

# Mean, Median, Mode and Range

Imagine we have the set of numbers 6, 3, 100, 3 and 13.

**The MEAN is the total of the numbers divided by how many numbers there are.**

To find the mean, add all the numbers together then divide by the number of numbers. Eg  $6 + 3 + 100 + 3 + 13 = 125 \div 5 = 25$

The mean is 25.

The mean is not always a whole number.

**The MEDIAN is the middle value.**

To find the median, order the numbers and see which one is in the middle of the list. Eg 3, 3, 6, 13, 100 = 6

The median is 6.

If there are two middle values the median is halfway between them. This might not be a whole number.

**The MODE is the number that appears the most.**

To find the mode, see which number appears the most often.

Eg 3, 3, 6, 13, 100 = 3

The mode is 3.

The mode is the only average where there can be more than one. You can have two modes or three modes and if all the values appear the same number of times, we can say **there is no mode**.

**The RANGE is the difference between the biggest and the smallest number.**

To find the range, subtract the lowest number from the biggest number.

Eg  $100 - 3 = 97$

The range is 97.

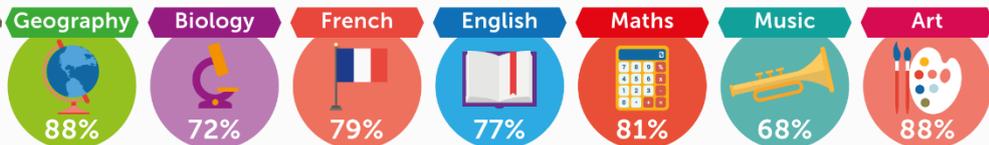
## 1 Mean



The mean is the sum of the values divided by the number of values.

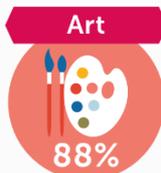
$$\text{Mean} = \frac{\text{Sum of values}}{\text{Number of values}}$$

Joe was pleased with his exam results:



$$\text{His mean mark was} = \frac{88 + 72 + 79 + 77 + 81 + 68 + 88}{7} = \frac{553}{7} = 79\%$$

## 2 Mode



The mode is the value that occurs most often.

The mode for Joe's results was 88%. It occurred twice, in Geography and Art.



### 3 Median

The median is the middle value when the data is arranged in order of size.



The median for Joe's results is 79% because the French result is in the middle. If there is an even number of values, then the median is the mean of the middle two values.

### Range

The range is the difference between the lowest value and the highest value in a data set.



To find the range, subtract the lowest value from the highest value. The range of Joe's results is 20.

Example Robert is preparing for his Mathematics GCSE exams. Each paper is marked out of 100. He attempts 10 tests and gets the following scores:

63, 86, 64, 67, 71, 42, 79, 64, 80, 64.

We can use these values to calculate the mean, median and mode to find out more information about his scores.

The mean uses all the values in the data. To calculate the mean:

1. Add all the numbers up
2. Divide by how many values there are:

$$\frac{63 + 86 + 64 + 67 + 71 + 42 + 79 + 64 + 80 + 64}{10} = \frac{680}{10} = 68$$

Mean = 68

The median is the middle value in the sorted set of data. To calculate the median:

1. List the values in order from smallest to largest
2. Cross values off from each end to identify the middle value

If there are two numbers in the middle, you must calculate the mean of these two values. This means we add them up and divide by 2.

1. Order: 42, 63, 64, 64, 64, 67, 71, 79, 80, 86
2. Middle: 64, 67

3.  $\frac{64 + 67}{2} = \frac{131}{2} = 65.5$

Median = 65.5

The mode is the most common value that appears in the data.

It is often useful to use the ordered set of numbers; 42, 63, **64, 64, 64**, 67, 71, 79, 80, 86.

Mode = 64

The value 64 appears three times. All the rest appear only once.

Example Emily got these scores when playing a game on her computer:

61, 73, 82, 90, 61, 67, 76, 40, 80, 62.

Calculate the mean, median and mode of her scores. Find the range.

Mean = 69.2 because

$$\frac{61 + 73 + 82 + 90 + 61 + 67 + 76 + 40 + 80 + 62}{10} = \frac{692}{10} = 69.2$$

Median = 70 because when we rearrange the numbers in order {40, 61, 61, 62, 67, 73, 76, 80, 82, 90}, 67 and 73 are in the middle:

$$\frac{67 + 73}{2} = \frac{140}{2} = 70$$

Mode = 61 because the value 61 appears twice and all the other numbers appear only once.

Range is 50 because 90 is the largest number and 40 is the smallest number and therefore 50 is the difference.