

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the October/November 2015 series

9691 COMPUTING

9691/22

Paper 2 (Written Paper), maximum raw mark 75

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1 (a)

| Field | Identifier | Data type | Example of input data | Field size (in bytes) | Marks |
|------------------------------------|---------------|---|-----------------------|--------------------------------|-------|
| Title | Title | STRING (not text) | How to solve it | 30 approx. (accept a range) | 1 |
| Author | Author | STRING (not text) | G Polya | 20 approx. (accept a range) | |
| International Standard Book Number | ISBN | STRING / LONGINT | 97806911 19663 | 13 minimum | 1 |
| Number of pages | NumberOfPages | INTEGER | 253 | 4 | 1 |
| Price(\$) | BookPrice | CURRENCY/FLOAT /SINGLE/REAL /DOUBLE/DECIMAL | 12.50 | 8/16/32/64 | 1 |
| Date started to read book | DateStarted | DATE / REAL (Accept STRING) | 28032012 | 8 | 1 |
| Date finished reading book | DateFinished | DATE / REAL (Accept STRING) | 17052012 | 8 | |
| Paperback? | IsPaperback | BOOLEAN | TRUE | 1/2 | 1 |
| Rating (Range 0 to 5) | Rating | INTEGER/BYTE /CHARACTER /STRING(1) | 4 | 4 / 1 | 1 |

[max 5]

| | | | |
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- (b) Mark as follows:
- 1 mark for correct record header
 - 1 mark for correct definition terminator
 - 1 mark for the first 5 fields defined correctly for language
 - 1 mark for the remaining 4 fields defined correctly for language

Do not accept pseudocode
Field names must be as given, but ignore capitalisation/spaces
Declared program language must match code given
Ignore field sizes and data type
If misused DIM in VB, penalise once
If statement separators missed, penalise once

Example Pascal:

```

TYPE  BookRecordType = RECORD
      Title:  STRING[20];
      Author: STRING[20];
      ISBN:  STRING[13];
      NumberOfPages: INTEGER;
      BookPrice: Currency;
      DateStarted: TDateTime;
      DateFinished: TDateTime;
      IsPaperback: Boolean;
      Rating: INTEGER;
END;

```

[4]

- (c) – set up a dummy record // assign each field a dummy value // use a constructor
– ...and store this in every element of the array // loop 100 times

Accept code [2]

- (d) 1 mark per point below (marks are for method)
- Record size ~80bytes
 - * 10 (number of records)
 - + 10%

Divide by 1024 (do not accept division by 1000) [4]

| | | | |
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(e) Mark as follows:

- Open file BookData.DAT
- ... for writing/output/append
- test for book data // test this is not a dummy record
- write record to file
- correctly working loop (FOR/WHILE/REPEAT)
- Close file BookData.DAT (or channel number)

Example pseudocode:

```

OPENFILE BookData.DAT FOR WRITING
i ← 1
WHILE i <= 100
    IF Book[i].Title > "" // accept any field and its dummy value
        THEN
            WRITE record to FILE
        ENDIF
    i ← i + 1
ENDWHILE
CLOSEFILE BookData.DAT

```

[Max 5]

- (f) – EOF returns TRUE or FALSE
- Depending on whether it found the marker at the end of the file

[2]

| | | | |
|--------|--|----------|-------|
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- (g) (i) Mark as follows:
- initial value of TopRatingSoFar (outside loop)
 - loop
 - compare rating
 - update rating if appropriate
 - keep note of title/array index
 - output top title only
 - correct field notation

Example pseudocode:

```

TopRatingSoFar ← 0
i ← 0
REPEAT
    i ← i + 1
    IF TopRatingSoFar < Book[i].Rating
        THEN
            TopRatingSoFar ← Book[i].Rating
            TopBookTitle ← Book[i].Title
        ENDIF
UNTIL Book[i].Title = ""
OUTPUT TopBookTitle

```

Alternative answer:

```

TopRatingSoFar ← 0
FOR i ← TO 100
    IF TopRatingSoFar < Book[i].Rating
        THEN
            TopRatingSoFar ← Book[i].Rating
            TopBookTitle ← Book[i].Title
        ENDIF
ENDFOR
OUTPUT TopBookTitle

```

[max 6]

- (ii) – first loop to find highest rating
– second loop to output relevant titles

[2]

- 2 (a) (i) Mark as follows:
- parameter
 - Return data type
 - Correctly formed CASE statement (including the end)
 - with all cases present (characters in quotes)
 - ELSE clause
 - Return of value (implied)

Example PASCAL:

```

FUNCTION NumeralValue (Letter : CHAR) : INTEGER;
BEGIN
    CASE Letter OF
        'M': NumeralValue := 1000;
        'D': NumeralValue := 500;
        'C': NumeralValue := 100;
        'L': NumeralValue := 50;
        'X': NumeralValue := 10;
        'V': NumeralValue := 5;
        'I': NumeralValue := 1;
    ELSE
        NumeralValue := -1;
    END;
END;

```

[max 5]

(ii)

| Letter | Expected result | Type of data (normal, borderline or invalid) |
|---------------|--------------------------|--|
| 'D' | 500 | normal |
| 'V' | 5 | normal |
| 'I' | 1 | normal |
| 'Y' | -1 (Do not accept Error) | invalid |

1 mark for 3 rows of normal data (Do not accept borderline)

1 mark for -1

1 mark for invalid

[3]

(b) Mark as follows:

1 mark per column (2 to 6)

If zero marks then mark by row

| RomanNumber | Denary | i | ThisLetter | ThisNumber | OUTPUT |
|-------------|--------|---|------------|------------|--------|
| "MDCLI" | 0 | | | | |
| | 1000 | 1 | 'M' | 1000 | |
| | 1500 | 2 | 'D' | 500 | |
| | 1600 | 3 | 'C' | 100 | |
| | 1650 | 4 | 'L' | 50 | |
| | 1651 | 5 | 'I' | 1 | 1651 |
| | | | | | |
| | | | | | |

Ignore quotes

[5]

- (c) (i) Meaningful variable names
 Capitalisation of keywords
 Use of (library/built-in) functions
 Accept empty lines
 Do not accept white space
 Camel case on its own is too vague

[max 2]

| | | | |
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(ii) 1 mark per line of pseudocode correctly written in the high-level language chosen:

```
RomanNumber ← "MDCLI"

Denary ← 0

FOR i ← 1 TO LENGTH(RomanNumber)
  ThisLetter ← MID(RomanNumber, i, 1)
  ThisNumber ← NumeralValue(ThisLetter)
  Denary ← Denary + ThisNumber
ENDFOR

OUTPUT Denary (ignore any message)
```

Example Pascal:

```
RomanNumber := 'MDCLI';
Denary := 0;

FOR i := 1 TO LENGTH(RomanNumber) DO
  BEGIN
    ThisLetter := MIDSTR(RomanNumber, i, 1);
    ThisNumber := NumeralValue(ThisLetter);
    Denary := Denary + ThisNumber;
  END;
WriteLn(Denary);
```

[8]

(d) Mark as follows:

1 mark for per row

| RomanNumber | Expected result | Reason for choice |
|-------------|--------------------------|---|
| "MDCLXVI" | 1666 | Each letter used once in descending order |
| "CCC" | 300 | Multiple letters (but not 4 identical letters) |
| "IIII" | 4 | Multiple letters (4 identical letters) |
| "IV" | 4 | Lower value letter followed by higher value letter |
| "XIV" | 14 | Order of letters: higher value, lower value, higher value |
| "XY" | Error (Do not accept -1) | Invalid symbol Y // invalid data |

[4]

(e) (i)

| RomanNumber | ThisLetter | ThisNumber | i | NextLetter | NextNumber | Denary |
|-------------|------------|------------|---|------------|------------|--------|
| "IV" | 'I' | 1 | | | | 0 |
| | | -1 | 2 | 'V' | 5 | -1 |
| | | 5 | | | | 4 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1 mark for each row above (accept rows spread over more than one row) [2]

(ii)

| RomanNumber | ThisLetter | ThisNumber | i | NextLetter | NextNumber | Denary |
|-------------|------------|------------|---|------------|------------|--------|
| "XY" | 'X' | 10 | | | | 0 |
| | | | 2 | 'Y' | -1 | 10 |
| | | -1 | | | | 9 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

1 mark for each row above [2]

(iii) – does not give expected result // logic error

Change required:

- if value returned from NumeralValue function is – 1
- need error trapping code // error message [3]

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- (f) (i) – during compilation of program // in IDE environment // running an interpreted program
– reported by the translator diagnostics
// highlights/stops at the statement with the syntax error
// compiler checks against syntax rules/rules of the language

Accept by example [2]

- (ii) – during testing (running code is not enough)
– When (using test data and) expected results do not match actual results [2]

3 (a) Also give credit for answers to “why” rather than “how”

- (i) Set a breakpoint in the program code
Execution will stop at this point [2]

- (ii) Stepping allows one statement to be executed at a time
Program execution pauses after each statement
Often used from a set break point
Can use variable watch at each step
Stepping over to skip statements [max 2]

- (iii) Variable watch allows tester to see the current contents of a variable
// Used to see how variable contents change when stepping through program
Tester chooses variables to watch [2]

- (b) White-box [1]