

## Calculating the median

Median is the **middle value** of a set of data. It is shown at the mid-point when a set of numbers is written out in order.

Working with the median is **Level 2** in the Basic Skills curriculum, but you may find it interesting to know what it is.

### Example 1

Find the median of these numbers.

6, 4, 6, 5, 3

First put the numbers in order. This makes it easier to find the median.

3, 4, 5, 6, 6,

You can now see that 5 is the middle number. It is halfway along the list.

**So the median value of this set of data is 5.**

### Example 2

Find the median value of these numbers.

9, 3, 5, 7, 10, 5

First put the numbers in order. This makes it easier to find the median.

3, 5, **5**, **7**, 9, 10

You can now see that 5 and 7 are in the middle of the list. The median is the exact middle. So here we need a number that's halfway between 5 and 7. That number is 6.

**So the median value of this set of numbers is 6.**

Notice that you can have a median value that doesn't appear in the list of data. In the example above, 6 is the median value, but 6 isn't in the list of numbers given in the question.

### Why use the median?

The factsheet 'Understanding distorted averages' explains that sometimes the mean value of a set of data is **distorted**. The median is not so easily distorted as the mean value. So sometimes it's a better type of average to use.

### Example

Look at the wages example in the factsheet 'Understanding distorted averages'. The wages, in order, are:

£8,000, £8,000, £8,000, £12,000, £175,000

The **mean** is £42,200. But this is misleading because it's much higher than most of the wages.

The **median** value is in the middle of the list. The median wage is £8,000, which is a good indication of the general level of pay. So in this example you could argue that the median is more useful than the mean for giving a less distorted impression of the wages at the company.

## Calculating the mode

The **mode** is the name of another type of average. It is the most **common** item in a set of data. It's the number or thing that appears **most often**.

For example, in a list of peoples' favourite films the mode would be the most popular choice - the one with most votes.

Working with the mode is **Level 2** in the Basic Skills Curriculum, but you may find it interesting to know what it is.

### Example 1

Find the mode of 6, 4, 6, 5, 3, 7, 6.

First put the numbers in order. This makes it easier to find the mode.

3, 4, 5, 6, 6, 6, 7

You can see that 6 is the most common number in the list. There are three of them.

**So 6 is the mode of this set of data.**

### Example 2

Find the mode of the shoe sizes for a group of students. Their shoe sizes are:

5, 6, 7, 4, 3, 9, 7, 6, 7, 8, 9

It's easier to see what's going on if you put the numbers in order.

3, 4, 5, 6, 6, 7, 7, 7, 8, 9, 9

Now it's easier to see which number appears most often in the list.

The number that appears most often is 7.

**So the mode of these shoe sizes is 7.**

### Example 3

Find the mode of the sick days taken by employees from the company Acme Ltd.

Sick days for each employee: 0, 0, 1, 3, 2, 0, 0, 2, 14, 1, 0, 1, 0, 1, 2, 0, 0, 3, 1.

First put them into order.

0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 2, 2, 2, 3, 3, 14

There are eight people with no sick days, that's eight 0s. There are five 1s, three 2s, two 3s and one person who took 14 days off sick. So the most common number is 0.

**So 0 is the mode of this data.**



## Calculating the range

The range is the **difference between the highest and lowest values** in a set of data.

### Example 1

Find the range of these numbers: 6, 4, 6, 5, 3.

First put them in order to make it easier to see the lowest and highest.

3, 4, 5, 6, 6

The lowest number is 3 and the highest is 6.

Find the difference. Subtract 3 from 6.

$$6 - 3 = 3$$

**So the range of this set of data is 3.**

### Example 2

Compare the range of temperatures for Cardiff and London for a week in July. Temperatures are given in the table in degrees centigrade.

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Cardiff	19°	19°	20°	20°	20°	18°	18°
London	20°	22°	22°	21°	20°	21°	19°

Find the range for Cardiff. First put the data into order.

Cardiff: 18, 18, 19, 19, 20, 20, 20

The lowest temperature for Cardiff was 18°C, the highest was 20°C.

The difference between the highest and lowest is:

$$20 - 18 = 2$$

**So the range of temperature for Cardiff is 2°C.**

Now look at London. First put the data into order.

London: 19, 20, 20, 21, 21, 22, 22

The range is the difference between the highest and the lowest. That is:

$$22 - 19 = 3$$

**So the range for the temperatures in London is 3°C.**

We can compare the temperature ranges for London and Cardiff. London has a slightly larger range of 3, compared to a range of 2 in Cardiff. This means that during this week the temperature in London was more variable than in Cardiff.



## Calculating the mean

The **mean value** of a set of figures is calculated by adding up the figures to find the total and then dividing by the number of figures in the set.

$$\text{mean value} = \text{total amount} \div \text{number of figures}$$

So to find the mean value of 5 numbers add them then divide the answer by 5. To find the mean of 20 numbers add them then divide by 20.  
Here are two examples:

### Example 1

Calculate the mean of 2, 3, and 7.

The total of these numbers is  $2 + 3 + 7 = 12$ .

There are 3 figures, so divide by 3:  $12 \div 3 = 4$ . So the mean is 4.

### Example 2

Calculate the mean of 16, 13, 21 and 14.

The total of these numbers is  $16 + 13 + 21 + 14 = 64$ .

There are 4 figures, so divide the total by 4:  $64 \div 4 = 16$ . So the mean is 16.

### Averages in real life

This method works for 'real problems' as well as for figures. Here's an example:

#### Example



The shoe sizes of a group of 6 students are 5, 6, 8, 8, 9 and 12.

How do you find the mean shoe size of the 6 students?

The total of the students' shoe sizes is  $5 + 6 + 8 + 8 + 9 + 12 = 48$ .

There are 6 students, so the mean shoe size is  $48 \div 6 = 8$ .