Interactive I.T. Student Activity Sheets
Leaving Certificate Strand 1

- **Student Activities written to match the I.T. interactive modules on the Project Maths Leaving Certificate Student's CD Strand 1**
- **Interactive Activity Sheets included to enhance students' understanding of mathematical concepts**
- **Simple and clear guidelines are provided to facilitate learning**
- **Interesting questions are provided to lead students to explore, construct and consolidate their learning**

Preface

The NCCA have pointed out particular key Skills in their Draft Syllabus. "While particular emphasis is placed in mathematics on the development and use of information processing, logical thinking and problem-solving skills, the new approach being adopted in the teaching and learning of mathematics will also give prominence to students being able to develop their skills in communicating and working with others. By adopting a variety of approaches and strategies for solving problems in mathematics, students will develop their self-confidence and personal effectiveness." To help our students to adapt to and take advantage of this new spirit of the syllabus, we have produced Interactive I.T. Student Activity Sheets which incorporate an innovative and diversified learning environment for mathematics.

As we all know, the advancement in technology has changed the way we can learn mathematics. Therefore we have developed a number of interactive modules on our student's CD to match this new development. With the help of these interactive modules, students can not only enhance their understanding in mathematics, but they can also enjoy learning it.

In order to help our students use the I.T. tools more effectively, ***Interactive I.T. Student Activity Sheets Leaving Certificate Strand 1*** are produced in this booklet. A student activity sheet is designed for the majority of the interactive modules on the CD. All student activity sheets provide simple and clear guidelines including:

1. Reference to the related topics in ***Project Maths Student's CD Leaving Certificate Strand 1 section***
2. Purpose of the I.T. tools
3. Instructions for using the I.T. tools.

These Student Activity Sheets, which include many interesting questions, will lead students to explore, construct, and consolidate their knowledge of mathematics on their own with ease. We believe that with the help of these activities, students' knowledge and understanding of mathematics will grow

Table of Contents

Instructions for use

This booklet contains student activities to accompany the majority of the interactive files on the Leaving Certificate Strand 1 section of the student disk. The specific section of the course that the activity relates to is specified in the name of the activity. At the top of each student activity the students are told what interactive file on the student disk is to accompany the student activity.

Technical Problems

The student disk has a link situated on the left hand side of its front page called "Troubleshooting" this section gives instructions, if any of the following problems are encountered:

- Problems opening Office 2007 documents
- You do not have Java on your machine
- You do not have a PDF reader on your machine.

Student Activity: To investigate the effect of adding a common constant to all data

Use in connection with the interactive file "Effect on Mean by adding a constant" on the Student's CD.

1. Calculate the mean of the following data set 5, 4, 3, 2, 1 manually.

   _____

   _____

2. Insert the data set 5, 4, 3, 2, 1 into the interactive file. Click the arrow No 2 to calculate the mean.

   _____

3. Calculate the mean of the following data set 10, 9, 8, 7, 6 manually.

   _____

   _____

4. Insert 5 as the common constant in the interactive file and click to calculate the new mean. Explain what this does to each data item and record the new mean.

   _____

   _____

5. Repeat with different common constants. Do you notice any relationship between the mean before the common constant is added and the mean after the common constant is added?

   _____

   _____

6. What is the effect on the mean of a set of data items of adding a common constant to all items in the data set?

   _____

   _____

7. If the mean of a set of 100 data items is 55 and 10 is added to each data item, what will the new mean be?

   _____

   _____

8. If 5 is added to each item in a data set and the mean is found to be 23, what would the mean of the original numbers have been?

   _____

   _____

Student Activity: To investigate the effect of multiplying all the data by a common constant

Use in connection with the interactive file "Effect on the Mean by multiply data items by a constant" on the Student's CD.

1. Insert the data set 8, 7, 6, 5, 4 into the interactive file and click the arrow to calculate the mean.

   _____

   _____

   _____

2. Insert 5 as the common constant and click to calculate the new mean. Explain what this does to each data item and record the new mean.

   _____

   _____

   _____

3. Repeat with different common constants. Do you notice any relationship between the mean before the data items are all multiplied by the common constant and the mean after the data items are all multiplied by the common constant?

   _____

   _____

   _____

4. What is the effect on the mean of multiplying all the data items by a common constant?

   _____

   _____

5. If the mean of a set of 10 data items is 34 and each data item is multiplied by 5, what will the new mean be?

   _____

   _____

   _____

6. If each item in a data set is multiplied by 10 and the mean is found to be 23, what would the mean of the original numbers have been?

   _____

   _____

Student Activity: To investigate the effect on the mean of adding an extra data item to a data set when the value of this data item is zero

Use in connection with the interactive file "Effect on the Mean by adding a new data item" on the Student's CD.

1. Calculate the mean of the data set 8, 7, 6, 5, and 4 manually.

   _____

   _____

2. Insert the following data set 8, 7, 6, 5, 4 into the interactive file. Click to calculate the mean.

   _____

3. What was the mean in the interactive file and did it agree with the answer you got in No 1? If not recheck your work in No 1.

   _____

4. Calculate the mean of the data set 8, 7, 6, 5, 4 and 0 manually.

   _____

   _____

5. Click arrows 3 and 4 in the interactive file to check your answer to No 4.

   _____

6. What was the difference in the data sets in No 1 and No 4 and are their means equal?

   _____

   _____

   _____

7. Click the button to reset the interactive file. Insert a data set of your own and after clicking the arrows 1-4 answer the question "Are the Mean and New Mean related?" Repeat this question once more.

   _____

   _____

8. If one adds a new data item that is equal zero to a data set, is the mean of the new data set always going to be bigger or smaller than the mean of the original data set? Explain why.

   _____

   _____

Stem and Leaf Quiz

Use in connection with the interactive file" Stem and Leaf" on the Student's CD.

1. 29 is the data item, is 2 or 9 the stem?
   A. 2 B. 9

2. 45 is the data item, is 5 the stem?
   A. No B. Yes

3. When the data item is a single digit like 6, is the stem 0?
   A. Yes

   B. No

4. Can a stem and leaf diagram deal with two data items being the same?
   A. Yes

   B. No

5. Are stem and leaf diagrams confined to dealing with item items between 0 and 100?
   A. Yes B. No

6. Which stem has more leaves?
   A. The least popular

   B. The most popular

7. Do the stems for a set of marks have to stop at 9?
   A. No

   B. Yes

8. Students are allowed marks between 30 and 80 inclusive, what numbers would be in the stem if they went up in 10's?
   A. 3,4,5,6,7,8

   B. 3,4,5,6,7

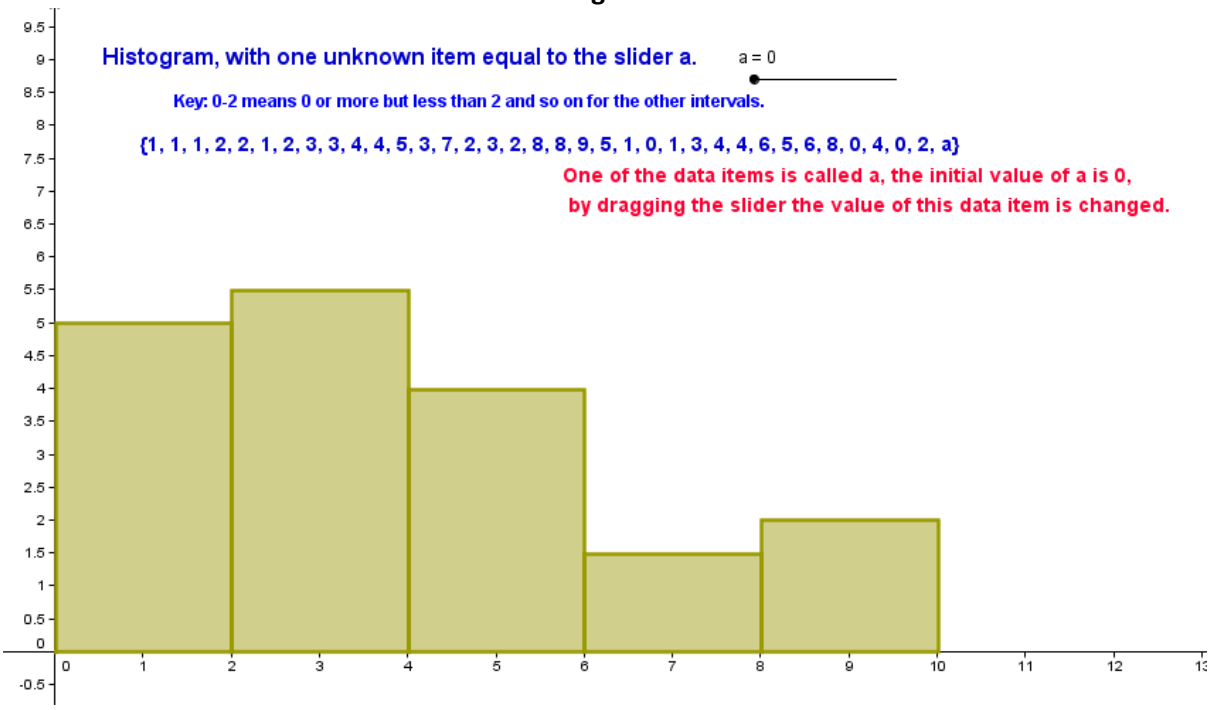
9. Do Stem and Leaf diagrams have to be in colour?
   A. Yes B. No

10. What is the median of the following stem and leaf?
    20: 7 8
    30: 5 5 5 6 7 9
    40: 1 3 6 8
    50:
    60: 3

    A. 37 B. 35

Student Activity: To investigate the effect of changing one data item in a histogram

Use in connection with the Interactive file "Histogram 2" on the Student's CD.



1. How many class intervals are in the histogram in the interactive file?

   _____

2. Using the given key, what values can be placed in the class interval 4-6?

   _____

3. What property of each rectangle represents frequency?

   _____

4. Using the interactive file as it was when first opened and given that there are 10 items in the class interval 0-2, complete the table?

Class Interval	Frequency	Reason
0-2		
2-4		
4-6		
6-8		
8-10		

5. Using your figures in Question 4, what is the total of all the frequencies. Check your answer using the interactive file.

_____

_____

6. Can this histogram represent any data greater than or equal to 10? Explain.

_____

7. The frequency of the data items can be varied with the slider a,

   a. Move the slider from 0 to 2 and complete the table:

The slider a equals 2	
Class Interval	Frequency
0-2	
2-4	
4-6	
6-8	
8-10	

How does this differ from the original table in question 4 of this student activity?

_____

   b. Move the slider to 6.5 and complete the corresponding table, then move the slider to 8.5 and complete the corresponding table.

Slider equals 6.5	
Class Interval	Frequency
0-2	
2-4	
4-6	
6-8	
8-10	

Slider equals 8.5	
Class Interval	Frequency
0-2	
2-4	
4-6	
6-8	
8-10	

What causes the change in the two tables in part b. of this question?

_____

8. Give possible labels for the x axis that this histogram could represent. Note histograms are used for continuous data.

_____

_____

_____

9. Reset the slider in the interactive file. If the boundaries of the class interval remained the same, but the frequency doubled in each interval, complete the table and draw the corresponding histogram.

Class Interval	Frequency
0-2	
2-4	
4-6	
6-8	
8-10	

<u>Student Activity</u>: To investigate the mean and standard deviation of a data set

Use in connection with the interactive file "Mean and SD" on the Student's CD.

Interval	Mid Interval	Frequency	Mid Interval X Frequency	Deviation = (Mid Interval - Mean)	Deviation ^{2} = (Mid Interval - Mean)^2	Frequency X (Mid Interval - Mean)^2
0 - 2	1	5				
2 - 4		8				
4 - 6		6				
6 - 8		6				
8 - 10		3				
10 - 12		2				
12 - 14		0				

(Note the interactive file records the Mean and Standard Deviation correct to 1 decimal place.)

1. How many students are in the class?

   _____

   _____

2. What is the mid interval between 2 and 4?

   _____

   _____

3. What is another name for how often an item occurs in an interval?

   _____

   _____

4. Calculate the Mid Interval values for all the intervals. Check your results using the interactive file.

   _____

   _____

   _____

   _____

   _____

5. Calculate the value of the Mid Interval x Frequency for all the intervals. Check your results using the interactive file.

_____

_____

_____

_____

_____

6. What 2 sets of figures does one need to calculate the mean?

_____

_____

7. Calculate the mean for the following data set:

Interval	Mid Interval	Frequency
0 - 2	1	5
2 - 4		8
4 - 6		6
6 - 8		6
8 - 10		3
10 - 12		2
12 - 14		0

8. List the steps required to calculate the mean of a set of data in a frequency table.

_____

_____

_____

_____

_____

9. Calculate the deviation = (mid interval value – mean) for all the intervals. Check your results using the interactive file.

_____

_____

_____

_____

_____

10. Calculate the values of the deviation^2 for all the intervals. Check your results using the interactive file.

_____

_____

_____

_____

_____

11. Notice that Step 4 changes all the numbers to positives. Does this mean that it does not matter which side of the mean the deviation is on? Comment on your answer.

_____

_____

12. Calculate the values of the deviation^2 X frequency for all the intervals. Check your results using the interactive file.

_____

_____

_____

_____

13. Calculate the standard deviation and use the interactive file to check your results.

_____

_____

_____

_____

14. List the steps required to calculate the Standard Deviation of a set of data in a frequency table?

_____

_____

_____

_____

15. Complete the table and calculate the Mean and Standard Deviation for the following table:

Interval	Mid Interval	Frequency	Mid Interval X Frequency	Deviation = (Mid Interval - Mean)	Deviation ^{2} = (Mid Interval - Mean)^2	Frequency X (Mid Interval - Mean)^2
0 - 2	1	4				
2 - 4		4				
4 - 6		1				
6 - 8		4				
8 - 10		4				
10 - 12		2				
12 - 14		1				

$$\text{Mean} = \frac{\text{Total(Mid Interval} \times \text{Frequency)}}{\text{Total(Frequency)}}$$

_____

_____

$$\text{Standard Deviation} = \frac{\text{Total(Frequency} \times \text{(Mid Interval - Mean)}^2\text{)}}{\text{Total(Frequency)}}$$

_____

_____

_____

Check your results on the interactive file.

_____

_____

16. What do you think will be the effect on the data, if all the students are very busy in a period just before their exams?

_____

_____

_____

17. If all the students got flu and were not able to take part in sports, what would be the effect on the mean and standard deviation?

_____

_____

_____

18. In order to increase the mean, what type of students would need to join the class? You can change the figures in the interactive table.

_____

_____

_____

Mean and Standard Deviation Quiz

Use in connection with the interactive file "Mean and SD Quiz" on the Student's CD.

1. How many students are in the class?
   A. 30

   B. 7

2. What is the mid Interval value for the interval 6-8?
   A. 3

   B. 7

3. In the (Mid Interval - Mean) column in the table, is it true that Mid Interval values less than the mean will give a negative value for the (Mid Interval -Mean) column?
   A. Yes

   B. No

4. After the (Mid Interval - Mean) has been squared must it be multiplied by the frequency, true or false?
   A. False

   B. True

5. Which of the following is the formula for standard deviation, when the frequency is greater than or equal to 1?
   A.

$$\sqrt{\frac{\sum f(x-\bar{X})^2}{\sum f}}, \text{where f= frequency, x = mid interval value and } \bar{X} = \text{the mean.}$$

   B.

$$\sqrt{\frac{\sum (x-\bar{X})^2}{\sum f}}, \text{where f= frequency, x = mid interval value and } \bar{X} = \text{the mean.}$$

6. Reset the table and run the arrows again. Now if the number of people in the Interval 12-14 increased by 4, would the mean increase?
   A. No

   B. Yes

7. If the number of people in the interval 0-2 increased by 4, would it have the same effect on the mean as the interval 12-14 increasing by 4?
   A. No B. Yes

8. If you remove all of the students in the interval containing the mean and don't replace them, what effect will it have on the Standard Deviation? Use the interactive file.
    A. It increases

    B. It decreases

9. Now click the Reset button on the table, and fix it so that all 30 students are in the 6-8 interval, what is the standard deviation?
    A. 30

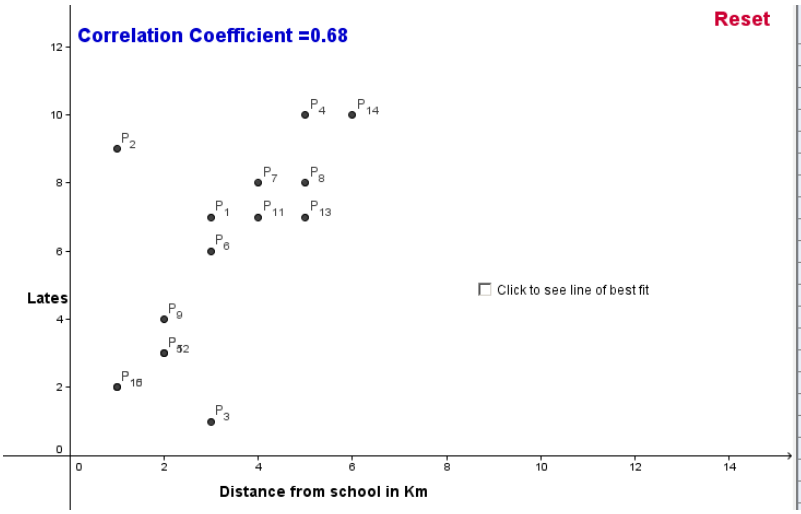
    B. 0

10. If all 30 students were in the range 12-14, then the Standard Deviation would be 0?
    A. True

    B. False

Student Activity: To investigate correlation and line of best fit

Use in connection with the Interactive file "Correlation and line of best fit" on the Student's CD.



	A	B	C	D
1	Student	(Km)	Late (in 3 month period)	Point
2	A. Lynch	3	7	P1
3	J. Ryan	1	9	P2
4	J. Moran	3	1	P3
5	D. McGowan	5	10	P4
6	M. Mason	2	3	P5
7	W. Martin	3	6	P6
8	C Harvey	4	8	P7
9	E. Bates	5	8	P8
10	C. Cullins	2	4	P9
11	K. Kelly	1	2	P10
12	J. Jones	4	7	P11
13	M. Quinn	2	3	P12
14	D. Byrne	5	7	P13
15	J. Bradley	6	10	P14
16	F. Morrow	1	2	P15
17				
18				
19				
20				
21				
22				

1. What type of graph is represented by the plotted points?

   _____

   _____

2. From viewing the interactive file do you consider that there is any correlation between the distance someone lives from school and the number of days they were late? Explain your answer.

   _____

   _____

3. In the diagram provided in the interactive file does the line of best fit have a positive or negative slope, what does this tell us?

   _____

   _____

4. List a data set that would enable the student in question to be described as an outlier and explain your answer.

   _____

   _____

5. It was discovered that an error had been made in J. Ryan' s figures and in fact he had been late no days. What effect would this have had on the correlation and line of best fit?

   _____

   _____

6. What is the effect of changing F. Morrow's figures to 8 lates? Explain the reason why?

_____

_____

7. What is the effect of changing Harvey's, Bates's, Kelly's and Byrne's number of lates to zero? Explain your answer. What shape is the line of best fit now?

_____

_____

8. If all the points lay on the line of best fit, what is the correlation?

_____

_____

9. Give a reason, other than distance from the school that could explain why some students were late.

_____

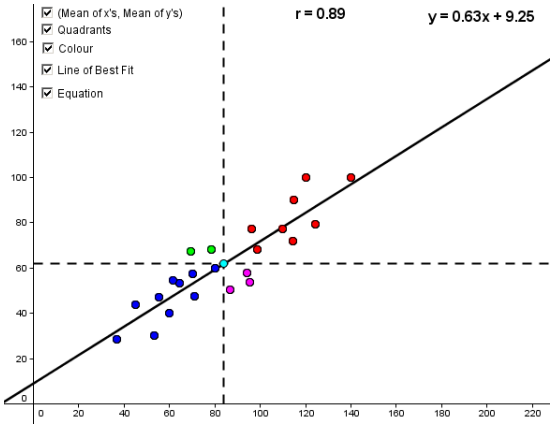
_____

Tasks Related to "Correlation and Line of Best Fit 2"

Use in connection with the interactive file, 'Correlation and Line of Best Fit 2', on the Student's CD.

Calculating the point (Mean of x s, Mean of y s) and using it to split the plane into 4 quadrants is <u>not</u> specifically mentioned in the syllabus. However, it is a helpful way of learning about relationships in the data.

The purpose of this task sheet is to explore the relationship between the pattern of the points in a scatter plot, the correlation coefficient, line of best fit, outliers, the point (Mean of x s, Mean of y s) and the numbers of points in each quadrant.



Task 1

Leave the 24 points as they are. Click on **"(Mean of x s, Mean of y s)"**. This shows the point that is the centre of the data. We will call this the point A

Click on **"Quadrants"**.

<u>Complete the sentence:</u> The bottom left quadrant has all the points that have below average x-values and _____ average y-values.

<u>Complete the sentence:</u> The top right quadrant has all the points that have above average x-values and _____ average y-values.

Click on **"Colour"**.

Count up all the points in each of the quadrants. Does the amount of points in each quadrant hint at a relationship in the data?

By looking at your answers to the previous questions and the diagram is there a **<u>linear</u>** relationship in the data?

By looking at both the correlation coefficient and the scatter plot could you say that as the x-values of the points increase the y-values of the points tend to increase?

Click on **"Line of Best Fit"** and **"Equation"**.

Does the line of best fit pass through all the points in the scatter plot?

Does the line of best fit have to go through any of the points in the scatter plot?

What can you say about the point A and the line of best fit?

Your friend George asks "Does the line of best fit have to have half the points on either side of it?". Move the points and see if you can answer George's question.

Drag some of the points around the screen so that the linear relationship is maintained. Which 2 quadrants does the line of best fit pass through when the correlation coefficient (r) is close to 1?

Drag some of the points around the screen so that the points are still in a linear relationship. Which 2 quadrants does the line of best fit pass through when the correlation coefficient (r) is close to –1?

Task 2

Reset the scatter plot using the icon at the top right-hand corner of the screen  .

Move the points so that there are an equal number of points in all four quadrants.

(a) Arrange the points so that they are bunched together into a "cloud" or "swarm". Is the correlation coefficient close to 1, –1 or 0?

(b) Arrange the points so that they resemble the outline of a circle. Is the correlation coefficient close to 1, –1 or 0?

(c) Arrange it so that the points in two of the quadrants are stretched out into a line and the points in the other two quadrants are close to the point A is the correlation coefficient close to 1, –1 or 0?

Task 3

Reset the scatter plot using the icon at the top right-hand corner of the screen  .

Put 10 points in the top right quadrant. Put 10 points in the bottom left quadrant.
Put 2 in the top left quadrant. Put 2 points in the bottom right quadrant.

While keeping the number of points in each quadrant as outlined above can you adjust the points so that there is a correlation close to -1 or 1?

While keeping the number of points in each quadrant as outlined above can you adjust the points so that there is a correlation close to 0?

Having a large number of points in the bottom left and top right quadrants doesn't always indicate association between the variables. There must be a linear pattern for the correlation coefficient (r) to be close to -1 or 1.

Task 4

Reset the scatter plot using the icon at the top right-hand corner of the screen  .

Move the points so that the pattern looks like a quadratic.

Is there a pattern to the points?

Is the pattern linear?

There may be a strong association between the variables, but since the relationship is not linear it wouldn't be useful to summarise the strength of the relationship with the correlation coefficient (r) or to draw a line of best fit.

Task 5

Reset the scatter plot using the icon at the top right-hand corner of the screen  .

Group all the points into a tight bunch in one of the corners of the screen.

Adjust the points until you have a correlation coefficient close to 0.

Drag one point very far away from this bunch e.g. to towards the opposite corner of the screen.

Watch the correlation coefficient changing.

23 of the points are in a bunch and there is 1 point far away from the rest.

Is there a linear relationship between the points?

What conclusion can you draw about the effect of the outlier on the level of correlation?

The correlation coefficient indicates a strong linear relationship but by looking at the graph you see that the relationship is not linear (without the outlier the correlation coefficient is near 0).

It is important to analyse the data both numerically (correlation coefficient) and graphically (scatter plot).

A single outlier can bring the value of r close to –1 or 1

Task 6

Set the points up so that they are (almost) in a line (that isn't horizontal or vertical).

Take note of the correlation coefficient (r).

Drag one point very far away from this line of dots.

How does the correlation coefficient (r) change?

A single outlier can bring the correlation coefficient close to zero.

Scatter plot Quiz

1. A scatter plot graphs pairs of numerical data, with one variable on each axis, to look for a relationship between them.
   A. True B. False

2. A scatter plot can be used when the dependent variable may have multiple values for the independent variable.
   A. True B. False

3. The better the correlation the closer the points will be to the line of best fit.
   A. True B. False

4. What are data points that lie far away from the overall pattern of the rest of the data called?
   A. Outliers B.Outsiders

5. Strong positive and negative correlations show data points clustered close to the line of best fit.
   A. True B. False

6. A line of best fit which is drawn from top left of the graph towards the bottom right shows what type of correlation?
   A. Positive

   B. Negative

7. In a positive correlation both variables will move in the same direction. True or false?
   A. True B. False

8. When the data points have been plotted, the more the diagram resembles a straight line the weaker the relationship.
   A. True B. False

9. When the scatter plot shows a strong correlation we can assume that one variable caused the other.
   A. True B. False

10. Weak positive and negative correlations show data points clustered close to the line of best fit. True or false?
    A. True B. False

11. Look at the following proverb – Does it indicate negative or positive correlations?
    •Many hands make light work
    A. Positive

    B. Negative

12. Look at the following proverb – Does it indicate negative or positive correlations?
    •Health is wealth
    A. Positive

    B. Negative

Statistical Words 1

Use in connection with the interactive file "Word Quiz 1" on the Student's CD.

By completing Table A match the items on the right to the items on the left.

1. Statistics	A. The number of occurrences of an item or an event.
2. Frequency	B. A chart that uses a rectangular bar to represent the data of each item.
3. Frequency Distribution Table	C. Shows data on a number line with x or other marks to show frequency.
4. Bar Chart	D. A chart that displays whether there is a relationship between 2 random variables.
5. Pie Chart	E. The study of collecting, organizing, presenting and analysing data.
6. Line Plot	F. The chart that uses "stem" and "leaves" to show the data.
7. Stem-and-Leaf Diagram	G. A table which shows the data distribution.
8. Scatter Diagram	H. A chart that uses sectors of a disk to represent what fraction of the data falls into different categories.

Table A

1.	2.	3.	4.	5.	6.	7.	8.

Statistical Words 2

Use in connection with the interactive file "Word Quiz 2" on the Student's CD.

By completing Table B match the items on the right to the items on the left

1. Discrete data	A. 25th Percentile
2. Continuous data	B. It is the range of the middle 50% of the data values.
3. Histogram	C. Type of numerical data where we can list all of the possible values that could arise.
4. Interquartile Range	D. Type of numerical data that could take on any real number in an interval, including decimals.
5. Univariate data set	E. A chart representing continuous data using adjacent rectangles.
6. First Quartile	F. A data set in which one measurement has been made on each item.

Table B

1.	2.	3.	4.	5.	6.