Criterion C: Product Development

Techniques used to create the spreadsheet

Only Q5 has been fully developed as the second version is based on a proof of concept.

- Original code to enhance functionality and ability of the product to dynamically adjust (page 4)
- Integration of original code and code generated by Excel (page 5)
- Calling procedures from other procedures (page 6)
- A range of cell formatting techniques (pages 7 - 8)
- 3D cell referencing and inserting data from procedures into cells (page 7)
- Declaring global and local variables (page 8)

Spreadsheet structure – explanation and justification

The spreadsheet was designed with an “at a glance” summary sheet to allow Margaret and the schools senior managers to view all of the results easily. The “marks” sheet allows Margaret and her department to add the results easily and provides the reference point for the programs to operate from.

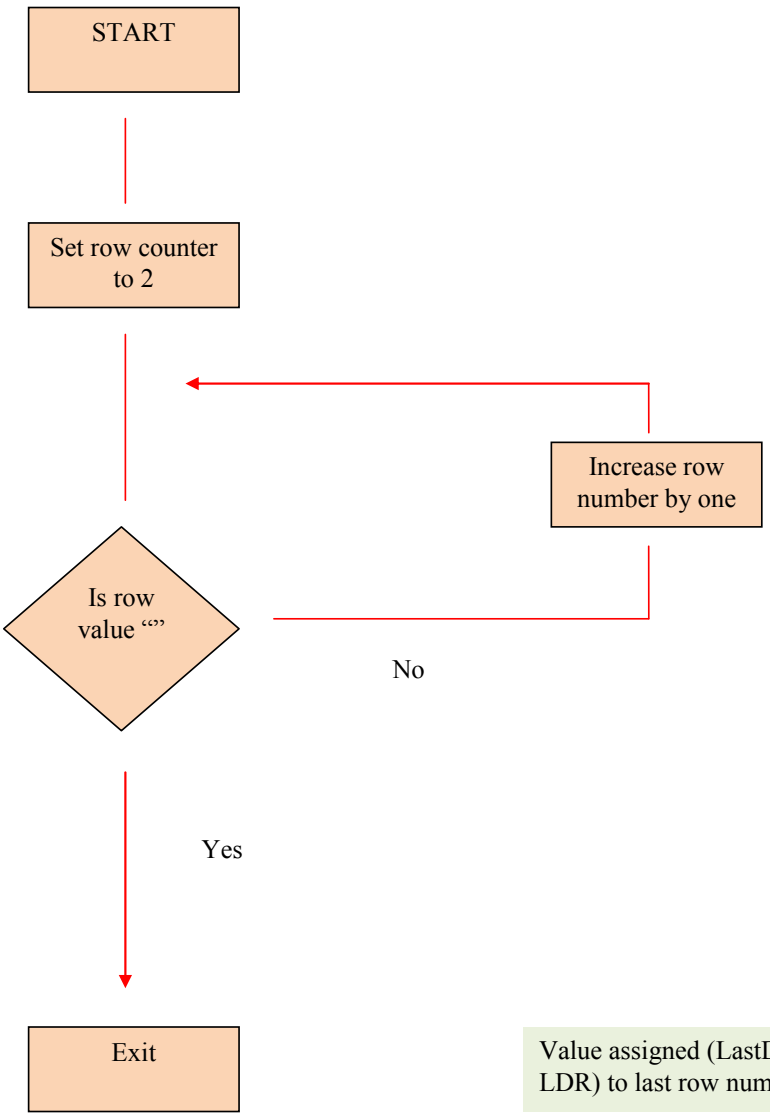
Once the macros are run, the information for each student is copied across to the sheets “Q5” or “Q6”, depending on the question they have attempted. The “Q5” sheet also allow the teacher to sort the results so that the students who have done least well (based on their expected score) to be easily seen allowing Margaret to look at these scripts more carefully in case the problems in the questions have significantly affected them.

The “Q5_chart” sheet provides a easily viewable chart to allow Margaret to look in more detail at the patterns that have emerged.

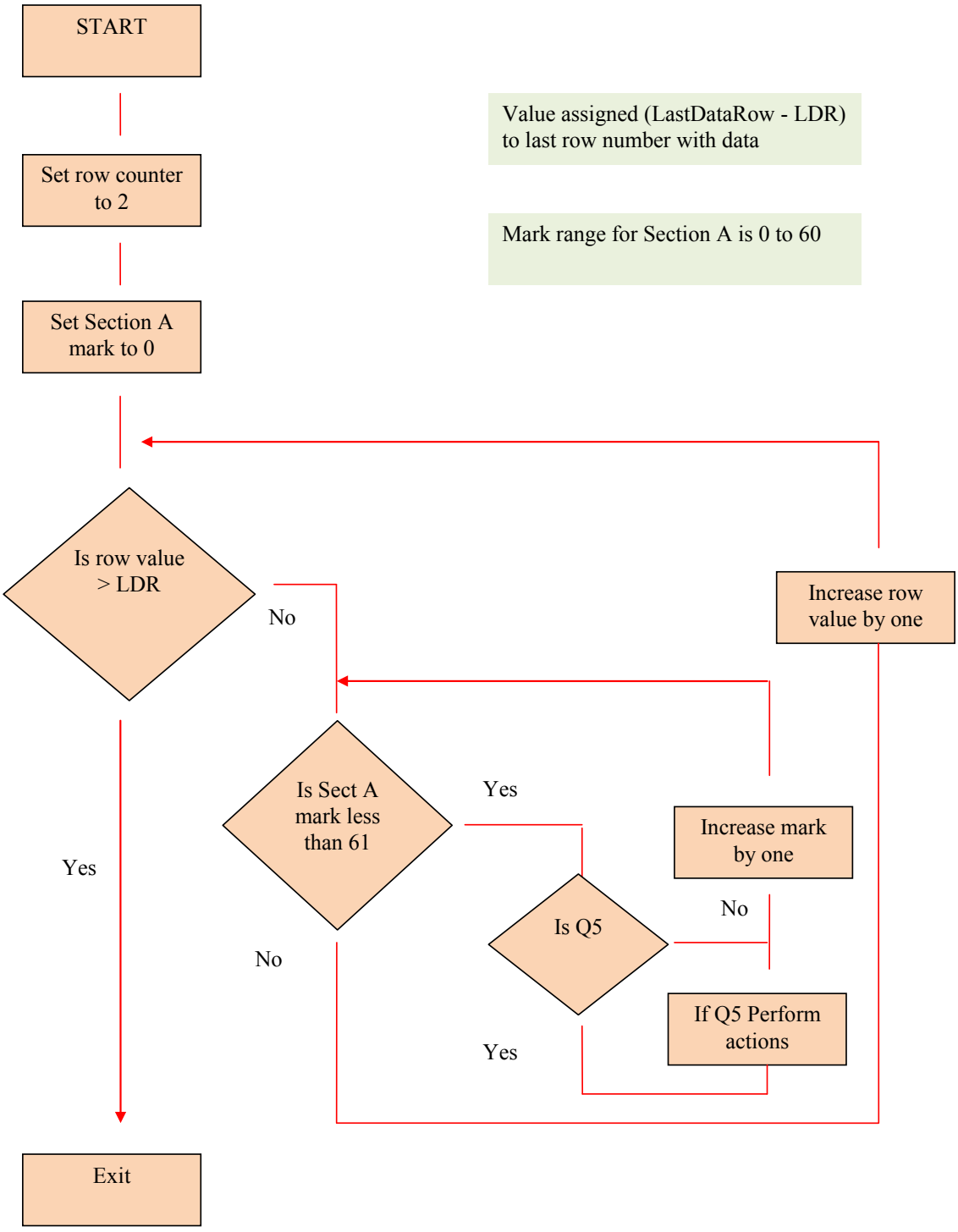
The underlying code has had comments added to allow a third party to maintain the spreadsheet or further develop it.

Spreadsheet algorithms

Algorithm to detect the last row of data. This means that the user does not have to edit code in a spreadsheet when new records are added.



Algorithm to separate student responses for Q5. This separates the responses into only those where question 5 was attempted.



Techniques used

Original code to enhance functionality and ability of the product to dynamically adjust

The use of code will not require the user to scroll down the spreadsheet to determine where the last row of data is with the problems of incorrect transferring of numbers or not selecting the correct data range.

Within the CountRecords procedure global variables have been used that allow the LastDataRow value to be used in other procedures

```
Dim RecordCounter As Integer 'counter used to count the number of records until an empty cell is
Dim LastDataRow As Integer 'indicates the last row of data in the spreadsheet
Dim TotalQ5 As Integer 'declares the total of student scores for Q5

Sub CountRecords()

RecordCounter = 2 'sets the value to the first row containing data


Do Until Worksheets("Marks").Cells(RecordCounter, 4).Value = ""
  RecordCounter = RecordCounter + 1
Loop

'MsgBox "Total number of records = " & RecordCounter - 1 : testing information
LastDataRow = RecordCounter - 1
'MsgBox "Last row holding data is row: " & LastDataRow : testing information

End Sub
```

The Do Until loop is used as the number of records is unknown and it will continue to loop until the condition (row value is “”, an empty string) is met.

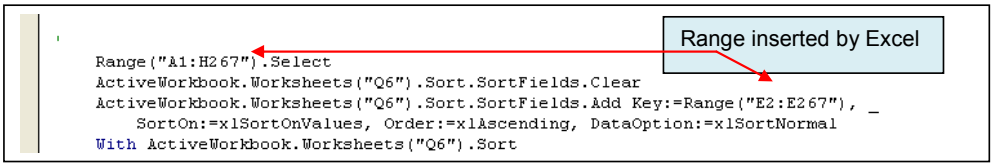
Different loops have also been used (For .. next) when there has been a known number of iterations required or (Do … until) when there have been an unknown number.

Integration of original code and code generated by Excel

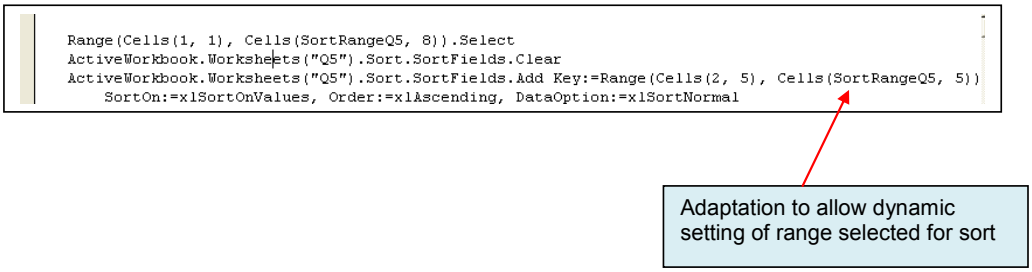
The integration of code generated by Excel and original code was used to dynamically assign the selected area for the sort of the Q5 results. This was used to avoid the user having to select the area for sorting and completely automate the process.

To do this the code inserted when a macro is generated is modified to allow the area used in the sort to be dynamically set depending on the number of students who have attempted Q5.

The original code (Q6) used would look as follows:



The code is adapted (Q5) as followed:



Code adapted from:

Source: "Xtreme VB talk." *Xtreme VB talk*. N.p., 2010. Web. 2 Nov 2010. http://www.xtremevbtalk.com/showthread.php?t=112863 .

Calling procedures from other procedures

This technique is used to enable code to be reused and for easier testing. In this spreadsheet there are two examples where this occurs:

Using the total number of rows in the teacher's marks sheet.

This will mean that the information that is used for Q5 can also be used for Q6 as the number of rows of data in the spreadsheet are the same. It shows that the same block of code can be used more than once.

This is demonstrated in the following code:

```
Sub MarkPlayQ5()

'Procedure for Question 5 only

Dim Counter As Integer 'declares the row counter to work through the for loop, this is the number of

TotalQ5 = 0 'sets the total of student scores

Dim Mark As Integer 'assigns the possible mar

Dim TotalMarkSectionA As Integer 'value that                                    on A where the
TotalMarkSectionA = 0 'sets the value to 0

Dim AveMarkSectionA As Integer 'value to hold
AveMarkSectionA = 0 'sets the value to zero

Dim CountQ5 As Integer
CountQ5 = 1 'counts the number of times Q5 he

Dim CountBadQ5 As Integer 'declares the variable to hold all of the vlaues of Q% that are more than
CountBadQ5 = 0 'sets the value to zero

'text here is inserted into the header row of Worksheet Q5
Worksheets("Q5").Cells(CountQ5, 1).Value = "Sect A /40"  'inserts the column headings on Worksheet Q
Worksheets("Q5").Cells(CountQ5, 2).Value = "Q5 /20"
Worksheets("Q5").Cells(CountQ5, 3).Value = "Q5 Expected"
Worksheets("Q5").Cells(CountQ5, 4).Value = "Q5 Difference"
Worksheets("Q5").Cells(CountQ5, 5).Value = "Q5 % Diff"
Worksheets("Q5").Cells(CountQ5, 6).Value = "Fname"
Worksheets("Q5").Cells(CountQ5, 7).Value = "Surname"
Worksheets("Q5").Cells(CountQ5, 8).Value = "Overall loss"

'loop to calculate the average mark etc, need to check this more closely

Call CountRecords 'calls the procedure to count the records
```

Allows the total number of records generated in the CountRecords procedure to be inserted dynamically into the MarkPlay procedure

This also prevents the code for CountRecords having to be retyped into each procedure that may want to call it.

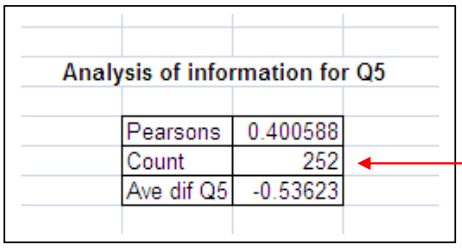
The LastDataRow value generated in the CountRecords procedure is indicated below:

```
Call CountRecords 'calls the procedure to count the records

MsgBox "The row of the last row of data is " & LastDataRow 'provides a

For Counter = 2 To LastDataRow 'determines the number of iterations re
```

LastDataRow is the final value of the teachers raw marks that holds data

3D cell referencing and inserting data from procedures into cells

These techniques, in the procedure Markplay, have been used to extract data calculated by the code and to insert it into sheets such as “Q5” for Margaret to see a summary of the findings.



Analysis of information for Q5

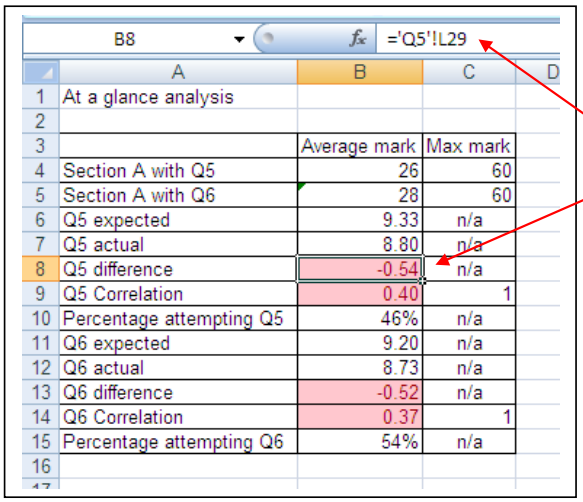
Pearsons	0.400588
Count	252
Ave dif Q5	-0.53623

Total number of students who attempted Q5 (Cell L28)

```
'outputs results below into the sheet Q5
Worksheets("Q5").Cells(28, 12).Value = TotalQ5 'inserts the total number of students
Worksheets("Q5").Cells(29, 12).Value = TotalDifQ5 / CountQ5 'calculates and inserts
```

Average difference between actual and expected mark of students who attempted Q5 (Cell L29)

These values are also automatically copied into the Summary table on the sheet “At a glance” using 3D cell referencing to prevent the need to copy and paste data or issues linked to version control.



B8 fx ='Q5'!L29

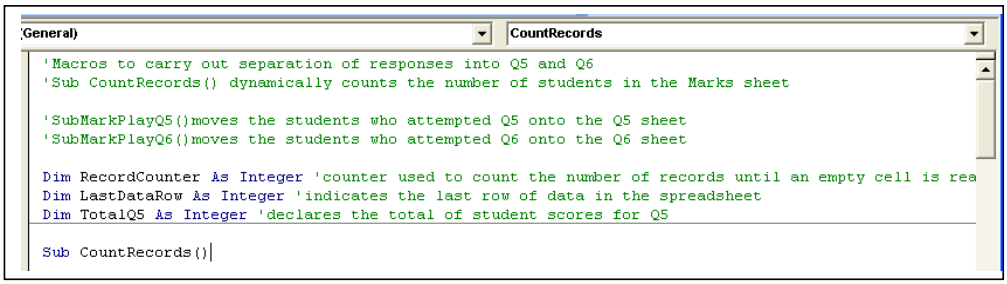
	A	B	C	D
1	At a glance analysis			
2				
3		Average mark	Max mark	
4	Section A with Q5	26	60	
5	Section A with Q6	28	60	
6	Q5 expected	9.33	n/a	
7	Q5 actual	8.80	n/a	
8	Q5 difference	-0.54	n/a	
9	Q5 Correlation	0.40	1	
10	Percentage attempting Q5	46%	n/a	
11	Q6 expected	9.20	n/a	
12	Q6 actual	8.73	n/a	
13	Q6 difference	-0.52	n/a	
14	Q6 Correlation	0.37	1	
15	Percentage attempting Q6	54%	n/a	
16				

The value in cell B8 is linked to cell L29 in the “Q5” sheet.

The value in cell L29 of the “Q5” sheet is generated by the procedure Markplay

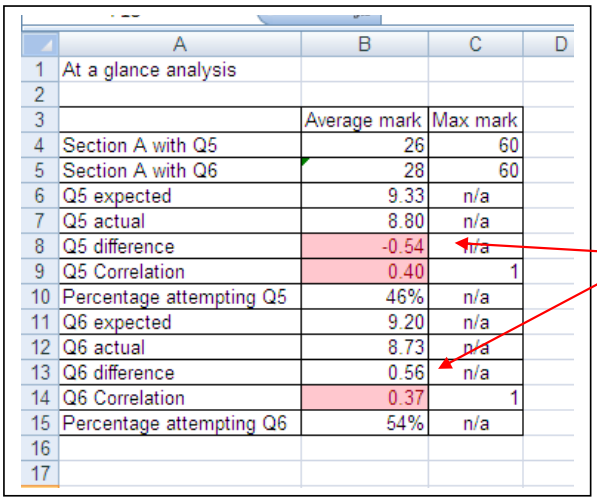
Declaring global and local variables

Global variables are declared where they are to be used across a range of different procedures. For example the LastDataRow variable is declared as global as it is used in at least two procedures.



A range of cell formatting techniques

Cell formatting is used to enable Margaret to easily see where students have done better or worse than anticipated. For example, for Q5 the students scored -0.54 of a mark below what would be expected, however for Q6 they exceeded expectations.



	A	B	C	D
1	At a glance analysis			
2				
3		Average mark	Max mark	
4	Section A with Q5	26	60	
5	Section A with Q6	28	60	
6	Q5 expected	9.33	n/a	
7	Q5 actual	8.80	n/a	
8	Q5 difference	-0.54	n/a	
9	Q5 Correlation	0.40	1	
10	Percentage attempting Q5	46%	n/a	
11	Q6 expected	9.20	n/a	
12	Q6 actual	8.73	n/a	
13	Q6 difference	0.56	n/a	
14	Q6 Correlation	0.37	1	
15	Percentage attempting Q6	54%	n/a	
16				
17				

Conditional formatting on the differences for Q5 and Q6