Candidate forename		Candidate surname	

Centre number					Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE
F452/01
COMPUTING

Programming Techniques and Logical Methods

TUESDAY 29 MAY 2012: Morning
DURATION: 1 hour 30 minutes
plus your additional time allowance

MODIFIED ENLARGED

Candidates answer on the Question Paper.

<u>OCR SUPPLIED MATERIALS:</u>
None

<u>OTHER MATERIALS REQUIRED:</u>
None

<u>READ INSTRUCTIONS OVERLEAF</u>

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**

- **Use black ink. HB pencil may be used for graphs and diagrams only.**

- **Answer <u>ALL</u> the questions.**

- **Read each question carefully. Make sure you know what you have to do before starting your answer.**

- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [ ] at the end of each question or part question.**

- **The total number of marks for this paper is <u>100</u>, of which marks are allocated to the assessment of the quality of written communication where an answer requires a piece of extended writing.**

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1 At a Gymnastics competition there are six judges who mark the gymnastics routines, each awarding a score out of 10.

The organisers want to computerise the judging of the competition.

(a) Each gymnast starts with a score of 10.0 points. If the gymnast makes an error the judge deducts 0.1, 0.3, 0.5 or 1 point depending on the seriousness of the mistake.

Each judge will have a touch screen, with which to enter quickly how many points need to be deducted for each error. This touch screen will:

show the name of the gymnast currently performing,

show the number of points the gymnast currently has,

allow the judge to select how many points to deduct,

allow the judge to undo a points deduction if it was made in error,

allow the judge to confirm the final score at the end of the performance.

In the space opposite, design an interface for the touch screen.

[7]

(b) At the end of each round, a computer program will store the following items of data.

For each item of data, state the most appropriate data type, and state ONE reason why this data type is appropriate.

Item of data: The name of the gymnast.

Data type _____

Reason _____

_____ [2]

Item of data: The number of points the gymnast has scored.

Data type _____

Reason _____

_____ [2]

Item of data: Whether or not the gymnast has qualified for the next round.

Data type _____

Reason _____

_____ [2]

(c) The data in part (b) will be stored in a record format.

Explain what is meant by a record format and why it is used.

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_____ **[5]**

(d) In order to qualify for the next round, a gymnast needs to rank among the top 3.

The following pseudo-code has been written to update the gymnast's record to show whether or not the gymnast has qualified. It contains a logic error.

```
01  IF Rank >= 3 THEN
02      Qualified = TRUE
03  ELSE
04      Qualified = FALSE
05  END IF
```

(i) Describe what is meant by a logic error.

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_____ **[2]**

(ii) Identify the logic error in the pseudo-code and state how it should be corrected.

_____

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_____ **[2]**

(e) Before calculating the total score of a gymnast, the scores from each of the six judges are stored in an array called RawScores.

(i) Describe what is meant by an array.

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_____ **[3]**

(ii) Write code to declare the array RawScores in a high level language of your choice.

You should state the name of the language you are using.

Name of language _____

Declaration

_____

_____ **[3]**

(iii) The final score of a gymnast is obtained by eliminating the lowest and highest values in the array RawScores and adding the remaining four scores together.

Write an algorithm to calculate the final score of a gymnast, assuming the array RawScores has already been populated with the six scores.

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_____ **[8]**

2 For his coursework, Ravi is writing a computer program which will help the Head of Sixth Form to advise students on what AS Levels to take based on their GCSE results.

(a) Ravi decides to use RAD.

Explain the term RAD and the roles that Ravi and the Head of Sixth Form will play in the development of the software.

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_____ **[4]**

(b) All the pupils in the school take GCSE Maths, English and Science. They also pick three out of History, Geography, Music, Sport and Dance.

The Head of Sixth Form asks Ravi to make sure that when a pupil's GCSE results are input, they are validated.

Describe FOUR DIFFERENT validation checks which Ravi should carry out on a pupil's GCSE results.
(Do not use the same check more than once with different subjects.)

1 _____

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2 _____

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3 _____

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4 _____

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[4]

(c) The program will use the algorithm opposite to advise students on Maths options.

State the advice about Maths options which the program will give to pupils with the following GCSE results.

Maths: C	English: D
Science: B	History: C
Geography: C	Music: F

Advice _____

_____

Maths: A*	English: D
Science: D	History: C
Music: A	Dance: B

Advice _____

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Maths: B	English: A
Science: A*	History: E
Music: A	PE: C
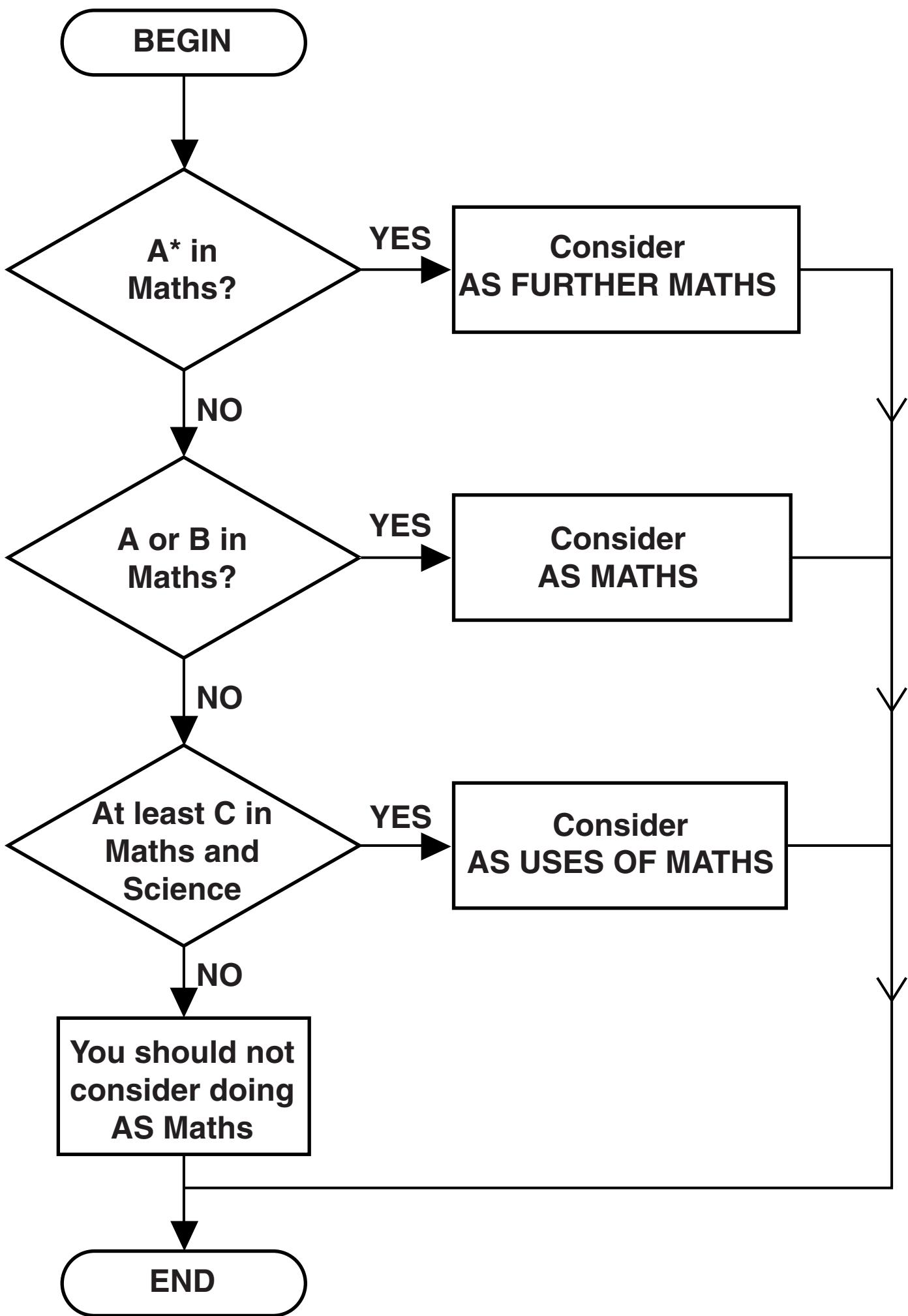
Advice _____

_____

Maths: C	English: A
Science: D	Music: B
PE: A*	Dance: A*

Advice _____

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[4]

14

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                    │    BEGIN    │
                    └─────────────┘
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                      ╱         ╲        YES      ┌──────────────────────────┐
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                    ╲  Maths?    ╱                 │    AS FURTHER MATHS      │  │
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                    ╲  Maths?    ╱                 │        AS MATHS          │  │
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              │  consider doing    │
              │    AS Maths        │
              └────────────────────┘
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                    │     END     │
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```

(d) The advice given to students considering AS Psychology and AS Sociology is:

You must have at least a C in English to take either Psychology or Sociology.
If you have at least a B in English, you may consider taking both. Otherwise, if you have at least a C in Science you may consider Psychology and if you don't, you may consider Sociology.

Draw a flow diagram for choosing the correct advice about Psychology and Sociology.

[6]

(e) When the program is finished, Ravi creates an installation routine and copies it onto a CD so that the program can be installed on the Head of Sixth Form's computer.

State **FOUR** tasks that will be carried out by the installation routine.

1 _____

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2 _____

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3 _____

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4 _____

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[4]

3 **(a)** **A program may use global and local variables.**

(i) **Explain ONE difference between a global variable and a local variable.**

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_____ **[2]**

(ii) **Describe what will happen if a programmer declares a global variable and a local variable with the same name.**

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_____ **[2]**

Jo has written a computer program to produce invoices for customers of her father's plumbing business.

To calculate the invoice total, the number of hours worked is rounded up to the next integer (e.g. 67 minutes would round up to 2 hours). This is then multiplied by the hourly rate. Finally, the cost of parts is added.

Here are some extracts from Jo's code.

```
01  REAL HourlyRate

...

40  PROCEDURE Initialise
41      HourlyRate = 15
42  END PROCEDURE

...

60  PROCEDURE CalculateTotal
61      INTEGER TimeInMinutes
62      INTEGER CostOfParts
63      INPUT TimeInMinutes
64      INPUT CostOfParts
65      OUTPUT TimeInMinutes DIV 60 + 1 *
        HourlyRate + CostOfParts
66  END PROCEDURE
```

(b) State ONE global variable and ONE local variable in Jo's code.

Global variable _____

Local variable _____

[2]

(c) Line 65 contains an error.

    (i) Calculate the output of the procedure CalculateTotal if TimeInMinutes = 96 and CostOfParts = 100 using

```
OUTPUT TimeInMinutes DIV 60 + 1 *
HourlyRate + CostOfParts
```

You MUST show your working.

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_____ [2]

(ii) Calculate the output of the procedure **CalculateTotal if TimeInMinutes = 60 and CostOfParts = 0** using

```
OUTPUT TimeInMinutes DIV 60 + 1 *
HourlyRate + CostOfParts
```

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_____ **[1]**

(iii) Show how the procedure should be modified so that it produces the correct answer.

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_____ **[3]**

(d) **Evaluate the extract of Jo's code. You should identify and explain the positive and negative aspects of her coding style and the implications that this will have on the maintainability of the program.**

The quality of written communication will be assessed in your answer to this question.

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_____ [8]

4 The words COW, BEEF and FORTY have all their letters written in alphabetical order.

Here is an algorithm for a function which checks whether all the letters in a word are in alphabetical order.

```
01 FUNCTION IsInOrder(Word)
02    IF LENGTH(Word) = 1 THEN
03        RETURN TRUE
04    ELSE
05        FirstChar = First character in
          Word
06        RestOfWord = All characters in
          Word except the first
07        IF FirstChar > RestOfWord THEN
08            RETURN FALSE
09        ELSE
10            RETURN IsInOrder(RestOfWord)
11        END IF
12    END IF
13 END FUNCTION
```

(a) (i) Describe what is meant by a parameter.

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_____ [2]

(ii) Identify ONE parameter in the algorithm on page 27.

_____ [1]

(b) Explain the difference between the uses of the = sign in line 02 and in line 05, stating the type of operation being carried out.

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_____ [4]

(c) **Line 07 compares the first character of the word with the rest of the word as shown below.**

```
07   IF FirstChar > RestOfWord THEN
```

Explain why there may be a problem with the call

IsInOrder("FoRtY")

and what can be done to avoid this problem.

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_____ **[3]**

Turn over for the next question

This is a copy of the algorithm shown earlier

```
01 FUNCTION IsInOrder(Word)
02     IF LENGTH(Word) = 1 THEN
03         RETURN TRUE
04     ELSE
05         FirstChar = First character in
           Word
06         RestOfWord = All characters in
           Word except the first
07         IF FirstChar > RestOfWord THEN
08             RETURN FALSE
09         ELSE
10             RETURN IsInOrder(RestOfWord)
11         END IF
12     END IF
13 END FUNCTION
```

(d) State what is meant by recursion using this algorithm as an example.

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_____ **[2]**

(e) The algorithm is tested with the call IsInOrder("Z").

State the value which will be returned.

_____

State the lines of the algorithm which will be executed.

_____

[2]

(f) Explain what happens if the algorithm is tested with a call IsInOrder(" ") where the value of the argument is the empty string.

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_____ [2]

**(g) Explain what happens when the algorithm is tested with the call IsInOrder("APE").
You should show each call made, the lines of the algorithm executed and the return value of each call.**

You may use a diagram.

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_____ **[6]**