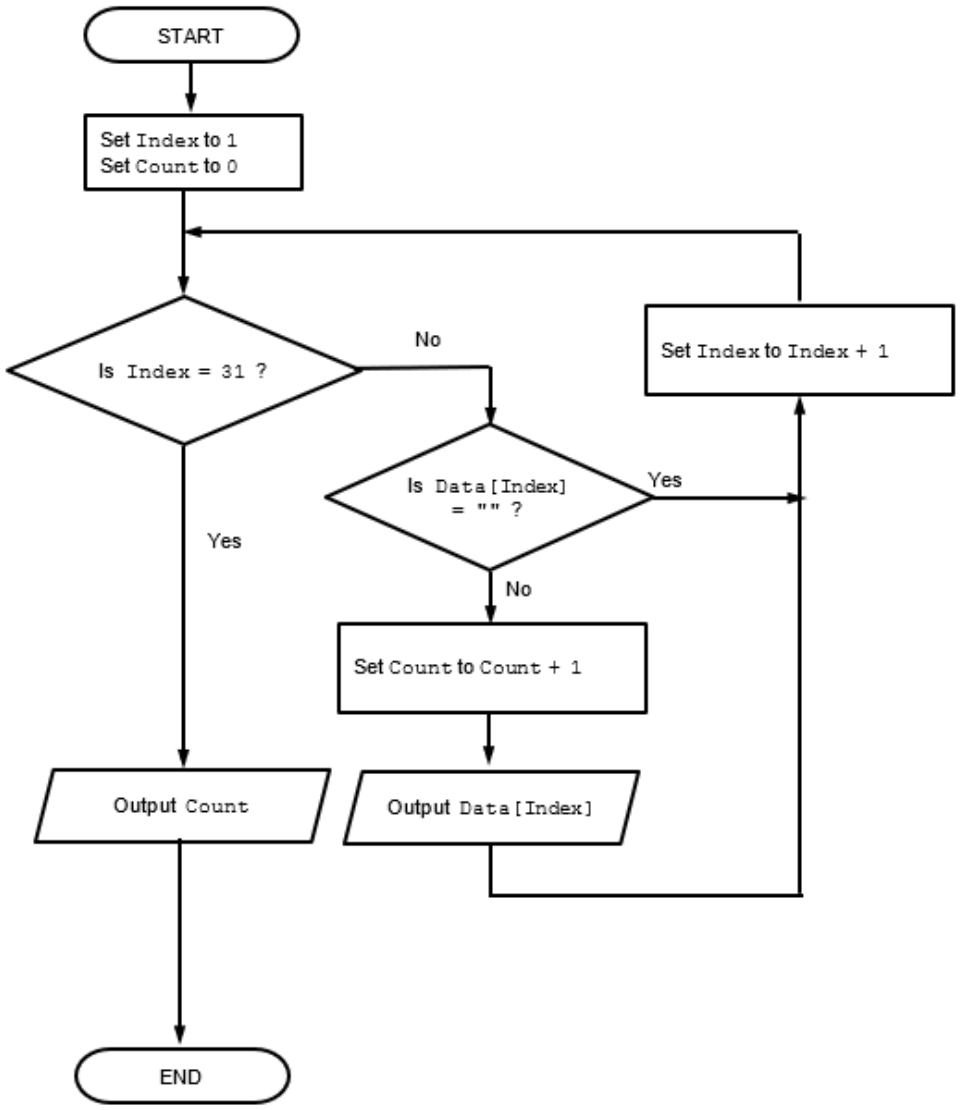
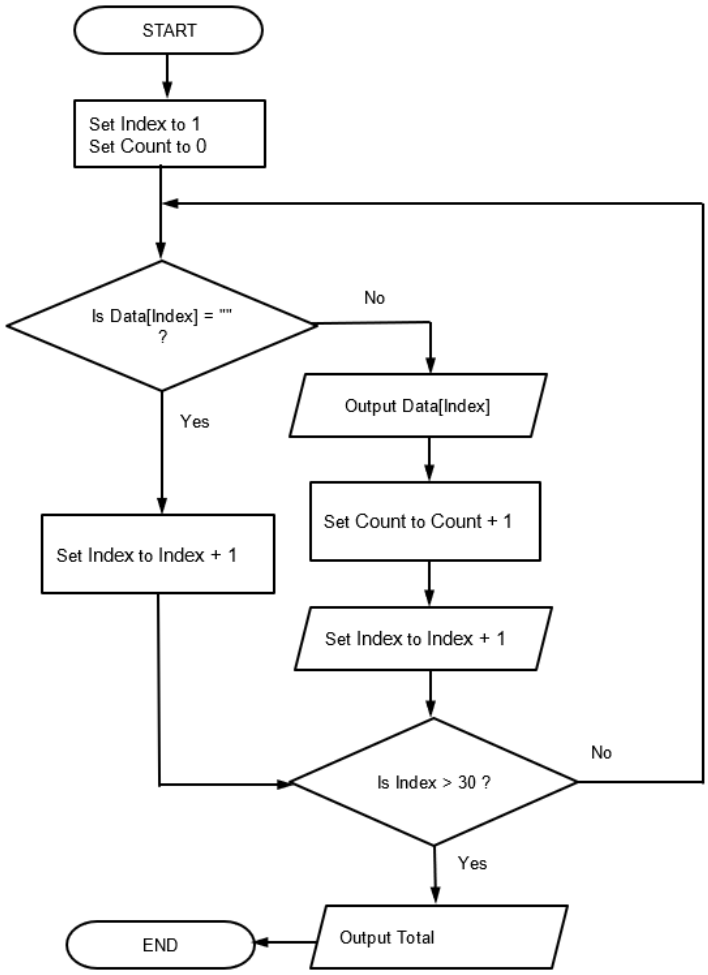
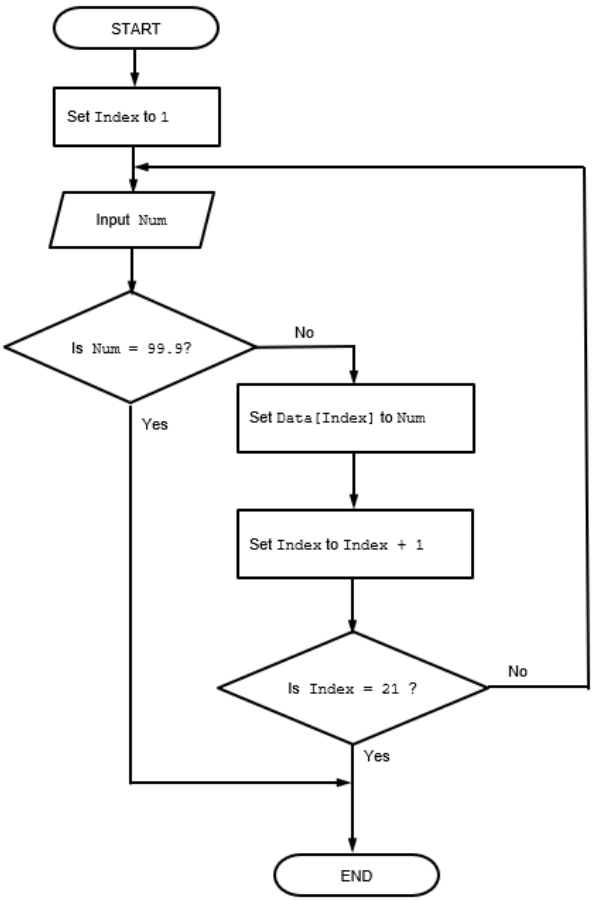
2	Example solution  Mark as follows: 1 Initialisation of variables used as **array index** and **count** 2 Loop through exactly 30 elements in the array 3 Test for empty string in current array element // Test for non-empty string 4 Increment count if appropriate **in a loop** 5 Both required outputs under correct conditions with correct outputs

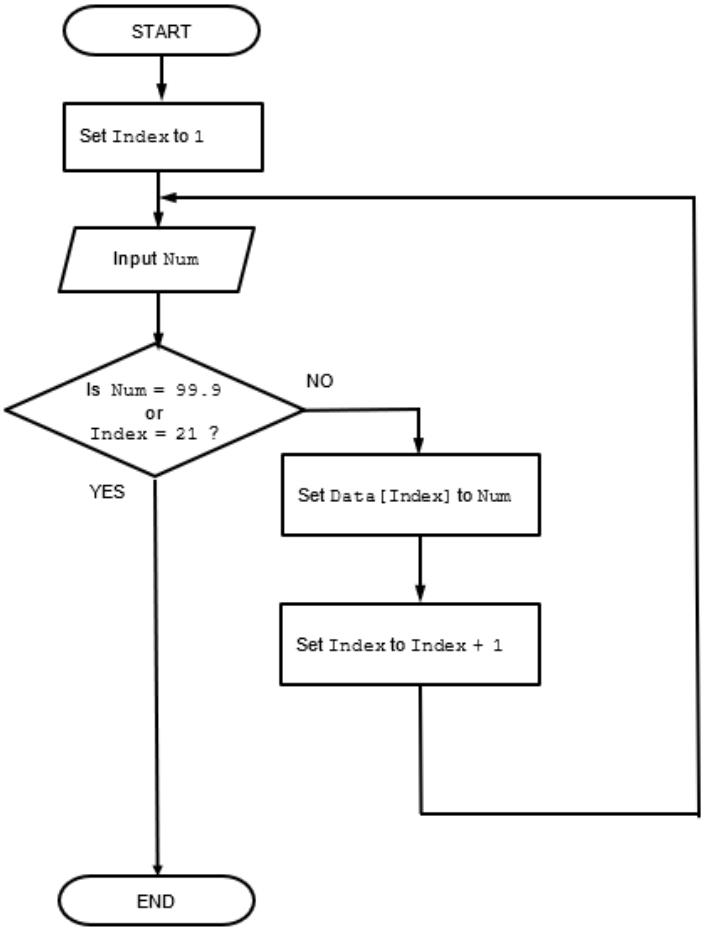
2	Alternative solution Checking for empty string first 

2



Mark as follows:

MP1 Initialisation of the array index
MP2 Input number **in a loop**
MP3 Test for termination value (99.9) **and** correct ending
MP4 Test for array full / maximum 20 iterations **and** correct ending
MP5 Assign number to `Data` array element **and** increment index

2	Alternative solution: 

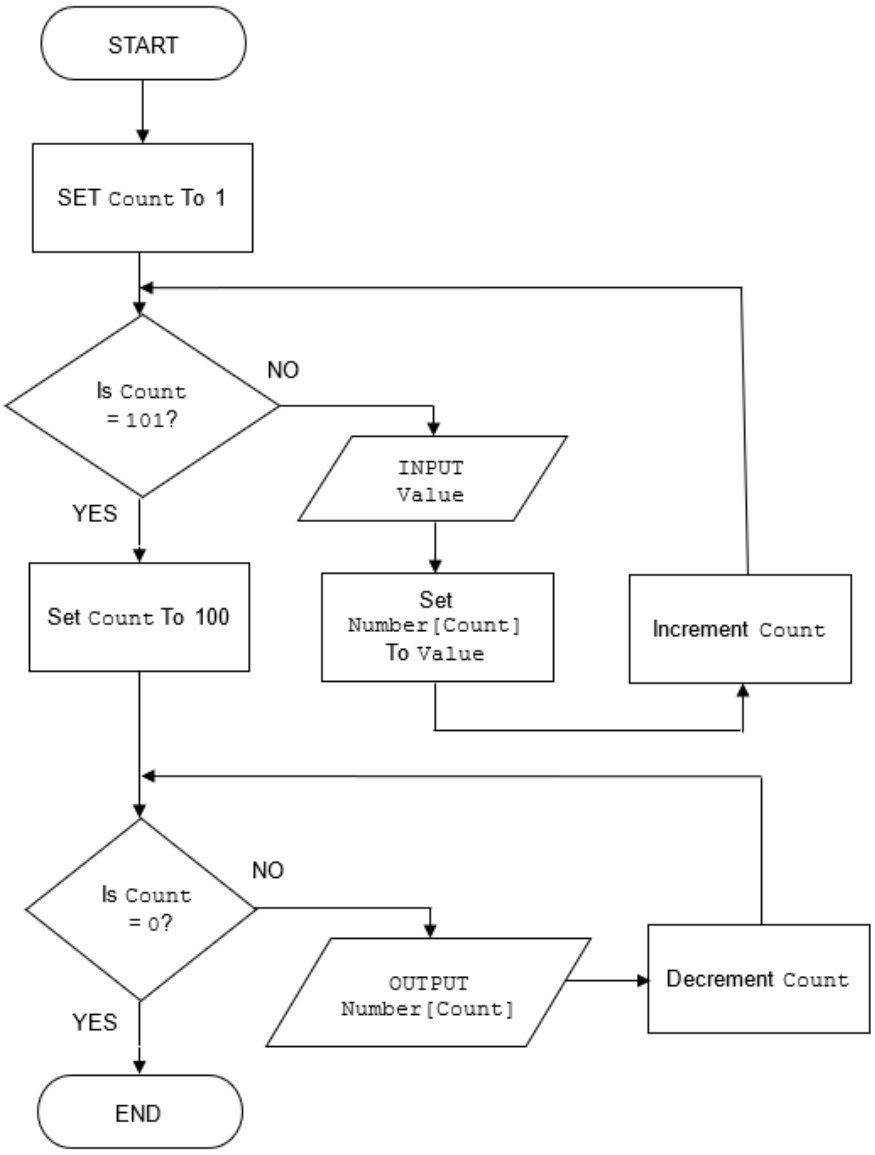
2(a)	One mark per point: 1 Open the file in append mode (and subsequently close) **before loop** 2 Initialise a variable to 1 / 0 **before loop** 3 Use the variable as an index to the array to access an element **in a loop** 4 Test if element value is blank / empty **in a loop** 5 If not blank then write 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**
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

3	Example solution:
	
	`DECLARE GeneratedValue : INTEGER`
	`DECLARE Guess : INTEGER`
	
	`GeneratedValue ← INT(RAND(100)) + 1`
	
	`REPEAT`
	`  OUTPUT "Enter a guess between 1 and 100: "`
	`  INPUT Guess`
	
	`  IF Guess > GeneratedValue THEN`
	`  OUTPUT "Guess was too high"`
	`  ENDIF`
	`  IF Guess < GeneratedValue THEN`
	`  OUTPUT "Guess was too low"`
	`  ENDIF`
	`UNTIL Guess = GeneratedValue`
	
	`OUTPUT "Number guessed correctly"`
	
	MP1 Declare all variables used
	
	MP2 Uses `RAND()` function
	MP3 Uses `INT()` function
	MP4 Correct syntax for random number between 1 and 100
	
	MP5 Conditional loop until correct number guessed
	MP6 Prompt and input a guess **in a loop**
	
	MP7 Check if guess is too high **in a loop**
	MP8 Check if guess is too low **in a loop**
	
	MP9 Output appropriate message (x2) when the number is **not** guessed correctly (**in** the loop) **and** output correct guess message
	
	Max 8

2(a)	Mark as follows: 1. To increase the level of detail of the algorithm // To break the problem / task into **smaller steps** … 2. … until steps can be directly translated into lines of code // from which it can be programmed
2(b)(i)	One mark for each of set test values Hours worked between 1 and 40 inclusive Sales value <= 2000 Bonus Pay: 0 Hours worked above 40 Sales value <= 2000 Bonus Pay: 10 Hours worked between 1 and 40 inclusive Sales value > 2000 Bonus Pay: 50 Hours worked above 40 Sales value above 2000 Bonus Pay: 100 **max 2**
2(b)(ii)	One mark per point • Simple **modules** are written to **replace** each of the unfinished modules. • Each simple module will return an expected value / will output a message to show it has been called.
2(b)(iii)	One mark for naming type of error and one mark for corresponding description Type of error: Logic (error) Description: Where the program does not behave as expected / Does not give expected result / An error in the logic of the algorithm **Or** Type of error: Run-time (error) Description: The program performs an illegal operation **Max 2**

3	Example solution
	
	`DECLARE FirstNumber : INTEGER`
	`DECLARE SecondNumber : INTEGER`
	`DECLARE ThirdNumber : INTEGER`
	
	`FirstNumber ← INT(RAND(21)) - 10`
	
	`OUTPUT FirstNumber`
	
	`REPEAT`
	`  SecondNumber ← INT(RAND(21)) - 10`
	`UNTIL FirstNumber <> SecondNumber`
	
	`OUTPUT SecondNumber`
	
	`IF FirstNumber < 0 AND SecondNumber < 0 THEN`
	`  ThirdNumber ← INT(RAND(6)) + 30`
	`  OUTPUT ThirdNumber`
	`ENDIF`
	
	Mark points:
	
	1. Declare all variables used
	2. Use `RAND()` function with any **integer** parameter
	3. Use `INT()` function with any **numeric** parameter
	4. Conditional loop until **two different** random numbers are generated
	5. Use `INT()` function using random number generated between –10 and 10 inclusive **in a loop**
	6. Output **two different** random integers / numbers
	7. Check if both random integers / numbers are negative
	8. then output a (third) random integer / number between 30 and 35 inclusive

4

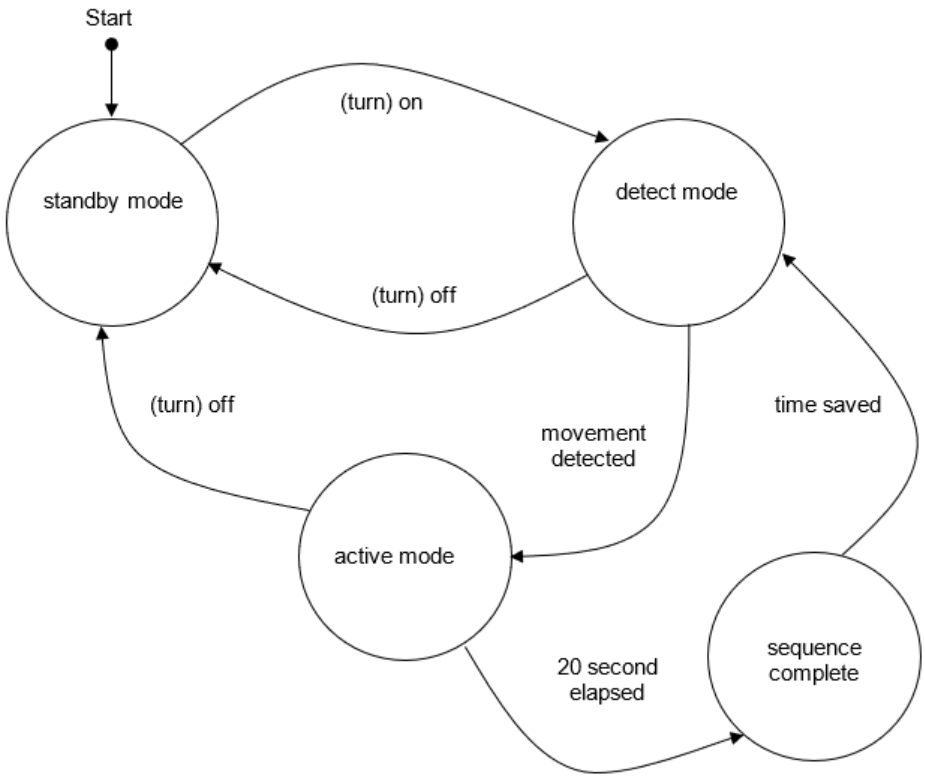


One mark for each functional group as listed:

1. Initialise Index used for `Number` to either 1 or 0 before first loop
2. Loop 100 times
3. Input value
4. Increment array index **and** store value in `Number` array at element referenced by array `index` **in a loop**
5. Output loop starts at last element in `Number` array
6. Output `Number` array element referenced by `Index` **in a loop**
7. Output all elements of `Number` array **once** in reverse order

Max 6

5(a)



Mark as follows:

1 Mark: The three new states drawn and labelled.

1 Mark: Two of the events drawn with labels connecting correct states and correct line direction

1 Mark: Four of the events drawn with labels connecting correct states and correct line direction.

1 Mark: All and only six events drawn with labels connecting correct states and correct line direction.

5(b)

Conditional Solution

Example Solution

```
DECLARE Count : INTEGER
DECLARE Line : STRING
DECLARE NextHour, Hour : STRING

OPENFILE "TimeTaken.txt" FOR READ
Count ← 1
READFILE "TimeTaken.txt", Line
Hour ← LEFT(Line, 2)

WHILE NOT EOF("TimeTaken.txt")
   READFILE "TimeTaken.txt", Line
   NextHour ← LEFT(Line, 2)
   IF NextHour = Hour THEN
     Count ← Count + 1
   ELSE
      OUTPUT "Hour : ", Hour, " Total : ", Count
      Hour ← NextHour
      Count ← 1
   ENDIF
ENDWHILE

OUTPUT "Hour : ", Hour, " Total : ", Count

CLOSEFILE "TimeTaken.txt"
```

Mark as follows:

1. Any Initialisation of count for number of pictures taken each hour
2. Open `"TimeTaken.txt"` for read and subsequently close
3. Conditional loop until EOF
4. Read a line from `"TimeTaken.txt"` **in a loop**
5. Extract Hour from line read **in a loop**
6. A mechanism to compare current hour extracted from file with last one read from file **in a loop**
7. If hours same increment count **in a loop**
8. If **not** same output count (with a suitable message) **and** update `Hour ← NextHour` **and** set Count to 1 **in a loop**
9. Output final `Count` **and** `Hour` (with a suitable message) **once only**

Note: max 8

5(b)

Alternative solution and mark scheme use of an array to hold count for each hour
Also, for use of 24 variables and 24 selection conditions

```
DECLARE HoursArray[0 : 23] OF INTEGER
DECLARE Index, Hour : INTEGER
DECLARE Line : STRING

FOR Index ← 0 TO 23
   HoursArray[Index] ← 0
NEXT Index

OPENFILE "TimeTaken.txt" FOR READ

WHILE NOT EOF("TimeTaken.txt")
   READFILE "TimeTaken.txt", Line
   Hour ← STR_TO_NUM(LEFT(Line, 2))
   HoursArray[Hour] ← HoursArray[Hour] + 1
ENDWHILE

FOR Index ← 0 TO 23
   IF HoursArray[Index] <> 0 THEN
      OUTPUT "Hour : ", Index, " Total : ",
                                          HoursArray[Index]
   ENDIF
NEXT Index

CLOSEFILE "TimeTaken.txt"
```

Mark as follows:

1. Initialisation of 24 array elements to 0 // Initialisation of 24 Integer variables to 0
2. Open `"TimeTaken.txt"` for read and subsequently close
3. Conditional loop until EOF
4. Read a line from `"TimeTaken.txt"` **in a loop**
5. Extract Hour from line read **in a loop**
6. Convert Hour to an integer value **in a loop**
7. Increment appropriate array element / variable **in a loop**
8. Output of each hour and corresponding count variable (with a suitable message) for all values **where count is not zero**

4(a)

MP1 **Open** the file (`Sales.txt`) in **read mode and** subsequently close

MP2 **Read <u>a line</u>** (from the text file)
MP3 Convert the line read (string) to a number
MP4 If the number is greater than 500 **and** then output week number
MP5 Increment week number (must have been Initialised **…**)
MP6 Repeat from step 2 for 52 times // Repeat from step 2 until end of file

Max 5

4(b)	**MP1** Going through the program **a line / statement at a time** **//** doing a **dry run** // **single-stepping (**at run-time with an IDE) // Peer testing/review is carried out **MP2** Creating a **trace table** **MP3** Draw up **test data** // draw up list **of inputs with expected output** **//** boundary, normal, abnormal data is used **MP4** Errors will be indicated when a **variable** / **output** gives an **unexpected value** **MP5** Faults in the logic of the program can be detected // Errors may be indicated by an unexpected path through the program **Max 3**

2(a)	`DECLARE Count, Total, NextNumber : INTEGER`
	
	`Total ← 0`
	`FOR Count ← 1 TO 100`
	`  OUTPUT "Input an integer value"`
	`  INPUT NextNumber`
	`  IF NextNumber > 0 THEN`
	`  Total ← Total + NextNumber`
	`  ENDIF`
	`NEXT Count`
	
	`OUTPUT Total`
	
	Mark as follows:
	MP1 Declarations of all variables used
	MP2 Loop for 100 iterations
	MP3 Prompt **and** input a value **in a loop and**
	MP4 Test for value > 0 // >=1 **in a loop**
	MP5 Sum the Total **in a loop**
	MP6 Output of Total after the **loop**
	
	Max 5 marks

2(b)	**MP1** Construct: Iteration / Repetition **MP2** Use: To loop through all 100 inputs // To loop 100 times ALTERNATIVE: **MP1** Construct: Selection **MP2** Use: To test whether the value input is positive

4(a)	One mark per highlighted part:
	
	`FOR Index ← 1 TO 5`
	`  Lower ← GB[Index] - 2`
	`  Upper ← GB[Index] + 2  // Lower + 4`
	`  IF Mark >= Lower AND Mark <= Upper THEN`
	`//IF Mark <= Upper AND Mark >= Lower THEN`
	`  OUTPUT "Check this paper"`
	`  ENDIF`
	`NEXT Index`

4(b)(i)	**MP1** Use `Mark` as the index to the `Check` array // to specify an array element **MP2** If value of indexed element is `TRUE`, then the paper will need to be checked

4(b)(ii)

Example:solution

```
PROCEDURE GBInitialise()
   DECLARE GBIndex, GBMark, ThisIndex : INTEGER

   FOR ThisIndex ← 0 TO 75
      Check[ThisIndex] ← FALSE // initialise all values
   NEXT ThisIndex

   FOR GBIndex ← 1 TO 5
      GBMark ← GB[GBIndex]
      FOR ThisIndex ← GBMark - 2 TO GBMark + 2
         Check[ThisIndex] ← TRUE //Set GBMark ± 2 to
                                                  TRUE
      NEXT ThisIndex
   NEXT GBIndex
ENDPROCEDURE
```

Mark as follows:

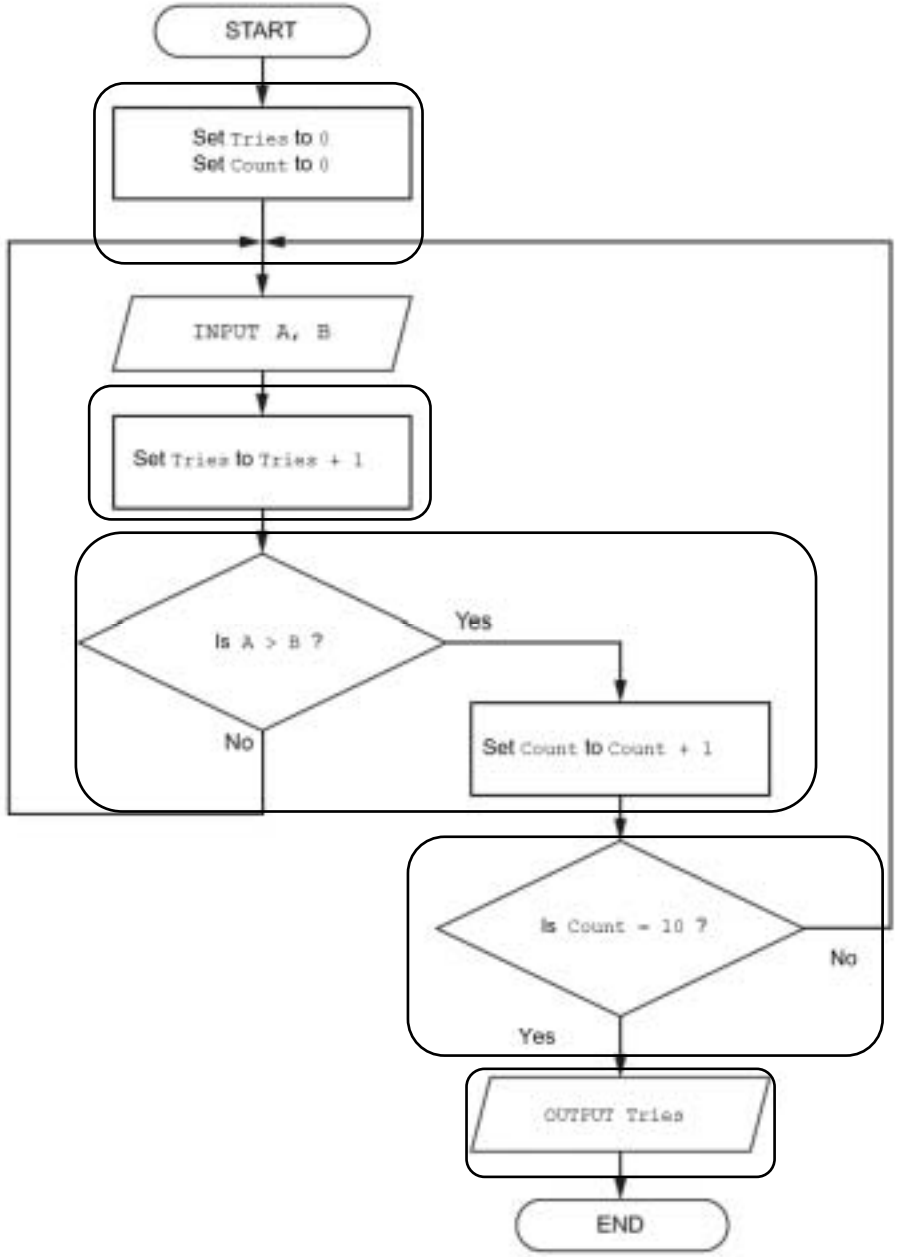
MP1 Procedure heading and ending
MP2 Initialise `Check` array to `FALSE`
MP3 Loop through `GB` array
MP4 Extract the `GB` mark
MP5 Loop for 5 elements across `GBMark` ± 2 // Check if within `GBMark` ± 2
MP6 Assign each element of `Check` array to `TRUE`

ALTERNATIVE – Example using selection Version 1

```
FOR ThisIndex ← 0 TO 75
   CASE ThisIndex
      GB[1] – 2 TO GB[1] + 2 : Check[ThisIndex] ← TRUE
      GB[2] – 2 TO GB[2] + 2 : Check[ThisIndex] ← TRUE
      GB[3] – 2 TO GB[3] + 2 : Check[ThisIndex] ← TRUE
      GB[4] – 2 TO GB[4] + 2 : Check[ThisIndex] ← TRUE
      GB[5] – 2 TO GB[5] + 2 : Check[ThisIndex] ← TRUE
   OTHERWISE: Check[ThisIndex] ← FALSE
   ENDCASE
NEXT ThisIndex
```

4(b)(ii)	ALTERNATIVE – Example using selection Version 2
	
	`DECLARE ThisIndex, GBIndex : INTEGER`
	`DECLARE Lower, Higher : INTEGER`
	
	`FOR ThisIndex ← 0 TO 75`
	`  For GBIndex ← 1 T0 5`
	`  Lower ← GB[GBIndex] - 2`
	`  Higher ← GB[GBIndex] + 2`
	`  IF ThisIndex >= Lower AND ThisIndex <= Higher THEN`
	`  Check[ThisIndex] ← TRUE`
	`  ELSE`
	`  Check[ThisIndex] ← FALSE`
	`  ENDIF`
	`  NEXT Index`
	`NEXT ThisIndex`
	
	Mark as follows:
	MP1 Procedure heading and ending
	MP2 Loop through `Check` array// loop from 0 to 75
	MP3 Attempt at using CASE / Selection structure with five clauses/ f**ive** checks for range
	MP4 Extract GB grade
	MP5 Compare `ThisIndex` with each element in GB array ±2
	MP6 Assign each element of `Check` array to `TRUE` if in range **or** `FALSE` if not in range

2(a)



One mark per outlined region:

1 Initialise both counts
2 Increment `Tries` every time a pair is input
3 Compare A > B **and** increment `Count` if TRUE
4 Test for Count = 10 (10th time A > B) – MUST include Yes / No labels
5 If so output `Tries`, otherwise loop

2(b)

One mark per point:

1 A (variable of type) string will be input // by example e.g. “67,72”
2 A special / identified character would need to be used to separate each numeric value // all numbers are fixed length