Cambridge
O Level

**Cambridge International Examinations**
Cambridge Ordinary Level

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| CANDIDATE NAME | |

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*6878216073*

**COMPUTER SCIENCE** **2210/21**

Paper 2 Problem-solving and Programming **May/June 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.

This document consists of **14** 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**

A teacher is planning a school trip to a theme park at the end of term. You have been asked to write a program to work out the cost per student, to record those who are going and whether they have paid. The maximum number of students who can go on the trip is 45.

Write and test a program for the teacher.

- 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 – Work out the cost.

The cost of the trip for each student is a share of the cost of a coach plus the cost of entry to the theme park. The total cost of the coach will be $550. The entry cost to the park is $30 for each student. The theme park gives one free ticket for every ten that are bought, which must be taken into consideration. Set up a program that:

- stores the cost of the coach
- stores the cost of an entry ticket
- inputs the estimated number of students taking part, this must be validated on entry and an unsuitable entry rejected
- calculates and outputs the recommended cost per student to ensure the trip does not make a loss.

TASK 2 – Record the students who are going and whether they have paid.

Input and store the names of the students who have asked to go on the trip up to the maximum number allowed. Input and store whether each student has paid. Enable printouts to be produced to show students who have not paid and those who have paid.

TASK 3 – Work out final costs.

Not all students will end up going on the trip, for example they might not have paid. Modify the program so that it gives overall totals for the costs charged and the amount of money collected. Output whether the school trip has made a profit or loss, or has broken even, and the amount of the final balance.

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

**(i)** Name **two** constants you used for **Task 1** and state the value of each one.

Constant 1 .....

Value .....

Constant 2 .....

Value .....
[2]

**(ii)** Name **two** arrays you used for **Task 2** and state the purpose of each one.

Array 1 .....

Purpose .....

.....

Array 2 .....

Purpose .....

.....
[2]

**(b)** Write an algorithm to complete **Task 1**, using **either** pseudocode, programming statements or a flowchart.

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**(c)** **(i)** Name and describe **one** suitable validation check you used for **Task 1**, and **one** suitable validation check for **Task 2**. Each check MUST be different.

**Task 1**

Name .....

Description .....

.....

.....

**Task 2**

Name .....

Description .....

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[4]

**(ii)** For each validation check in **part (c)(i)**, give an example of suitable test data and explain why you chose the test data.

Test data for **(c)(i) Task 1** .....

Reason for choice .....

.....

.....

Test data for **(c)(i) Task 2** .....

Reason for choice .....

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[4]

**(d)** Explain how your program calculates whether or not you have made a profit (**Task 3**). Any programming statements used in your answer must be fully explained.

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## Section B

**2** This section of program code asks for 50 numbers to be entered. The total and average of the numbers are calculated.

```
1   Total = 0
2   Counter = 50
3   PRINT 'When prompted, enter 50 numbers, one at a time'
4   REPEAT
5     PRINT 'Enter a number'
6     INPUT Number
7     Total + Number = Total
8     Number = Number + 1
9   UNTIL Counter = 50
10  Average = Number * Counter
11  PRINT 'The average of the numbers you entered is ', Average
```

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

State the line number for each error and write the correct code for that line.

Error 1 Line number .....

Correct code .....

Error 2 Line number .....

Correct code .....

Error 3 Line number .....

Correct code .....

Error 4 Line number .....

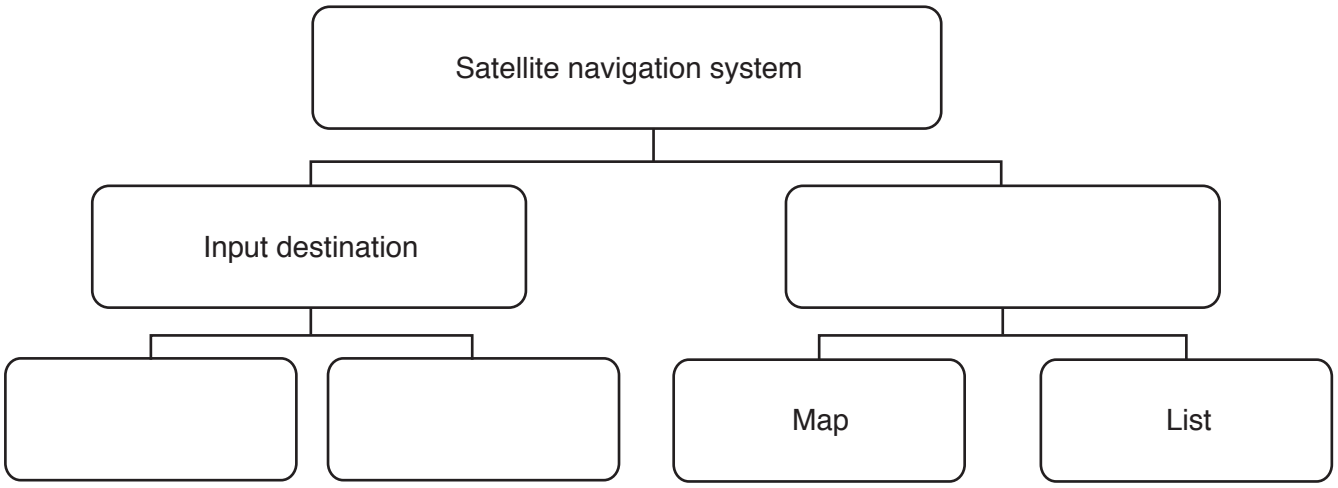
Correct code .....

[4]

**3** A satellite navigation system works using destination details entered by the user, either a new destination or chosen from previously saved destinations. The satellite navigation system will then output directions to the destination in the form of either a visual map or a list of directions.

A satellite navigation system is an example of a computer system that is made up of sub-systems. This structure diagram shows some of its sub-systems.

Complete the diagram by filling in the empty boxes.




[2]

**4** For each of the **four** statements in the table, place a tick in the correct column to show whether it is an example of **validation** or **verification**.

| **Statements** | **Validation** | **Verification** |
|---|---|---|
| To automatically check the accuracy of a bar code | | |
| To check if the data input is sensible | | |
| To check if the data input matches the data that has been supplied | | |
| To automatically check that all required data fields have been completed | | |

[4]

**5** **(a)** Describe the purpose of each statement in this algorithm.

```
FOR I ← 1 TO 300
  INPUT Name[I]
NEXT I
```

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.....[2]

**(b)** Identify, using pseudocode, another loop structure that the algorithm in **part (a)** could have used.

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.....[1]

**(c)** Write an algorithm, using pseudocode, to input a number between 0 and 100 inclusive. The algorithm should prompt for the input and output an error message if the number is outside this range.

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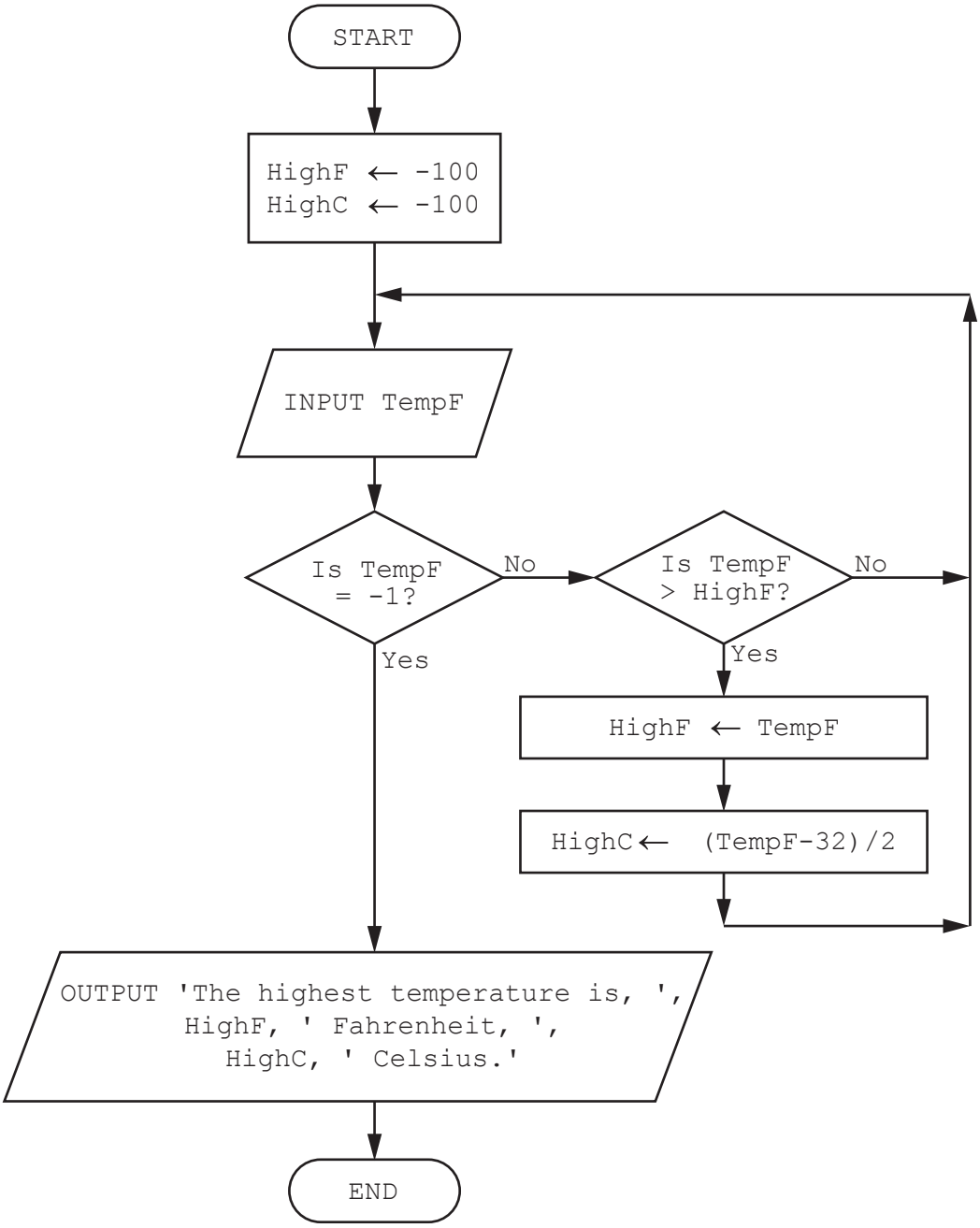
.....[3]

**6** This flowchart inputs a range of temperatures in degrees Fahrenheit.

As each temperature is input, it is compared with the previous highest temperature. If it is higher than the current highest, it replaces the previous highest temperature and then it is converted to degrees Celsius.

For ease of calculation, the final step of the Fahrenheit to Celsius conversion has been approximated as division by 2.

When –1 is entered, the input process stops and the highest temperature (in both Fahrenheit and Celsius) is output.



Complete the trace table for the input data:

68, 46, 50, 86, 65, 50, 40, 30, –1

| HighF | HighC | TempF | OUTPUT |
|---|---|---|---|
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[5]

**7** A television (TV) store has a database table, TVSTOCK, for its new range of televisions. The table stores the screen size of each TV, whether it will show 3D, whether the screen is curved or flat, if the internet is available on the TV, if it has a built-in hard disk drive and the price. Part of the database table is shown below.

| TVID | ScreenSize | 3D | CurvedFlat | Internet | HDD | Price |
|---|---|---|---|---|---|---|
| TV80CVINT | 80 | YES | CV | YES | YES | $7,000.00 |
| TV65CVINT | 65 | YES | CV | YES | YES | $5,000.00 |
| TV60CVINT | 60 | YES | CV | YES | YES | $4,500.00 |
| TV60FTINT | 60 | YES | FT | YES | YES | $4,000.00 |
| TV55CVINT | 55 | YES | CV | YES | NO | $3,000.00 |
| TV55FTINT | 55 | YES | FT | YES | NO | $3,500.00 |
| TV55FTNIN | 55 | YES | FT | NO | NO | $3,000.00 |
| TV50CVINT | 50 | YES | CV | YES | NO | $2,500.00 |
| TV50FTINT | 50 | YES | FT | YES | NO | $2,000.00 |
| TV50FTNIN | 50 | YES | FT | NO | NO | $1,750.00 |
| TV42FTINT | 42 | YES | FT | YES | NO | $1,500.00 |
| TV37FTINT | 37 | NO | FT | YES | NO | $1,200.00 |
| TV20FTNIN | 20 | NO | FT | NO | NO | $800.00 |
| TV15FTNIN | 15 | NO | FT | NO | NO | $400.00 |

**(a)** State the type of the field **TVID** and give a reason for your choice.

.....

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.....[1]

**(b)** Complete the table with the most appropriate data type for each field.

| Field name | Data type |
|---|---|
| ScreenSize | |
| 3D | |
| CurvedFlat | |
| Internet | |
| HDD | |
| Price | |

[3]

**(c)** Use the query-by-example grid below to provide a list of all of the curved screen TVs that have a built-in hard disk drive. Make sure the list only displays the TVID, the price and the screen size in ascending order of price.

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

[5]

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