

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International Advanced Subsidiary and Advanced Level

## **MARK SCHEME for the October/November 2015 series**

### **9691 COMPUTING**

**9691/23**

Paper 2 (Written Paper), maximum raw mark 75

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<b>Page 2</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2015</b>	<b>9691</b>	<b>23</b>

**1 (a)**

<b>Field</b>	<b>Identifier</b>	<b>Data type</b>	<b>Example of input data</b>	<b>Field size (in bytes)</b>	<b>marks</b>
course code	CourseCode	STRING (not text/alphanumeric)	015110217	10 (approx.) (accept a range)	1
title	Title	STRING (not text/alphanumeric)	Programming for Beginners	30 (approx.) (accept a range)	1
tutor (3-letter initials)	Tutor	STRING (not text/alphanumeric)	PGL	3/6	
day of week	Day	BYTE / INTEGER Accept CHAR/STRING(1)	2	1 / 4 1 / 2	1
lab based?	IsLabBased	BOOLEAN	TRUE	1 / 2	1
session duration in hours	SessionHours	REAL/FLOAT/SINGLE	2.5	4 / 8	1
fee (\$)	CourseFee	CURRENCY/FLOAT/DECIMAL SINGLE/REAL/DOUBLE	25.50	8 / 16	1
date course starts	StartDate	DATE/REAL (STRING)	03/11/2015	8 (10)	1
date course ends	EndDate	DATE/REAL (STRING)	03/12/2015	8 (10)	

[max 5]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2015	9691	23

(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 missing, penalise once

Example Pascal

```
TYPE CourseRecordType = RECORD
  CourseCode: STRING[10];
  Title: STRING[30];
  Tutor: STRING[3];
  Day: BYTE;
  IsLabBased: Boolean;
  SessionHours: REAL;
  CourseFee: Currency;
  StartDate: TDateTime;
  EndDate: TDateTime;
END;
```

[4]

(c) Note that some candidates may already have done this in part (b). In that case, give marks according to part (b).

```
VAR Course : ARRAY[1..50] OF CourseRecordType;
VAR DummyRecord : CourseRecordType;
```

[2]

```
WITH DummyRecord DO
  BEGIN
```

```
    CourseCode := '';
    Title := '';
    Tutor := '';
```

[1]

```
    Day := 0;
    IsLabBased := FALSE;
    SessionHours := 0;
    CourseFee := 0;
```

[1]

```
    StartDate:= 01/01/2010
    EndDate := 01/01/2010
```

[1]

```
  END;
```

```
FOR i := 1 to 50 DO
```

[1]

```
  Course[i] := DummyRecord;
```

[1]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2015	9691	23

Alternative:

VAR Course : ARRAY[1..50] OF CourseRecordType [2]

FOR i := 1 to 50 DO [1]

BEGIN

Course[i].CourseCode := '';  
 Course[i].Title := '';  
 Course[i].Tutor := ''; } [1]

Course[i].Day := 0;  
 Course[i].IsLabBased := FALSE;  
 Course[i].SessionHours := 0; } [1]

Course[i].Course Fee := 0;  
 Course[i].StartDate := 0;  
 Course[i].EndDate := 0; } [1]

END;

[1]

[max 6]

Do not penalise again for incorrect data type

- (d) (i) – EOF () returns TRUE or FALSE [2]  
 – depending on whether it found the marker at the end of the file

(ii) Mark as follows:

- Open file CourseData.DAT
- ... for reading/input
- loop while not end of file CourseData.DAT
- read record from file
- assign to array element
- correctly initialised and incremented index
- Close file CourseData.DAT

Example pseudocode:

OPENFILE CourseData.DAT for READING // for INPUT

i ← 1

WHILE NOT EOF(CourseData.DAT)

  READ record FROM FILE

  Course[i] ← record

  i ← i + 1

ENDWHILE

CLOSEFILE CourseData.DAT

[max 6]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2015	9691	23

(e) Mark as follows:

- change outer FOR loop to a REPEAT/WHILE loop
- decrementing the iterations of the FOR loop
- introduce a Boolean variable `NoSwaps` (or similar)
- initialise Boolean variable correctly (inside outer loop and outside inner loop)
- terminate REPEAT loop when no swaps made
- leave comparison and swapping code the same
- change upper limit of inner loop to `NumberOfCourses - x` (instead of 49)

Example pseudocode:

```

PROCEDURE SortData(NumberOfCourses)
  x ← 0
  // NoSwaps ← FALSE      (required for WHILE loop)
  REPEAT // WHILE NoSwaps = FALSE
    x ← x + 1
    NoSwaps ← TRUE
    FOR y ← 1 TO NumberOfCourses - x
      IF Course[y].CourseFee > Course[y + 1].CourseFee
        THEN
          NoSwaps ← FALSE
          TempRecord ← Course[y]
          Course[y] ← Course[y + 1]
          Course[y + 1] ← TempRecord
        ENDIF
      ENDFOR
    UNTIL NoSwaps = TRUE // ENDWHILE
  ENDPROCEDURE

```

[max 6]

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 DenaryDigit (Letter : CHAR) : INTEGER;
BEGIN
    CASE Letter OF
        'K': DenaryDigit := 0;
        'D': DenaryDigit := 1;
        'L': DenaryDigit := 2;
        'C': DenaryDigit := 3;
        'F': DenaryDigit := 4;
        'H': DenaryDigit := 5;
        'B': DenaryDigit := 6;
        'G': DenaryDigit := 7;
        'E': DenaryDigit := 8;
        'A': DenaryDigit := 9;
    ELSE
        DenaryDigit := -1
    END;
END;
```

[max 5]

(ii)

<b>Letter</b>	<b>Expected result</b>	<b>Type of data</b> (normal, borderline or invalid)
'1'	-1	Invalid (digit)
'X'	-1	Invalid (letter)
'G'	7	normal

1 mark per row

[3]

- (b) (i) Mark as follows:  
 1 mark per column (2 to 6)  
 if zero marks then mark by row

CodedNumber	Denary	i	ThisChar	ThisNumber	OUTPUT
"LED"	0				
	20	1	L	2	
	100	2	E	8	
	110	3	D	1	110

[5]

- (ii) line number 08

Denary  $\leftarrow$  Denary \* 10 + ThisNumber

[2]

Do not accept concatenation of separate digits (unless they are CHAR/STRING)

- (iii) logic error

[1]

- (iv) Second and third mark dependent on first mark.

***When and how interchangeable***

**Type:** – syntax error

**When:** – during compilation of program // in IDE environment // running an interpreted program

**How:** – reported by the translator diagnostics // highlights/stops at the statement with the syntax error // compiler/interpreter checks against syntax rules / rules of the language

**Type:** – run-time error

**When:** – during testing/execution

**How:** – program will 'crash' e.g. attempted 'divide **by zero**' error

[6]

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2015	9691	23

- (c) (i) – Meaningful variable names  
– Capitalisation of keywords  
– Empty lines  
– Use of indentation  
– Initialisation (of variables)  
– Use of (library/built-in) functions [max 3]

Do not accept white space / camel case on its own.

- (ii) Comments/annotations/remarks [1]

- (iii) 1 mark per line of pseudocode correctly written in the high-level language chosen.  
1 mark for declarations:  
Example Pascal:

```

PROCEDURE ConvertToDenary(CodedNumber: STRING); // [1]
VAR Denary, ThisNumber, i : INTEGER;
    ThisChar : CHAR; // [1]

BEGIN
    Denary := 0; // [1]

    FOR i := 1 TO LENGTH(CodedNumber) DO // [1]
        BEGIN
            ThisChar := MIDSTR(CodedNumber, i, 1); // [1]
            ThisNumber := DenaryDigit(ThisChar); // [1]
            Denary := Denary + ThisNumber * 10; // [1]
            Accept 'corrected version'

        END; // [1]

        WriteLn(Denary); // [1]
    END; // [1]

```

[10]

- (iv) – IF ThisNumber = -1 THEN  
– output statement giving the error message  
– instead of OUTPUT Denary  
– exit from the loop [3]



<b>Page 9</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge International AS/A Level – October/November 2015</b>	<b>9691</b>	<b>23</b>

- 3 (a)** Give credit for answers to “why” rather than “how”.
- (i)** Set a breakpoint in the program code  
Execution will pause at this point [2]
  - (ii)** Stepping allows one statement to be executed at a time  
The program execution pauses after each statement  
Often used from a set breakpoint  
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]