

# Interquartile range

## What is interquartile range?

**Interquartile range**, or **IQR**, is a measure used to describe the spread or variability of a data set.

To find the interquartile range of a data set, find the difference between the third quartile ( $Q_3$ ) and the first quartile ( $Q_1$ ).

$$\text{IQR} = Q_3 - Q_1$$

## What are quartiles?

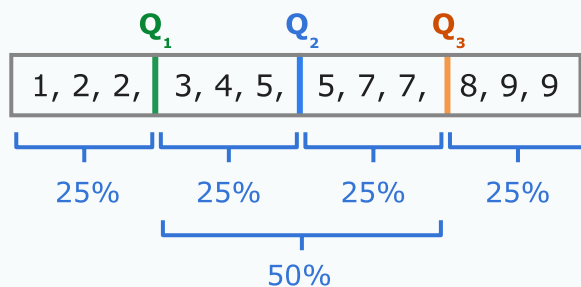
Quartiles divide a data set into quarters, or four parts.

- $Q_3$  is the upper quartile. It is the median of the upper half of data.
- $Q_2$  is the middle quartile. It is the same as the median of the data set.
- $Q_1$  is the lower quartile. It is the median of the lower half of data.



### Tip

Because quartiles split the data into four parts, each part represents about 25% of the data. Since the IQR is the difference between  $Q_3$  and  $Q_1$ , it measures the middle 50% of the data.



## Finding the interquartile range of a data set

Before you find the interquartile range of a data set, you will need to find the first and third quartiles. Then you can subtract them!

Follow these steps to find the interquartile range:

1. Order the data from least to greatest.
2. Split the data into a lower half and an upper half.
3. Find  $Q_1$  and  $Q_3$ .
4. Subtract:  $IQR = Q_3 - Q_1$ .

Let's try an example. Find the interquartile range of this data set:

5, 8, 7, 10, 4, 5, 5, 9

First, order the data from least to greatest.

4, 5, 5, 5, 7, 8, 9, 10

Next, split the data into a lower half and an upper half.

4, 5, 5, 5, | 7, 8, 9, 10  
└───┬───┘ └───┬───┘  
lower half upper half

To find  $Q_1$ , find the [median](#) of the lower half of the data.

4, 5, | 5, 5  
↓  
 $\frac{5 + 5}{2} = 5$

So, the **first quartile** is **5**.

To find  $Q_3$ , find the median of the upper half of the data.

$$7, 8, | 9, 10$$


$$\frac{8 + 9}{2} = 8.5$$

So, the **third quartile** is **8.5**.

Now, subtract  $Q_3 - Q_1$  to find the IQR.

$$8.5 - 5 = 3.5$$

So, the IQR for this data set is 3.5!



### Tip

If you have an odd number of numbers in your data set, you can still split the data set into a lower half and an upper half. The two halves will be on either side of the median:

3, 3, 4, 5, **5**, 7, 8, 9, 9

lower half      upper half

Go to IXL to try some practice problems!

In the data set below, what are the lower quartile, the median, and the upper quartile?

49 37 21 52 37 33 55

lower quartile =

median =

upper quartile =

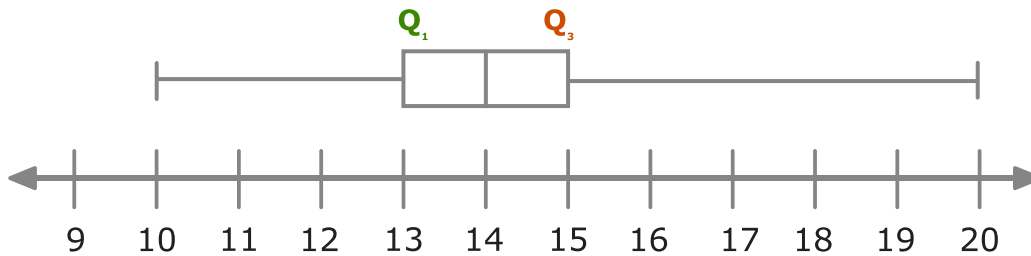


Calculate quartiles and interquartile range MNV

## Finding interquartile range from a box and whisker plot

You might see a data set displayed using a [box and whisker plot](#). When you do, you can find the interquartile range of the data set by looking at the plot.

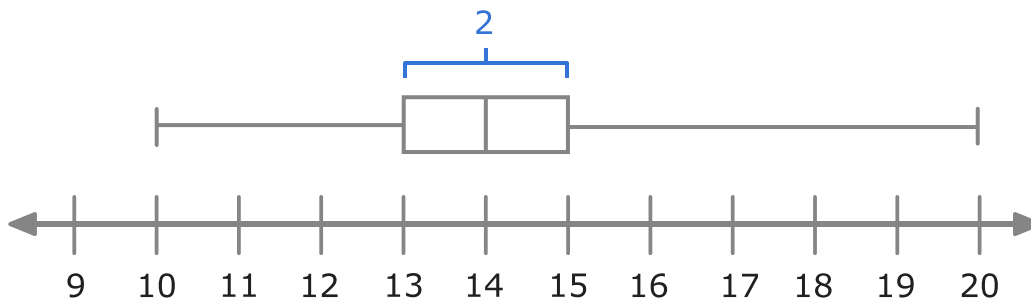
Look at the box and whisker plot below.



The first quartile ( $Q_1$ ) is 13. The third quartile ( $Q_3$ ) is 15. Subtract to find the IQR!

$$15 - 13 = 2$$

You can also find the IQR of this data set by finding the length of the box.



So, the IQR for this data set is 2!

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### Skills

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### Lessons

[Box and whisker plots](#)

[Mean, median, mode, and range](#)