Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3781982019

COMPUTER SCIENCE **0478/22**

Paper 2 Problem-solving and Programming **October/November 2017**

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.

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

This document consists of **10** printed pages and **2** blank pages.

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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

The owner of a river boat hire company wants to calculate the daily profits from hiring out 10 rowing boats on the river. Boats are numbered 1 to 10. Boats can be hired for use between 10:00 and 17:00 every day.

Write and test a program for the owner.

- Your program must include appropriate prompts for the entry of data.
- 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 money taken in a day for one boat.

The cost of hiring a boat is $20 for one hour or $12 for half an hour. When a boat is hired the payment is added to the money taken for the day. The running total of hours hired that day is updated and the time when the boat must be returned is stored. At the end of the day the money taken and the total hours hired is output.
No boat can be hired before 10:00 or returned after 17:00.

TASK 2 – find the next boat available.

Extend TASK 1 to work for all 10 rowing boats. Use the data stored for each boat to find out how many boats are available for hire at the current time. If no boats are available show the earliest time that a boat will be available for hire.

TASK 3 – calculate the money taken for all the boats at the end of the day.

At the end of the day use the data stored for each boat to calculate the total amount of money taken and the total number of hours boats were hired that day. Find out how many boats were not used that day and which boat was used the most. Provide a report for the owner to show this information.

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

(i) For **one** variable that you have used to record the information about a single boat in **Task 1**, state the name, data type and its use.

Variable name .....

Data type .....

Use .....
[3]

(ii) State **one** constant and its value that you could have used for **Task 1**.

Constant name .....

Value .....
[2]

(b) Give **two** different validation checks you could have used for data entry in **Task 1**. For each check explain why it could be used and provide a set of data for testing.

Validation check 1 .....

.....

Reason for choice .....

.....

Set of test data .....

.....

Validation check 2 .....

.....

Reason for choice .....

.....

Set of test data .....

.....
[6]

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[Turn over

(c) Write an algorithm to complete **Task 3**, using **either** pseudocode, programming statements **or** a flowchart. You may assume Task 2 has been completed.

....[5]

(d) Explain how your program finds out how many boats are available for hire (**Task 2**). Any programming statements used must be fully explained.

....[4]

Section B

2 Write an algorithm using **either** pseudocode **or** a flowchart, to:

- input a positive integer
- use this value to set up how many other numbers are to be input
- input these numbers
- calculate and output the total and the average of these numbers.

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.....[6]

3 The following diagram shows **four** data structures and **four** descriptions.

Draw a line to connect each data structure to the correct description.

Data structure	Description
Constant	A collection of related data
Array	A value that can change whilst a program is running
Table	A value that never changes whilst a program is running
Variable	A series of elements of the same data type

[3]

4 `IF … THEN … ELSE … ENDIF` is one type of conditional statement used when writing pseudocode.

Identify and describe **another** type of conditional statement that you could use when writing pseudocode. Give a reason why you would use this type of conditional statement.

Conditional statement .....

.....

.....

.....

Description .....

.....

.....

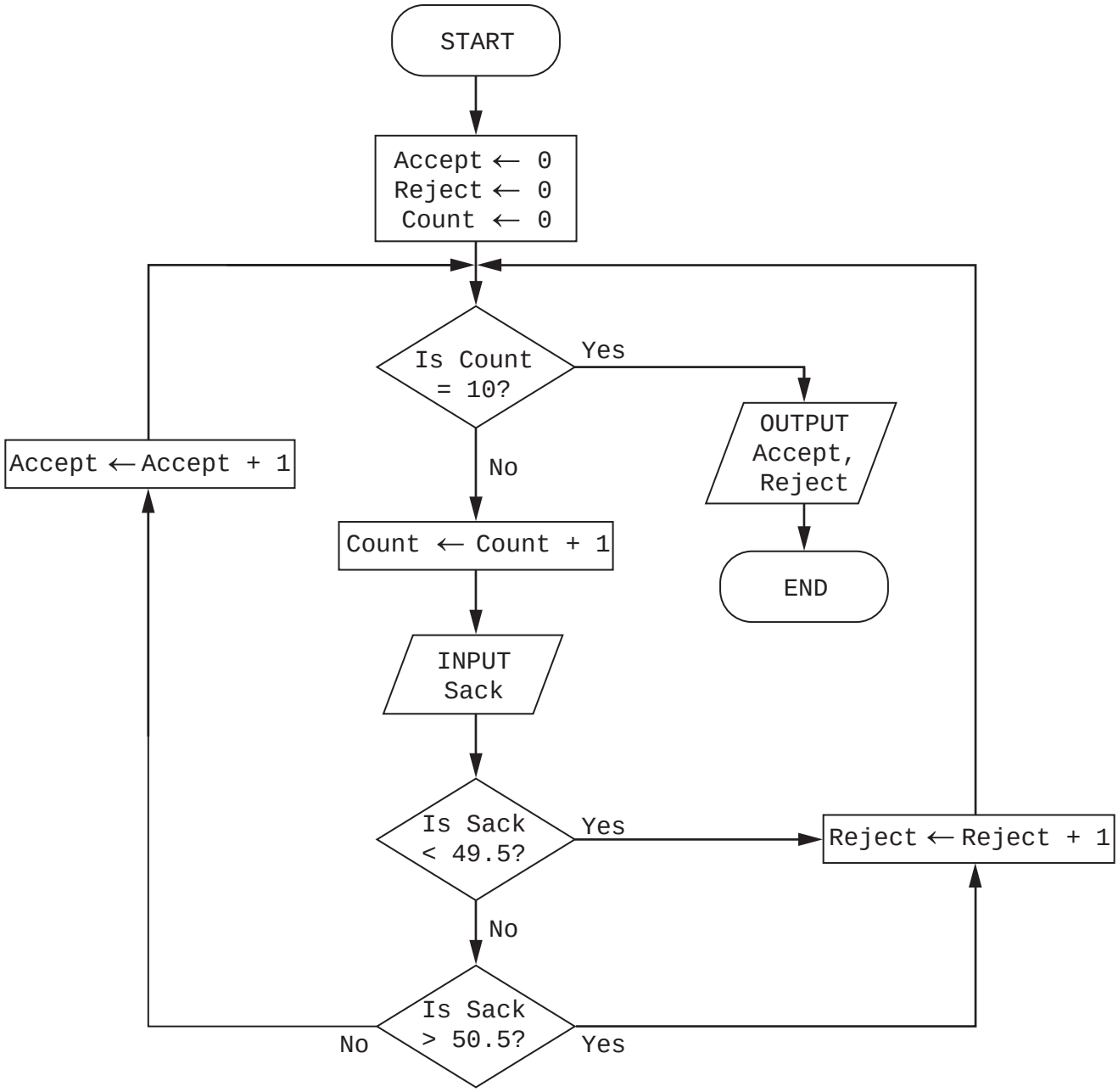
.....

Reason .....

.....

[4]

5 **(a)** This flowchart checks a batch of 10 rice sacks for weight. Sacks should weigh 50 kilograms each. Sacks weighing over 50.5 kilograms or less than 49.5 kilograms are rejected. The number of sacks accepted and the number of sacks rejected is output.



Complete the trace table for the input data:

50.4, 50.3, 49.1, 50.3, 50.0, 49.5, 50.2, 50.3, 50.5, 50.6

Accept	Reject	Count	Sack	OUTPUT

[5]

(b) The size of the batch has increased to 50 sacks. It has been decided to only reject sacks that are underweight.

State the changes that need to be made to the flowchart.

.....

.....

.....

.....[2]

6 A database table, TRAIN, is to be set up for a railway company to keep a record of the engines available for use. Each engine has a unique number made up of 5 digits, nnnnn. The engines are classified as freight (F) or passenger (P) together with a power classification that is a whole number between 0 and 9, for example F8. The railway company keeps a record of the date of the last service for each engine.

(a) Identify the **three** fields required for the database. Give each field a suitable name and data type. Provide a sample of data that you could expect to see in the field.

Field 1 Name .....

Data type .....

Data sample .....

Field 2 Name .....

Data type .....

Data sample .....

Field 3 Name .....

Data type .....

Data sample .....[6]

(b) State the field that you should choose as the primary key.

.....[1]

(c) Using the query-by-example grid below, write a query to identify all passenger engines that have not been serviced in the past 12 months. Only display the engine numbers.

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

[3]

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