



Statistics - a Definition

Statistics is the branch of Mathematics which analyses information and data gleaned from surveys, questionnaires or reports. Its purpose is to present this information in a more understandable form, either graphically or in some numeric format.

"Average" and "Spread"

Imagine we had a set of numbers to analyse - for example, the ages of those on a Sunday School trip to the beach.

2, 6, 6, 7, 7, 7, 7, 8, 8, 8, 10, 10, 11, 13, 55.



There are basically two "numerical" aspects you might wish to look at.

- The **AVERAGE** age - this is a measure of where the "centre" of the group lies.
- The **SPREAD** of ages - this gives you an idea of what "range" of ages there are.

Averages - Mean, Median and Mode

Revision of CfE Level 3 work.

You have already learned how to calculate an **average** of a set of values - namely, the **mean**.

You will now learn that there are two further measures of **average**, called the **median** and the **mode**.

MEAN - "Add" all the data together and "divide" by the number of pieces of data.

$$\frac{2 + 6 + 6 + 7 + \dots + 13 + 55}{15} = 11$$

MEDIAN - The "middle" number, (as long as the numbers are in "order").

$$2, 6, 6, 7, 7, 7, 7, 8, 8, 8, 10, 10, 11, 13, 55.$$

median = 8

MODE - The number that occurs "most".

$$2, 6, 6, 7, 7, 7, 8, 8, 8, 10, 10, 11, 13, 55.$$

mode = 7

Exercise 22.1

- Calculate the **mean** for each set of data :-
 - 2, 3, 4, 5, 6, 7, 8, 9, 10
 - 8, 9, 12, 13, 13, 18, 22, 25
 - 21, 22, 24, 27, 27, 29
 - 0.3, 0.5, 0.6, 0.7, 0.8, 0.9, 1.1
 - 121, 123, 123, 126, 136, 181
 - 25, 35, 19, 33, 45, 17, 35, 23, 25, 7
 - 6, -2, 8, -13, 5, 11, -17, 2.

- Find the **median** for each set of data :-
(Remember to put the numbers in order first)
 - 6, 9, 5, 3, 2, 7, 3, 10, 8
 - 41, 51, 44, 16, 57, 39, 45
 - 2.7, 3.3, 2.4, 3.5, 2.1, 2.8, 3.3
 - 122, 133, 76, 184, 155, 130, 168.

If there is not a single middle number :- take the **mean of the middle two numbers**.

Example :- 2, 2, 4, 5, 6, 7, 8, 10

The **median** is $(5 + 6) \div 2 = 5.5$



3. Find the **median** for each of the following :-
- 14, 21, 17, 18, 22, 17
 - 9, 13, 15, 31, 7, 35, 25, 17, 21, 19
 - 111, 107, 108, 106, 104, 107, 103, 110
 - 0.6, 0.7, 0.1, 1.0, 1.6, 0.9, 0.2, 0.3
 - 6, -6, -3, -1, 1, 3, 5, 10
 - $2, 2\frac{1}{2}, 2\frac{1}{2}, 4\frac{1}{2}, 5\frac{1}{2}, 5\frac{1}{2}, 5\frac{1}{2}, 7.$
4. Find the **mode** for each set of data :-
- 2, 3, 4, 5, 6, 7, 8, 8, 9
 - 21, 32, 23, 64, 21, 23, 41, 20, 23
 - 1.4, 1.8, 2.0, 1.1, 1.8, 5.7, 2.5
 - 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2
 - 1131, 1210, 1113, 1124, 1021, 1120, 1124
 - $\frac{3}{4}, \frac{1}{4}, \frac{2}{3}, \frac{1}{2}, \frac{3}{4}, \frac{4}{5}, \frac{1}{4}, \frac{3}{4}.$


A Measure of Spread - The Range

The **RANGE** is a mathematical tool used to measure how widely spread a set of numbers are.

$$\Rightarrow \text{Range} = \text{Highest score} - \text{Lowest score}$$

Example :- For the set of numbers :- 3, 3, 4, 6, 7, 7, 8, 11, 13, 13,

$$\Rightarrow \text{Range} = 13 - 3 = 10$$

5. Calculate the **range** for each set of data in :-
- question 3
 - question 4.
6. Look at this data set :-
- 5, 7, 2, 9, 10, 2, 3, 4, 57**
- Find the **range**.
 - Find the **mean, median** and **mode**.
 - Which average is best suited here ?
 - Explain why you think the other two averages are less suitable.
7. Calculate the **mean, median, mode** and **range** for each set of data below :-
- 2, 3, 3, 3, 5, 9, 17
 - 6.7, 3.3, 5.4, 5.4, 6.1, 5.4, 4.8
 - 307, 106, 293, 314, 307, 299
 - 40, 42, 33, 51, 65, 46, 37, 40
 - 65, 65, 63, 64, 67, 66, 67, 67
 - 13 000, 10 000, 15 000, 10 000, 19 000
 - 5, -2, 7, 15, -8, -5, 0, 7, -5, 6.
8. The weights of six women are shown :-
45 kg, 55 kg, 68 kg, 45 kg, 52 kg, 54 kg.
- Find the **range** of their weights.
 - Calculate the **mode** and **median** weights.
 - Choose which is the better average of the two and explain why.
9. Rory buys 10 Easter Eggs.
The number of chocolates in each is listed below :-
- 8, 7, 9, 6, 8,
7, 8, 11, 5, 9**
- 
- Calculate the **mean, median** and **mode**.
 - How many eggs have **less** than the **mean** number of chocolates ?
10. (a) Calculate the **mean** and the **range** of the first ten **prime** numbers.
- Calculate the **mean** and the **range** of the first ten **square** numbers.
 - Find the **median** of the first 100 **square** numbers.

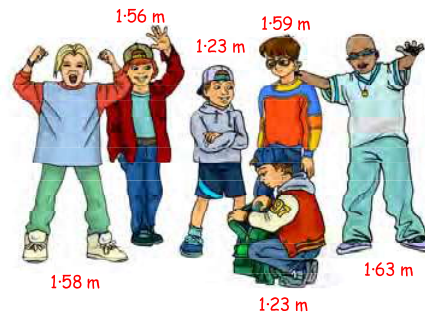
11. The heights of six boys are shown opposite.

Bob says, “ the average height is 1.23 m.”

Bill says, “ the average height is 1.57 m.”

Ben says, “ the average height is 1.47 m”

- (a) Explain why, technically, all three could be correct.
 (b) Which of the three would be least likely to be used ?



12.



The mean weight of two tyres is 12 kilograms.

If one of the tyres weighs 13.5 kg, what must the weight of the other tyre be ?

13. The mean age of five children is 13 years old.
 Four of the children’s ages are 10, 10, 12 and 16.
 What is the age of the fifth child ?



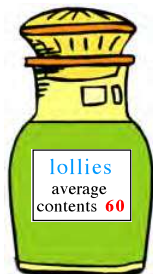
14.



When a family of seven visit gran, their mean age is 22.
 When gran is included in the group, the mean age of the eight then goes up to 29.
 How old must gran be ?



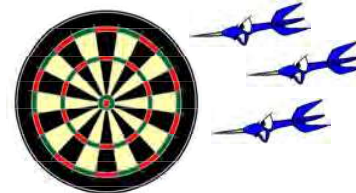
15.



Billy owns a corner sweet shop and buys in 10 jars of lollies.
 He discovers that the jars contain the following number of lollies :-
 59, 61, 57, 60, 58, 59, 58, 58, 61, 59.

- (a) Is the statement on the jar correct ? (explain).
 (b) An eleventh jar is examined. How many lollies would need to be in that jar in order for the sweet manufacturer’s claim to **then** be 100% accurate ?

16. Ten people threw 3 darts at a dartboard and recorded their scores.
 The mean for the the first nine was 33.
 The 10th contestant pushed the mean score up to 39.
 What must the woman have scored with her three darts ?



17.



On a putting green, the mean score for the 4 children for a round was 54.
 The mean score of the 3 adults with them was 61.
 Calculate the mean score of all 7 in the group.

18. Freddy’s dad said he would buy him a new bike if he could get a mean score of at least 75% for his **six** science tests.
 In his first **five** tests Freddy scored : 72%, 69%, 83%, 65% and 60%.
 Can Freddy possibly do well enough to get the bike ? (Explain !!)

