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COMPUTER SCIENCE

0478/23

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.

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 baguette ordering service allows customers to order filled baguettes. There are two sizes of baguette: 30cm and 15cm. Baguettes are available as white, brown or seeded bread. Baguettes have one filling and can have up to three salad items added.

Filling and salad choices are:

| Filling | Salad |
|---------|-----------|
| Beef | Lettuce |
| Chicken | Tomato |
| Cheese | Sweetcorn |
| Egg | Cucumber |
| Tuna | Peppers |
| Turkey | |

Customers choose their baguette options. They then confirm their order, alter their choices or choose not to proceed.

Each day the ordering service calculates the number of each:

- size of baguette sold
- type of bread (white, brown or seeded) sold
- filling sold.

Write and test a program or programs for the baguette ordering 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 – Ordering.

Customers are given choices on size, type of bread, filling and salad items as shown. Only valid choices can be accepted. The customer is asked to confirm their order, alter their choices or choose not to proceed. If the customer confirms their order they are given a unique order number. Display the baguette ordered and the order number.

Task 2 – Recording the choices.

Extend TASK 1 to record totals for the size, types of bread and fillings sold that day and calculate the total number of baguettes sold that day.

Task 3 – Finding the most and least popular baguette fillings.

Using your results from TASK 2, display the most popular and least popular fillings as a percentage of the total number of baguettes sold that day.

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..... [5]

(ii) Explain how your algorithm in **part (b)(i)** ensured that only valid choices were accepted for the filling.

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..... [3]

(c) Explain how you would need to change your program for **Task 1** if there were three sizes of baguette to choose from (15 cm, 20 cm and 30 cm).

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..... [2]

Section B starts on Page 8.

Section B

- 2 An algorithm has been written in pseudocode to check the temperature readings taken from a freezer are within the range -18 degrees to -25 degrees inclusive.

The algorithm counts the number of times that the temperature reading is below -25 degrees and the number of times that the temperature reading is above -18 degrees.

An engineer is called if there are more than 10 temperature readings below -25 degrees.

An alarm sounds if there are more than 5 temperature readings above -18 degrees.

```

01 TooHot ← 0
02 TooCold ← 1000
03 REPEAT
04     OUTPUT "Please enter temperature"
05     INPUT Temperature
06     IF Temperature < -25
07         THEN
08             TooCold ← TooCold - 1
09         ENDIF
10     IF Temperature > -18
11         THEN
12             TooHot ← TooHot + 1
13         ENDIF
14 UNTIL TooHot > 5 OR TooCold > 10
15 IF TooHot < 5
16     THEN
17         INPUT "Alarm!!"
18     ENDIF
19 IF TooCold > 10
20     THEN
21         OUTPUT "Call the Engineer"
22     ENDIF

```

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

an assignment statement

a loop

a counting statement

a selection statement

[4]

- 3 Four programming concepts and five descriptions are shown.

Draw a line to connect each **Programming concept** to its correct **Description**. Not all Descriptions will be connected to a Programming concept.

Programming concept

Validation

Verification

Procedure

Function

Description

A subroutine that does not have to return a value

An automatic check to ensure that data input is reasonable and sensible

A subroutine that always returns a value

An overview of a program or subroutine

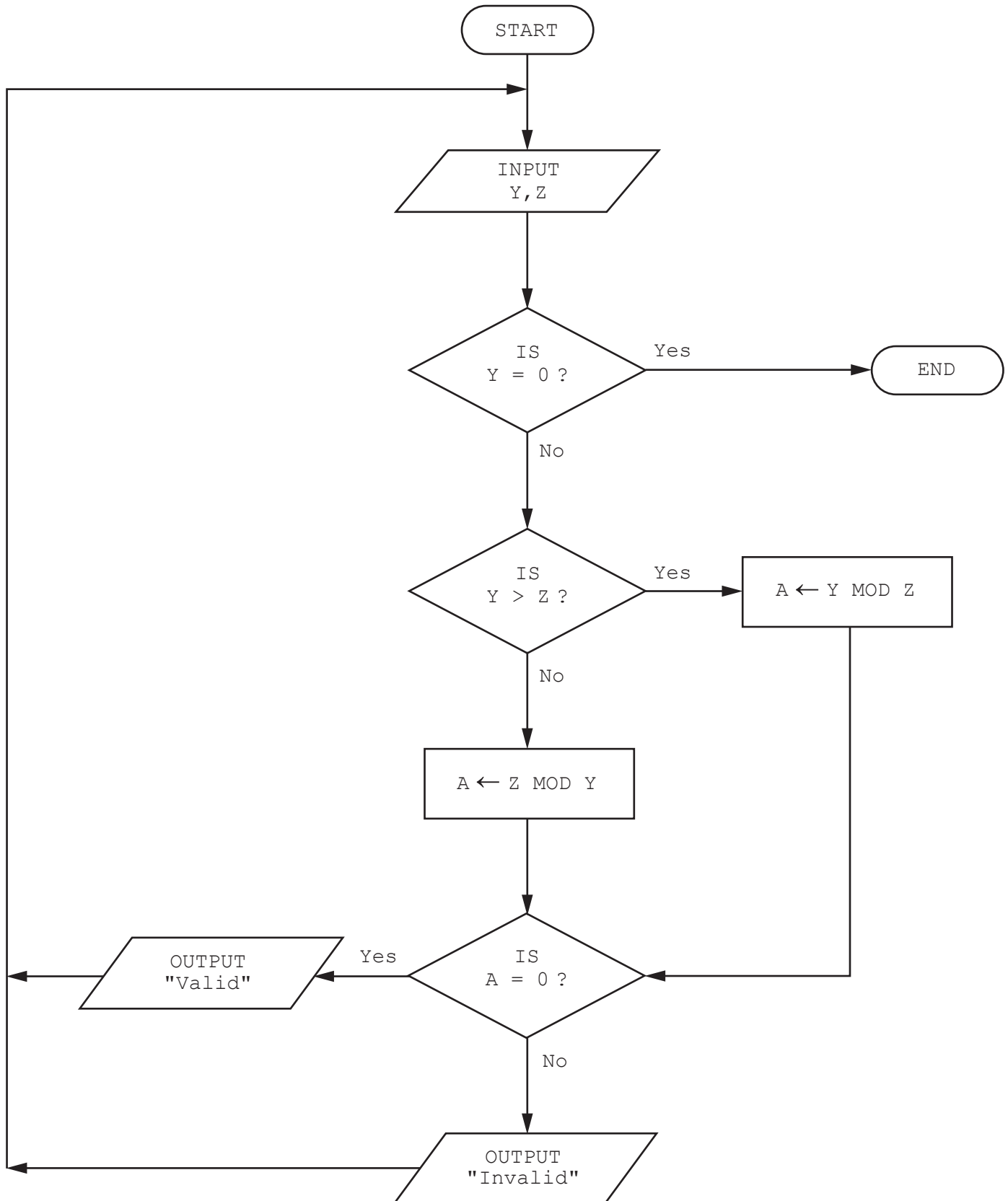
A check to ensure that data input matches the original

[4]

Question 4 starts on Page 12.

- 4 This flowchart represents an algorithm that allows the input of two numbers and performs a calculation.

The predefined function MOD finds the remainder from integer division for example $X \leftarrow 8 \text{ MOD } 5$ gives X a value of 3.



(a) Complete a trace table for this set of input data:
11, 4, 6, 2, 3, 9, 3, 2, 2, 6, 0, 0, 1, 1

| Y | Z | A | OUTPUT |
|---|---|---|--------|
| | | | |
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[4]

(b) Explain the purpose of this algorithm.

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..... [2]

5 A marine wildlife rescue centre uses a database table, MARINE, to keep records of its creatures.

| Creature | Class | Quantity | Ready for release | Offspring |
|--------------------------|---------|----------|-------------------|-----------|
| Manta Ray | Fish | 3 | Y | N |
| Short-tailed Albatross | Bird | 4 | Y | N |
| Emperor Penguin | Bird | 50 | Y | Y |
| Bluefin Tuna | Fish | 2 | N | N |
| Manatee | Mammal | 4 | Y | N |
| Hawksbill Turtle | Reptile | 10 | Y | Y |
| Hammerhead Shark | Fish | 3 | Y | N |
| Yellow-eyed Penguin | Bird | 4 | Y | N |
| Kemp's Ridley Sea Turtle | Reptile | 1 | Y | N |

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

Number of fields

Number of records

[2]

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

| | | | |
|-----------|-------------------------------------|--------------------------|-------------------------------------|
| Field: | Creature | Class | Ready for release |
| Table: | MARINE | MARINE | MARINE |
| Sort: | | | |
| Show: | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Criteria: | | = "Bird" | |
| or: | | | |

.....

 [2]

- (c) Complete the query-by-example grid to display the creatures, in ascending order of quantity, that have no offspring and are ready for release. Display only the creature field.

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

[4]

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