COMPUTER SCIENCE **0478/02**

Paper 2 Problem-solving and Programming **For Examination from 2016**

SPECIMEN MARK SCHEME

1 hour 45 minutes

MAXIMUM MARK: 50

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

Section A

1 **(a)** **(i)** **Many correct answers, they must be meaningful. This is an example only.**
```
StudentNames[1:30]
```
[1]

    (ii) **Many correct answers, they must be meaningful. This is an example only.**
```
StudentMarksTest1[1:30]
StudentMarksTest2[1:30]
StudentMarksTest3[1:30]  (1 mark)
StudentTotalScore[1:30]  (1 mark)
```
[2]

  (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, 35
       Reason: valid data to check that data on the upper bound of each range check is
                accepted

       Set 2:   21, 26, 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)
    ENDIF
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 <u>after the end of the repeat loop</u>

    line 8:   this should read **UNTIL c = 20** or **UNTIL c >= 20** or **UNTIL c > 19**   [3]

5 *PENDOWN*
    LEFT 90
    REPEAT **3**
    FORWARD 30   (1 mark)
    RIGHT 90

    ENDREPEAT
    FORWARD 10
    LEFT 90   OR   **PENUP**   (1 mark)

    PENUP   OR   **LEFT 90**
    FORWARD 10   (1 mark)
    PENDOWN

    REPEAT 2   OR   **REPEAT 3**
    FORWARD 20   (1 mark)

    RIGHT 90
    ENDREPEAT
    FORWARD 20   OR   **(LEFT/RIGHT 180)**   (1 mark)
    (LEFT 90)

Alternative answer for ***last 2 marks:***

    FORWARD 20   (1 mark)
    RIGHT 90

    FORWARD 20
    RIGHT 90   (1 mark)
    FORWARD 20

Give a mark for each correct group of statements   **[5]**

6 (a) <u>marking points:</u>

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

<u>sample algorithm:</u>

```
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) <u>marking points:</u>

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

<u>sample algorithm:</u>

```
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]