUTPUT T2
  ENDCASE
  X ← T1
ENDWHILE
CASE X OF
  10:OUTPUT A
  11:OUTPUT B
  12:OUTPUT C
  13:OUTPUT D
  14:OUTPUT E
  15:OUTPUT F
  OTHERWISE OUTPUT X
ENDCASE
```

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Complete a trace table for each of the **two** input values 37 and 191.

**Trace table for input value 37**

| X | T1 | T2 | OUTPUT |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

**Trace table for input value 191**

| X | T1 | T2 | OUTPUT |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

[4]

**(b)** State the purpose of the pseudocode in **part (a)**.

.....

.....[2]

**4** A routine checks the age and height of children who are allowed to enter a play area. The children must be less than 5 years of age and under 1 metre in height.

**(a)** The first set of test data used is age 3 and height 0.82 metres.

State what type of test data this is.

.....

Give a reason for using this test data.

.....

.....[2]

**(b)** Provide **two** additional sets of test data. For each, give

- the type of each set of test data
- the reason why it is used

Each type of test data and reason for use must be different.

Set 1 .....

Type .....

Reason .....

.....

.....

Set 2 .....

Type .....

Reason .....

.....

.....[6]

**5** A motor boat hire company decides to set up a database to keep information about boats that are available for hire. The database table, BOAT, will contain the following fields:

Boat Name; Model; Engine Power (in hp); Number of Seats; Life Raft (whether there is a life raft kept on the boat); Day Price (price for a day's hire).

**(a)** Give the data type you would choose for each field.

Boat Name .....

Model .....

Engine Power .....

Number of Seats .....

Life Raft .....

Day Price .....[3]

**(b)** State a validation check that you can perform on each of these fields. Each validation check must be different.

Boat Name .....

Model .....

Number of Seats .....

Day Price .....[4]

**(c)** Complete the query-by-example grid below to select and show the Boat Name, Model and Day Price of a day's hire for all boats with 4 seats and an Engine Power of more than 100 hp.

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

[5]

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