CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/23**

Paper 2 Fundamental Problem-solving and Programming Skills **October/November 2025**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **17** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
BOD	Benefit of the doubt
^	To indicate where a key word/phrase/code is missing
✗	Incorrect
FT	Follow through
〰	Indicate a point in an answer
Highlighted text	To draw attention to a particular aspect or to indicate where parts of an answer have been combined
I	Ignore
NAQ	Not answered question
NE	No examples or not enough
⌇	Not relevant or used to separate parts of an answer
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.
REP	Repetition
SEEN	Indicates that work or a page has been seen including blank answer spaces and blank pages.
✓	Correct

Annotation	Meaning
TV	Too vague

Mark scheme abbreviations

/	separates alternative words / phrases within a marking point
//	separates alternative answers within a marking point
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be awarded
( )	the word / phrase in brackets is not required, but sets the context

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>Answers include:

1 They are tried and tested // Free from errors
2 They are readily available // Speed up development time
3 They will be updated automatically when improvements are made // No maintenance of routine is needed (as automatically updated)
4 The algorithm will be compliant with the international standard

One mark per point

<b>Max 3</b></td><td><b>3</b></td></tr>
<tr><td>1(b)(i)</td><td>1 When a part of the algorithm performs a specific task
2 Part is repeated // performed in several places
3 Testing / debugging / maintenance is easier

One mark for each point

<b>Max 2</b></td><td><b>2</b></td></tr>
<tr><td>1(b)(ii)</td><td><table>
<tr><th>Term</th><th>Description</th></tr>
<tr><td><code>Pass2</code></td><td>the name of the function</td></tr>
<tr><td><code>Count</code></td><td>The parameter / value passed to the function</td></tr>
<tr><td><code>BOOLEAN</code></td><td>The (data) <b>type</b> returned (by the function)</td></tr>
</table>
One mark per description (excluding first row)</td><td><b>2</b></td></tr>
<tr><td>1(c)</td><td><table>
<tr><th>Expression</th><th>Evaluates to</th></tr>
<tr><td><code>LENGTH(NUM_TO_STR(Multiplier))</code></td><td><b>3</b></td></tr>
<tr><td><code>MONTH(DoB) &gt; 4</code></td><td><b>TRUE</b></td></tr>
<tr><td><code>15 + STR_TO_NUM(MID(AddressLine[1], 2, 1))</code></td><td><b>20</b></td></tr>
</table>
One mark per row</td><td><b>3</b></td></tr>
</table>

Question	Answer	Marks
2(a)	One mark per point: 1 Open the file in append mode (and subsequently close) **before loop** 2 Initialise a variable to 1 / 0 **before loop** 3 Use the variable as an index to the array to access an element **in a loop** 4 Test if element value is blank / empty **in a loop** 5 If not blank then write the value to the file **in a loop** 6 Increment the variable **in a loop** 7 Repeat from MP3 until variable value is 66 / 65 / all elements (in the array) have been checked **Max 6**	**6**
2(b)	One mark per point: Construct: Selection Use: To test whether the (array) element is blank Alternative: Construct: Sequence Use: To specify the order in which the steps of the algorithm have to be followed so that the task is completed correctly	**2**

Question	Answer	Marks

3	`FUNCTION Pop() RETURNS PopData`
	   `DECLARE ThisPop :` **`PopData`** MP 2
	   `IF` **`SP < 1 // SP = 0`** `THEN` MP 3
	      `PopData.Exists ←` **`FALSE`** `// Stack is empty` MP 1
	   `ELSE`
	      `PopData.Data ←` **`ThisStack[SP]`** MP 4
	      `PopData.Exists ←` **`TRUE`** MP 1
	      `SP ←` **`SP – 1`** MP 5
	   `ENDIF`
	   ``RETURN ThisPop` ``
	`ENDFUNCTION`
	Mark as follows:
	MP 1 One mark for **both** assignments to `PopData.Exists` (`FALSE` **and** `TRUE`)
	MP 2, 3, 4 ,5 One mark for each of remaining four bold parts
		5

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4</td><td>
Example solution:

```
PROCEDURE Store()
   DECLARE Index, StartPos, ThisNum : INTEGER
   DECLARE ThisString : STRING

   Index ← 1
   StartPos ← 1

   WHILE StartPos < LENGTH(NumString) AND Index < 21
      ThisString ← MID(NumString, StartPos, 3)
      ThisNum ← STR_TO_NUM(ThisString)
      Data[Index] ← ThisNum
      Index ← Index + 1
      StartPos ← StartPos + 4
   ENDWHILE

ENDPROCEDURE
```

Mark as follows:
1 Declare all local variables used
2 Conditional loop while end of string not reached
3 ... and array not full
4 Attempted use of MID() // Attempted use of Right() and Left()
5 Correct extraction and use next three letter substring from NumString **in a loop**
6 Convert to integer **and** assign value to array element **in a loop**
7 Correct increment of array index by 1 **and** start position of substring by 4

Max 6

Alternative FOR loop solution:

```
PROCEDURE Store()
   DECLARE Index, StartPos, ThisNum : INTEGER
   DECLARE ThisString : STRING
   StartPos ← 1
   FOR Index ← 1 TO 20
      ThisString ← MID(NumString, StartPos, 3)
      ThisNum ← STR_TO_NUM(ThisString)
      Data[Index] ← ThisNum
      StartPos ← StartPos + 4
      IF StartPos > LENGTH(NumString) THEN
         Break
      ENDIF
   NEXT Index
ENDPROCEDURE
```
</td><td>6</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4</td><td>Alternative where number of 3-digit substrings calculated

```
StartPos ← 1
NumOfSubStrings ← ((LENGTH(NumString) + 1)DIV 4))

FOR Index ← 1 TO NumOfSubString
   ThisString ← MID(NumString, StartPos, 3)
   ThisNum ← STR_TO_NUM(ThisString)
   Data[Index] ← ThisNum
   StartPos ← StartPos + 4
   IF Index = 20 THEN
      Break
   ENDIF
NEXT Index
```

Mark as follows:
1 Declare all variables used
2 Loop for 20 iterations // number of 3-digit numbers in the `NumString`
3 Attempted use of `MID()`// Attempted use of `Right()` and `Left()`
4 Correct extraction and use next three letter substring from `NumString` **in a loop**
5 Convert to integer **and** assign value to array element **in a loop**
6 Increment `StartPos` by 4 **in a loop**
7 Test for end of `NumString` **and** `Break` // Test for end of array **and** Break

Max 6</td><td></td></tr>
</table>

Question	Answer	Marks
4	Alternative Solution extracting one character at a time **and** testing for comma	

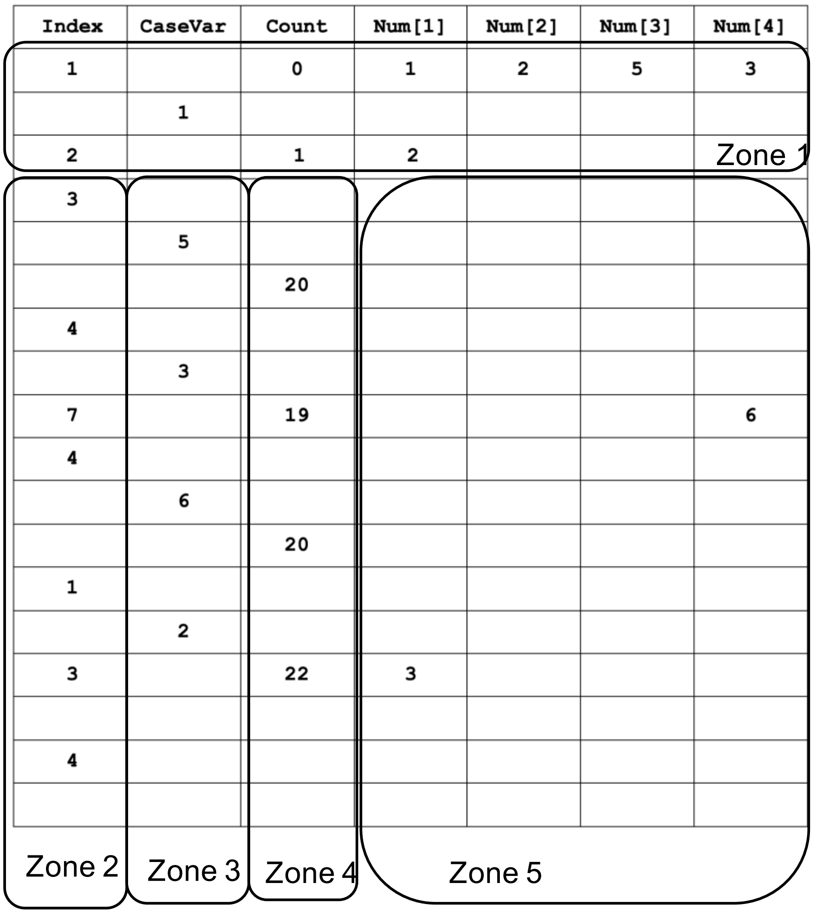
```
PROCEDURE Store()
   DECLARE Index, Position : INTEGER
   DECLARE SubString : STRING
   Decalre ThisCharacter : CHAR
   Index ← 1
   Position ← 0
   SubString ← ""
   WHILE Index <= 20 AND Position <= LENGTH(NumString)
      Charcter ← MID(NumString, Position, 1)
      IF Character = ','
         Data[Index] ← STR_TO_NUM(SubString)
         Index ← Index + 1
         SubString ← ""
      ELSE
         SubString ← SubString & Character
      ENDIF
      Position ← Position + 1
   ENDWHILE
   Data[Index] ← STR_TO_NUM(SubString)  //last 3 digit
                                              string

ENDPROCEDURE
```

Mark as follows:

1 Declare all variables used
2 Conditional loop while end of string not reached
3 ... and array not full
4 Correct extraction and use of a character from `NumString` **in a loop**
5 Test for comma **in a loop**
6 If true convert substring to number
… **and** store in `Data` array **and** set `SubString` to `""` **and** increment `Index`
7 Otherwise concatenate next character from `NumString` to end of Substring

Max 6

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(a)</td><td>
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
<table>
<tr><th>Index</th><th>CaseVar</th><th>Count</th><th>Num[1]</th><th>Num[2]</th><th>Num[3]</th><th>Num[4]</th></tr>
<tr><td>1</td><td></td><td>0</td><td>1</td><td>2</td><td>5</td><td>3</td></tr>
<tr><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td></td><td>1</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>5</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>20</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7</td><td></td><td>19</td><td></td><td></td><td></td><td>6</td></tr>
<tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>20</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td>22</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Zones 1 to 4 : One mark for each set of values as shown
Zone 5: Num[4] set to 6 when Index is 7
and
Num[1] set to 3 when index is 3 for **second** time</td><td>5</td></tr>
<tr><td>5(b)(i)</td><td>1 and 2</td><td>1</td></tr>
<tr><td>5(b)(ii)</td><td>`1 TO 2 : Num[Index] ← Num[Index] + Index`
`Index ← Index + CaseVar`
`Count ← Count + CaseVar`

One mark per point:
• use of variable `CaseVar` rather than literal values
• completely correct clause</td><td>2</td></tr>
</table>

Question	Answer	Marks
6(a)	One mark per point: 1 Create a list of numbers that should generate **all of the** possible check digit values 2 and check that each / the / a generated value is as expected	2

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(b)</td><td>

Note 2 different solutions with different mark scheme

Example solution – conversion to string and using a loop

```
FUNCTION CheckNumber(Number : INTEGER) RETURNS BOOLEAN
   DECLARE Total, Index, CheckDigit : INTEGER
   DECLARE NumString : STRING

   Total ← 0

   NumString ← NUM_TO_STR(Number)
   CheckDigit ← STR_TO_NUM(RIGHT(NumString, 1))
   // CheckDigit ← Number MOD 10

   FOR Index ← 1 TO LENGTH(NumString) - 1
             // 1 TO LENGTH(NUM_TO_STR(Number DIV 10))
      Total ← Total + STR_TO_NUM(MID(NumString, Index, 1))
   ENDFOR

   IF Total MOD 10 <> CheckDigit THEN
      RETURN FALSE
   ENDIF

   RETURN TRUE

ENDFUNCTION
```

Mark as follows:

1 Function Header including Identifier, parameters and return type
2 Use of `Num_TO_STR` to convert parameter // Use of `Num_TO_STR` to convert parameter excluding least significant digit to a string
3 Extract `CheckDigit` from `NumString` // Extract least significant digit from parameter
4 Loop for length of `NumString` **– 1** following correct convesrion to string
5 attempt to form sum of digits **in a loop**
6 completely correct sum of digits **in a loop and** of sum initialised **before loop**
7 Calculate check digit from sum
8 Compare sum with final digit of parameter **and** return appropriate Boolean value

Max 7

</td><td>**7**</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(b)</td><td>
Example solution – numeric version

<pre>
FUNCTION CheckNumber(Number : INTEGER) RETURNS BOOLEAN
   DECLARE Sum, CheckDigit, Remainder: INTEGER

   Remainder ← Number MOD 10
   Number ← Number DIV 10

   CheckDigit ← Remainder

   Sum ← 0
   WHILE Nummer > 0
      Remainder ← Number MOD 10
      Number ← Number DIV 10
      Total ← Total + Remainder
   ENDWHILE

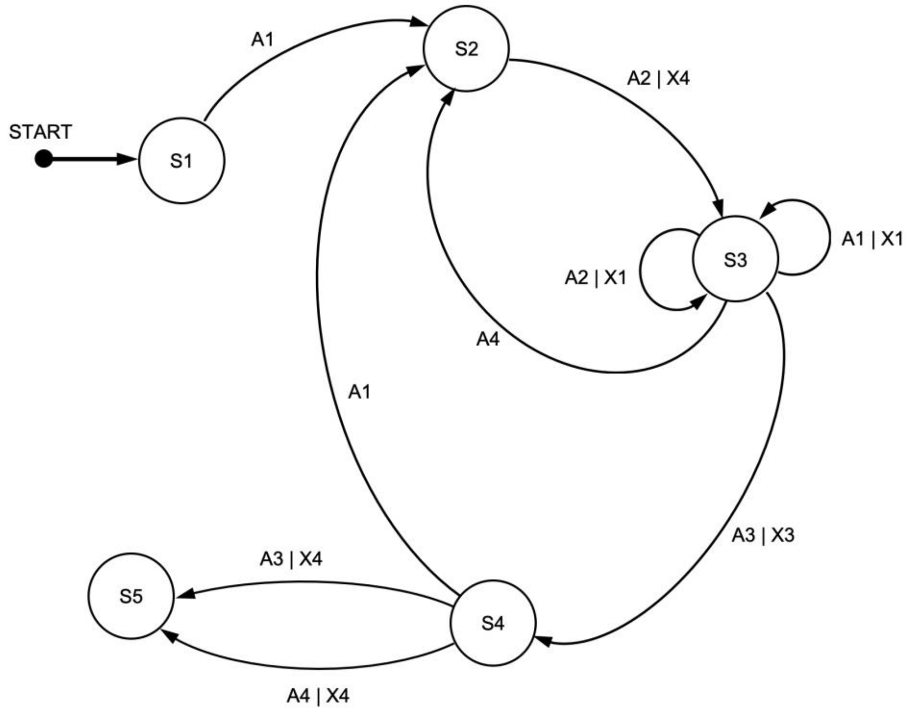
   IF Total MOD 10 <> CheckDigit THEN
      RETURN FALSE
   ENDIF

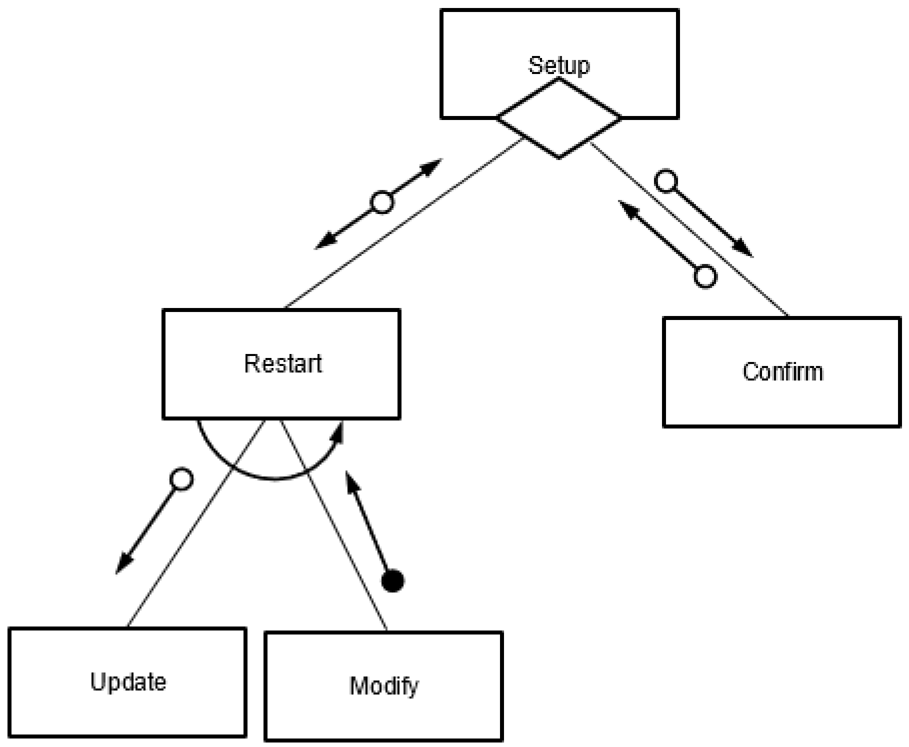
   RETURN TRUE

ENDFUNCTION
</pre>

1 Function Header including Identifier, parameters and return type
2 Initialise Sum
3 Set CheckDigit to least significant digit in Number
4 Loop while Number > 0
5 attempt to use MOD and DIV to sum successive digits in Number **in loop**
6 completely correct sum of all digits in Number **apart** from least significant digit **in loop**
7 Calculate check digit from sum
8 Compare with CheckDigit **and** return appropriate Boolean value

Max 7
</td><td></td></tr>
</table>

Question	Answer	Marks
7(a)	 START S1 S2 S3 S4 S5 A1 A2 | X4 A1 | X1 A2 | X1 A4 A1 A3 | X3 A3 | X4 A4 | X4 One mark for each: 1 S2 to S5 labelled 2 Label A1 added to event from S1 to S2 3 Event lines from S2 to S3 **and** S3 to S2 correctly labelled 4 Events lines from S3 to S3 **and** event line from S3 to S4 all labelled correctly 5 Event lines from S4 to S5 correctly **and** event line from S4 to S2 labelled correctly **Max 4** for any additional events/lines	**5**

Question	Answer	Marks
7(b)	 One mark for each: 1 All **boxes** correctly labelled and connected in correct hierarchy 2 BYREF parameter to Restart, parameter to Confirm and return 3 Diamond and loop symbol 4 Parameter to Update **and** return from Modify	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>

Example solution:

```
PROCEDURE LoanStatus(ThisStudentID, ThisBookID : STRING)
   DECLARE Index : INTEGER
   DECLARE Found : BOOLEAN

   Index ← 1 / 0
   Found ← FALSE

   WHILE Index <= 8000 / 7999 AND NOT Found
      IF Loan[Index].StudentID = ThisStudentID AND
                     Loan[Index].BookID = ThisBookID THEN
         IF Loan[Index].OnLoan = FALSE THEN
            OUTPUT "Loan has been returned."
         ELSE
            OUTPUT "Loan has not been returned."
         ENDIF
         Found ← TRUE
      ENDIF
      Index ← Index + 1
   ENDWHILE

   IF NOT Found THEN
      OUTPUT "Warning - Loan not found."
   ENDIF
ENDPROCEDURE
```

Mark as follows:
1 Procedure heading, parameters and ending
2 Loop through **all elements** in `Loan` array
3 ... or until record loan is found
4 Test for correct `StudentID` **in a loop**
5 ... and correct `BookID`
6 ... check `OnLoan` data item
7 ... and output both messages as appropriate regarding book loan status **once**
8 If no matching loan found, Output 'not found' **after the loop**

</td><td>8</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(b)</td><td>

Example solution:

```
FUNCTION LoansPerTutor(TutorID : STRING) RETURNS INTEGER
   DECLARE Index, Count : INTEGER

   Count ← 0

   FOR Index ← 1 / 0 TO 8000 / 7999
         IF LEFT(Loan[Index].StudentID, 3) = TutorID AND
                              Loan[Index].OnLoan = TRUE THEN
            Count ← Count + 1
         ENDIF
   NEXT Index

   RETURN Count

ENDFUNCTION
```

Mark as follows:
1 Initialise local integer for `Count`
2 Loop through **all elements** in the `Loan` array
3 Attempt at referencing a data item **in a loop**
4 Extract `TutorID` from `Loan[Index].StudentID` **in a loop**
5 Test for Matching Tutor **AND**
test if the book has been returned using correct dot notation **in a loop**
6 ... if true then increment `Count` **in a loop**
7 Return count

</td><td>7</td></tr>
<tr><td>8(c)(i)</td><td>

One mark per point:
1 Include (a suffix string based on) the date of the archive / the next number in sequence
2 Concatenate with a root filename such as 'Archive'

</td><td>2</td></tr>
<tr><td>8(c)(ii)</td><td>

Boolean data cannot be written to a text file // `OnLoan` is not a string // `OnLoan` will have to be converted to text

</td><td>1</td></tr>
<tr><td>8(c)(iii)</td><td>

One mark per point:
Benefit: Algorithm to **store / extract** a record is easier // unpacking of data is not required // No need for string concatenation
Drawback: More file **accesses needed** (to read / write a complete record)

</td><td>2</td></tr>
</table>