

Tuesday 29 May 2012 – Morning

AS GCE COMPUTING

F452/01 Programming Techniques and Logical Methods

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

None

Duration: 1 hour 30 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** 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).
- Do **not** write in the bar codes.

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 **100**, of which marks are allocated to the assessment of the quality of written communication where an answer requires a piece of extended writing.
- This document consists of **20** pages. Any blank pages are indicated.

- 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 below, design an interface for the touch screen.



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

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(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

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[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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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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(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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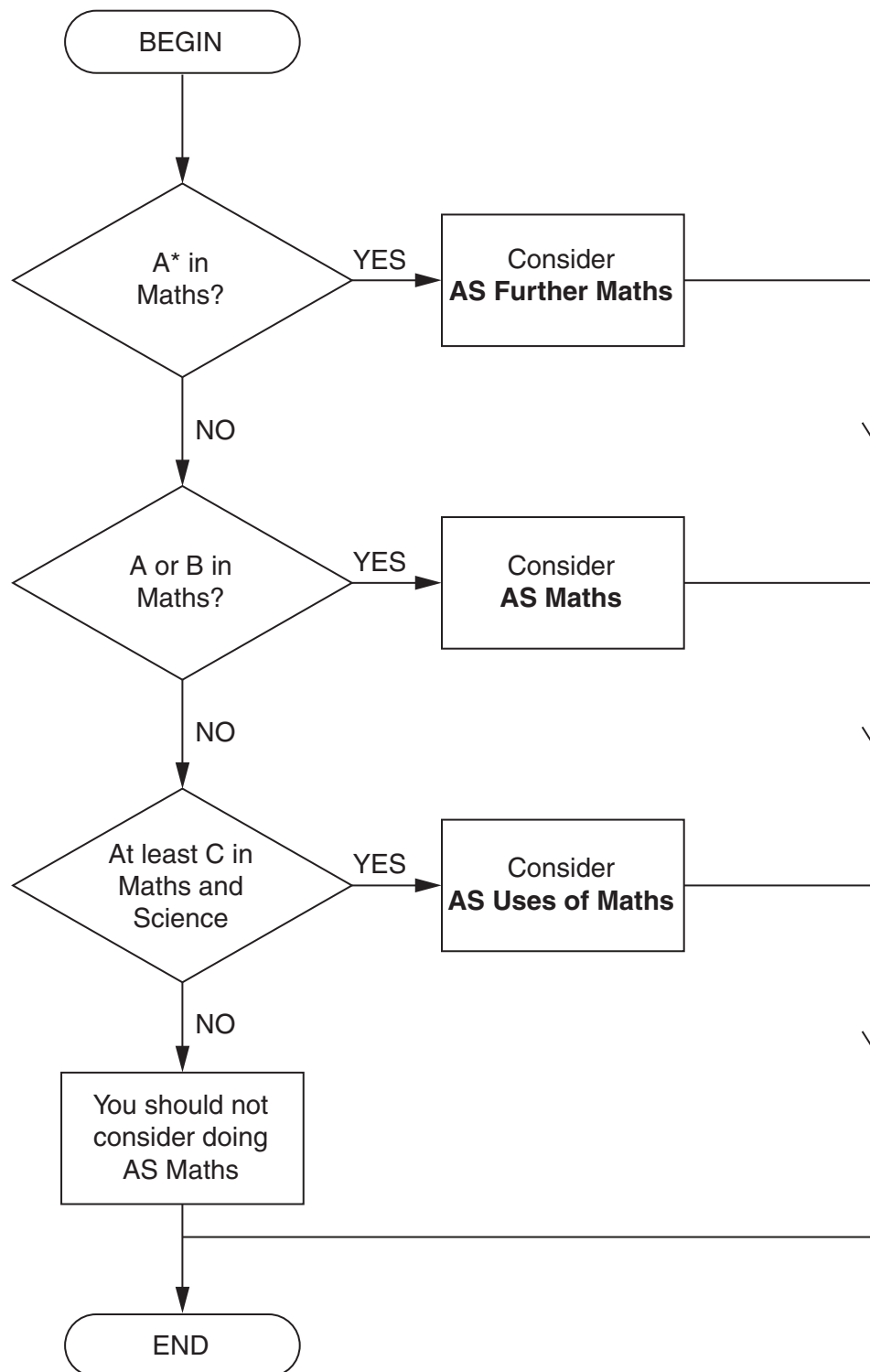
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4

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..... [4]

(c) The program will use the following algorithm 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

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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

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

Advice

.....

[4]

(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.

- (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.

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

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Turn over for the next question

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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(ii) Identify **one** parameter in the algorithm above.

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(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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(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.

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State the lines of the algorithm which will be executed.

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(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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