

chapter

2

Statistics 1

Section 2.6 Stem and leaf diagrams (stemplots)

PROJECT MATHS
Text & Tests 5
 LEAVING CERTIFICATE
 HIGHER LEVEL
 STRAND 1
 PROBABILITY & STATISTICS

79

A **stem and leaf diagram** is a very useful way of presenting data. It is useful because it shows all the original data and also gives you the overall picture or shape of the distribution.

It is similar to a horizontal bar chart, with the numbers themselves forming the bars.

Stem and leaf diagrams are suitable only for small amounts of data.

Often the stem shows the tens digit of the values and the leaves show the units digit.

If you put them together, you get the original value.

For example $4|2$ represents 42.

A typical stem and leaf diagram is shown below.

0		6	9	
1		2	5	7 ← This represents 17.
2		3	3	6 8
3		0	2	7
4		1	2	6
5		3		

Key: $3|2 = 32$

You must always add a key to show how the stem and leaf combine.

The data represented above is:

6, 9, 12, 15, 17, 23, 23, 26, 28, 30, 32, 37, 41, 42, 46, 53

Example 1

Here are the marks gained by a class of students in a science test.

~~58~~ ~~62~~ ~~40~~ ~~59~~ ~~68~~ ~~62~~ 81 ~~76~~ ~~62~~ ~~87~~ ~~41~~ ~~47~~ ~~83~~ ~~70~~ 80
~~68~~ 81 ~~61~~ ~~57~~ ~~49~~ ~~70~~ ~~54~~ ~~75~~ ~~69~~ ~~63~~ ~~59~~ ~~52~~ ~~68~~ ~~62~~ ~~74~~

- (i) Construct a stem and leaf diagram to represent this data.
- (ii) What is the mode of the data?
- (iii) What is the median?
- (iv) What is the range of the data?

30 students

(i)

4	0, 4, 7, 9
5	2, 3, 4, 7, 7, 8, 9, 9
6	1, 3, 5, 3 , 5, 5, 8, 8, 9
7	0, 0, 5, 4, 6
8	0, 1, 1

Key: 7|5 = 75 marks

(ii) mode = 63

(iii) Q_2 [$\frac{30+1}{2} = 15.5$ position] $Q_2 = 63$

(iv) Range: [40, 81] = 81 - 40 = 41

Different values for the stems

In a stem and leaf diagram, each leaf consists of one digit only.

The stem may have more than one digit.

Here are the times, in seconds, for the contestants in a 60-metre race.

6.6 4.9 5.7 7.6 8.2 6.3 6.5 7.4 5.1 5.3 6.2 7.8

This time we will use the units as the stems.

Step 1 Draw the first diagram.

The units are the stems.

The tenths are the leaves.

4	9
5	7 1 3
6	6 3 5 2
7	6 4 8
8	2

Key: 6|3 = 6.3 seconds

Step 2 Put the leaves in numerical order.

The units are the stems.

The tenths are the leaves.

4	9
5	1 3 7
6	2 3 5 6
7	4 6 8
8	2

Back-to-back stem and leaf diagrams

Two stem and leaf diagrams can be drawn using the same stem.

These are known as **back-to-back stem and leaf diagrams**.

The leaves of one set of data are put to the right of the stem.

The leaves of the other set of data are put on the left.

A back-to-back stem and leaf diagram is very useful to compare two sets of data.

Jack and Ciara compared the length of time they spent each evening on their homework.

Their times are shown in this back-to-back stem and leaf diagram.

Jack						Ciara				
6	5	5	3	2	2					
			8	6	5	3	6	7		
				3	2	4	4	6	6	
					1	5	2	3	4	5
						6	4	8		

Key: 5|3 = 35 minutes

Key: 4|6 = 46 minutes

Sometimes the key is given as 5|3|6. This means 35 for Jack and 36 for Ciara.

We read Jack's times from the stem to the left.

Thus Jack's times are:

22, 23, 25, 25, 26, 35, 36, ...

Ciara's times are:

36, 37, 44, 46, 46, 52, ...

The following example shows how a back-to-back stem and leaf diagram can be used to compare two sets of data.

Example 2

Robert and Jane compared the lengths of time they spent each evening watching television.

Their times are shown in the following back-to-back stem and leaf diagram.

Robert						Jane				
7	4	4	3	2	2					
			9	6	4	4	6			
				5	3	5	7	7		
					2	5	3	4	6	
					6	5	7			

Key: 3|4 = 43 minutes

Key: 6|5 = 65 minutes

- (i) What does the diagram show about the lengths of time Robert and Jane spent watching television?
- (ii) What was Jane's median time spent watching television?
- (iii) What was Robert's median time?
- (iv) Do these median times support your conclusion in (i) above?

	(i)	Jane spends more time watching television (apparent from skew).
$\frac{11+1}{2} = 6$	(ii)	Q_2 (JANE) = 53 minutes
	(iii)	Q_2 (ROBERT) = 34 minutes
	(iv)	Yes

Finding the interquartile range from a stem and leaf diagram

In Section 2.5 of this chapter, we found that the lower quartile is the value in the data that is one quarter way through the distribution. The upper quartile is the value that is three quarters way through the distribution. The difference between the upper quartile and the lower quartile is the **interquartile range**.

We will now show how to find the two quartiles and the interquartile range of a distribution presented as a stem and leaf diagram.

Example 3

The stem and leaf diagram below shows the marks, out of 50, obtained in a maths test.

Marks obtained	
1	2 8
2	1 4 7 7 8
3	1 4 5 7
4	1 2 8
5	0

Key: 2|1 = 21

- Find (i) the median mark (ii) the lower quartile
(iii) the upper quartile (iv) the interquartile range.

15 marks	(i) $Q_2 = 31$
$Q_1 \text{ position} = \frac{15+1}{4} = 4$	(ii) $Q_1 = 24$
$Q_2 \text{ position} = \frac{15+1}{2} = 8$	(iii) $Q_3 = 41$
	(iv) $I.Q.R. = Q_3 - Q_1 = 41 - 24 = 17$