Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3953935075

COMPUTER SCIENCE **2210/22**

Paper 2 Problem-solving and Programming **October/November 2016**

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.

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

The manager of a supermarket needs a program to record donations to charity. Each customer has the choice of three charities to donate to, and 1% of their shopping bill will be donated to the chosen charity.

Write and test a program for the manager.

- Your program must include appropriate prompts for the entry of data.
- Error messages and other output need to be set out clearly.
- 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 – Set up the donation system

Set up a routine that allows:
- the names of three charities to be input and stored
- the charity names to be displayed with a number (1, 2 or 3) beside each name
- a choice of 1, 2 or 3 to be entered to choose the charity, all other entries rejected
- the value of a customer's shopping bill to be entered
- the donation to be calculated
- three totals to be set to zero ready to total each charity donation

TASK 2 – Record and total each donation

For a customer's shopping bill:
- input a charity choice of 1, 2 or 3
- input the value of a customer's shopping bill
- calculate the donation
- add the donation to the appropriate total

Output the name of the charity and the amount donated.

TASK 3 – Show the totals so far

Extend TASK 2 to accept:
- donations from more customers
- a charity choice of -1 to show the totals so far

Display the charities' names and the totals in descending order of totals.
Calculate a grand total of all three totals.
Output 'GRAND TOTAL DONATED TO CHARITY' and the amount of the grand total.

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

(i) For **three** of the variables that you have used in **Task 1**, state the name, type and its use.

Variable 1 name .....

Type .....

Use .....

Variable 2 name .....

Type .....

Use .....

Variable 3 name .....

Type .....

Use ..... [3]

(ii) Name and describe the data structure(s) that you have used to store the donation totals for each charity. Explain why you chose your data structure(s).

Name of data structure(s) .....

Description .....

.....

Reason .....

..... [3]

(b) Write an algorithm to complete **Task 2**, using **either** pseudocode, programming statements **or** a flowchart. You can assume that Task 1 has been completed.

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..... [5]

(c) Explain how you show the totals so far (**Task 3**). You may include programming statements as part of your explanation.

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..... [6]

(d) Explain how you would change your solution for Task 1 to allow the number of charities to be set to two, three or four by the manager.

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..... [3]

Section B

2 Read this section of program code that inputs positive numbers, discards any negative numbers and then outputs the average. An input of zero ends the process.

```
1  Total = 0
2  Counter = 100
3  REPEAT
4    REPEAT
5      INPUT Num
6    UNTIL Num < 0
7    Total = Total + 1
8    Counter = Counter + Num
9  UNTIL Num = 0
10 Average = Total / (Counter - 1)
11 Print Average
```

There are four errors in this code.

Locate these errors and suggest a correction to remove each error.

Error 1 .....

Correction .....

.....

Error 2 .....

Correction .....

.....

Error 3 .....

Correction .....

.....

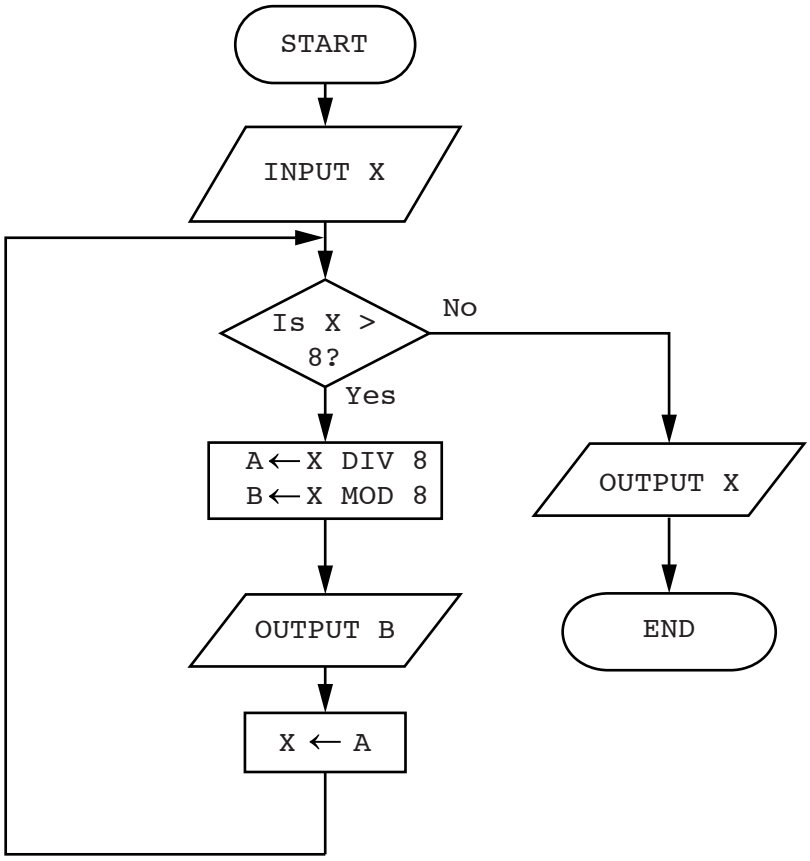
Error 4 .....

Correction .....

..... [8]

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3 The flowchart below inputs an integer. The predefined function `DIV` gives the value of the division, for example `Z ← 11 DIV 3` gives the value `Z = 3`. The predefined function `MOD` gives the value of the remainder, for example `Z ← 11 MOD 3` gives the value `Z = 2`.



Complete a trace table for each of the two input values **33** and **75**.

Trace table for input value **33**

X	A	B	OUTPUT

Trace table for input value **75**

X	A	B	OUTPUT

[4]

4 `IF ... THEN ... ELSE ... ENDIF` and `CASE ... OF ... OTHERWISE ... ENDCASE` are two different conditional statements that you can use when writing pseudocode.

Explain, using examples, why you would choose to use each conditional statement.

Example 1 .....

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Reason for choice .....

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Example 2 .....

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Reason for choice .....

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..... [6]

Question 5 begins on page 10.

5 A database, PLAYPRODUCTION, was set up to show the performance dates, prices and number of seats available at a theatre specialising in Shakespeare productions.

Play	Performance Date	Number Seats Stalls	Number Seats Circle	Price Stalls Seats $	Price Circle Seats $
As You Like It	01/07/2016	120	90	20.00	30.00
As You Like It	02/07/2016	85	45	30.00	40.00
As You Like It	09/07/2016	31	4	30.00	40.00
Macbeth	14/07/2016	101	56	25.00	35.00
Macbeth	15/07/2016	50	34	25.00	35.00
Macbeth	16/07/2016	12	5	35.00	50.00
Julius Caesar	22/07/2016	67	111	20.00	20.00
Julius Caesar	23/07/2016	21	24	15.00	15.00
A Comedy of Errors	30/07/2016	45	36	35.00	45.00

(a) Give the number of fields that are in each record.

..... [1]

(b) State the data type you would choose for each of the following fields.

Play .....

Number Seats Stalls .....

Price Stalls Seats $ ..... [3]

(c) The query-by-example grid below selects all the productions with more than 100 seats left in either the stalls or the circle.

Field:	Play	Performance Date	Number Seats Stalls	Number Seats Circle
Table:	PLAYPRODUCTION	PLAYPRODUCTION	PLAYPRODUCTION	PLAYPRODUCTION
Sort:	Ascending			
Show:	✓	✓	☐	☐
Criteria:			> 100	
or:				> 100

Show what would be output from the query-by-example.

.....

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..... [3]

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(d) Complete the query-by-example grid below to select all the productions with at least six seats left in the circle and show the Play, Performance Date and Price Circle Seats $ in Performance Date order.

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

[5]

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