



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**COMPUTER SCIENCE**

**0478/02**

Paper 2 Problem-solving and Programming

**For Examination from 2015**

SPECIMEN MARK SCHEME

**1 hour 45 minutes**

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**MAXIMUM MARK: 50**

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This document consists of **6** printed pages.

## Section A

- 1 (a) (i) **Many correct answers, they must be meaningful. This is an example only.** [1]  
 StudentNames[1:30]
- (ii) **Many correct answers, they must be meaningful. This is an example only.** [2]  
 StudentMarksTest1[1:30]  
 StudentMarksTest2[1:30]  
 StudentMarksTest3[1:30] (1 mark)  
 StudentTotalScore[1:30] (1 mark)
- (b) (i) – outside loop zeroing total for loop (sum in example below)  
 – loop for all students  
 – input name and all test scores  
 – in loop adding a student's total  
 – storing the total  
 – inside loop printing student's name and total  
 – outside loop calculating class average  
 – printing class average
- sample algorithm:
- ```

Sum ← 0
FOR Count ← 1 TO 30
  INPUT Name
  StudentName[Count] ← Name
  INPUT Mark1, Mark2, Mark3
  StudentMarksTest1[Count] ← Mark1
  StudentMarksTest2[Count] ← Mark2
  StudentMarksTest3[Count] ← Mark3
  Total ← Mark1 + Mark2 + Mark3
  StudentTotalScore[Count] ← Total
  Sum ← Sum + Total
  PRINT StudentName[Count], StudentTotalScore[Count]
NEXT Count
ClassAverage = Sum/30
PRINT ClassAverage

```
- [8]
- (ii) any relevant comment with regards to efficient code (e.g. single loop) [1]
- (c) **Many correct answers, these are examples only.**  
 1 mark per data set and reason
- Set 1: 20, 25, 30, 35  
 Reason: valid data to check that data on the upper bound of each range check is accepted
- Set 2: 21, 26, 31, 36  
 Reason: invalid data to check that data above the upper bound of each range check is rejected [2]

- (d) (i) Maximum 5 marks **in total** for question part  
Maximum 3 marks for algorithm

Description (max 3)

- set variable called HighestScore to zero and variable called BestName to dummy value
- loop 30 times to check each student's total score in turn
- check student's score against HighestScore
- if student's score > HighestScore then
- ... replace value in HighestScore by student's score and store student's name in BestName
- output BestName and HighestScore outside the loop

Sample algorithm (max 3):

```
HighestScore ← 0
BestName ← "xxxx" (1 mark)
FOR Count ← 1 TO 30
  IF StudentTotalScore[Count] > HighestScore (1 mark)
    THEN
      HighestScore ← StudentTotalScore[Count]
      BestName ← StudentName[Count] (1 mark)
    ENDF
NEXT Count (1 mark)
PRINT BestName, HighestScore (1 mark)
```

**If algorithm or program code only, then maximum 3 marks** [5]

- (ii) comment on which student(s)' name will be output  
e.g. The first student with the highest score will be output [1]

## Section B

2 (a) 1 mark for value of c and message

51020: value of c: 5  
message: PIN OK (1 mark)

5120: value of c: 4  
message: error in PIN entered (1 mark)

[2]

(b) length check

[1]

3

| Engine | Count | Number | Size | Average | OUTPUT |
|--------|-------|--------|------|---------|--------|
| 0      | 0     | 0      | 1.8  |         |        |
| 1.8    | 1     | 1      | 2.0  |         |        |
| 3.8    | 2     | 2      | 1.0  |         |        |
| 4.8    |       | 3      | 1.3  |         |        |
| 6.1    |       | 4      | 1.0  |         |        |
| 7.1    |       | 5      | 2.5  |         |        |
| 9.6    | 3     | 6      | 2.0  |         |        |
| 11.6   | 4     | 7      | 1.3  |         |        |
| 12.9   |       | 8      | 1.8  |         |        |
| 14.7   | 5     | 9      | 1.3  |         |        |
| 16.0   |       | 10     | -1   |         |        |
|        |       |        |      | 1.6     |        |
|        |       |        |      |         |        |
|        |       |        |      |         | 1.6, 5 |

(1 mark)

(1 mark)

(1 mark)

(1 mark)

(1 mark)

(1 mark)

[6]

4 1 mark for each error identified + suggested correction

line 5: this should read **IF  $x > h$  THEN  $h = x$**

line 7: **PRINT  $h$**  should come after the end of the repeat loop

line 8: this should read **UNTIL  $c = 20$**  or **UNTIL  $c \geq 20$**  or **UNTIL  $c > 19$**

[3]

|   |                                                                                             |    |                         |   |          |
|---|---------------------------------------------------------------------------------------------|----|-------------------------|---|----------|
| 5 | <i>PENDOWN</i><br><i>LEFT 90</i><br><i>REPEAT 3</i><br><b>FORWARD 30</b><br><b>RIGHT 90</b> |    |                         | } | (1 mark) |
|   | -----                                                                                       |    |                         | } |          |
|   | <b>ENDREPEAT</b><br><b>FORWARD 10</b><br><b>LEFT 90</b>                                     | OR | <b>PENUP</b>            | } | (1 mark) |
|   | -----                                                                                       |    |                         | } |          |
|   | <b>PENUP</b><br><b>FORWARD 10</b><br><b>PENDOWN</b>                                         | OR | <b>LEFT 90</b>          | } | (1 mark) |
|   | -----                                                                                       |    |                         | } |          |
|   | <b>REPEAT 2</b><br><b>FORWARD 20</b>                                                        | OR | <b>REPEAT 3</b>         | } | (1 mark) |
|   | -----                                                                                       |    |                         | } |          |
|   | <b>RIGHT 90</b><br><b>ENDREPEAT</b><br><b>FORWARD 20</b><br><b>(LEFT 90)</b>                | OR | <b>(LEFT/RIGHT 180)</b> | } | (1 mark) |

*Alternative answer for last 2 marks:*

|  |                                                           |  |  |   |          |
|--|-----------------------------------------------------------|--|--|---|----------|
|  | <b>FORWARD 20</b><br><b>RIGHT 90</b>                      |  |  | } | (1 mark) |
|  | -----                                                     |  |  | } |          |
|  | <b>FORWARD 20</b><br><b>RIGHT 90</b><br><b>FORWARD 20</b> |  |  | } | (1 mark) |

*Give a mark for each correct group of statements*

[5]

- 6 (a) marking points:  
 the way to find and print the largest value a 1 mark  
 the way to find and print the largest value b 1 mark  
 the way to find and print the largest value c 1 mark

sample algorithm:

```

INPUT a, b, c
  IF a > b AND a > c THEN PRINT a (1 mark)
    ELSE IF b > c THEN PRINT b (1 mark)
      ELSE PRINT c (1 mark)

```

[3]

- (b) marking points:  
 loop construct 1 mark  
 check if number is an *integer* 1 mark  
 counting the number of integers input 1 mark  
 output count value (outside the loop) 1 mark

sample algorithm:

```

FOR x ← 1 TO 1000 (1 mark)
  INPUT Number
    Difference ← INT(number) - Number (1 mark)
    IF Difference = 0 THEN Total ← Total + 1 (1 mark)
NEXT x
PRINT total (1 mark)

```

(NOTE: alternative to lines 3 and 4:

```

IF INT(Number) = Number THEN Total ← Total + 1 (2 marks) ) [4]

```

- (c) Description of any **two** sets of test data. Many correct answers, these are examples only.

1000 whole numbers to ensure that loop works properly

900 whole numbers and 100 numbers with decimal places to ensure that the routine distinguishes correctly [2]

- 7 (a) 7 [1]

- (b) Hg, Cs [2]

- (c) Element symbol [1]