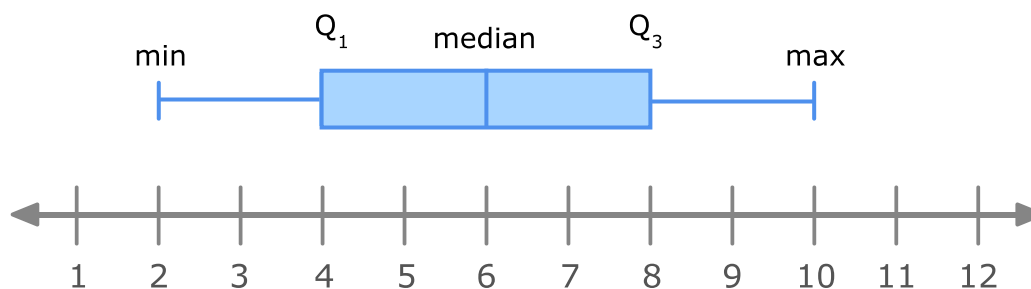# Box and whisker plots

What is a box and whisker plot?

A **box and whisker plot**, or box plot, is a way to display data. Box and whisker plots show the five-number summary of a data set.

The five-number summary includes the minimum, first quartile (Q_1), median, third quartile (Q_3), and maximum.

- The minimum is the smallest number in a data set.

- The first quartile (Q_1) is the median of the lower half of a data set. It is also called the lower quartile.

- The median is the middle number of a data set. It is sometimes called Q_2 or the middle quartile.

- The third quartile (Q_3) is the median of the upper half of a data set. It is also called the upper quartile.

- The maximum is the largest number in a data set.

Here is an example of a box and whisker plot.

Making a box and whisker plot

To make a box and whisker plot, start by finding the five-number summary. You can do that using these steps:

1. Order the data from least to greatest.
2. Find the **median**.

3. Find the **first quartile** and the **third quartile**.
4. Find the **minimum** and **maximum**.

Once you've completed these steps, you can make your box plot!

Let's try an example. Make a box plot for this data set:

1, 9, 4, 5, 4, 6, 7, 2, 9

First, order the data from least to greatest:

1, 2, 4, 4, 5, 6, 7, 9, 9

Next, find the **median**. Remember that the median is the middle number of the data set.

1, 2, 4, 4, **5**, 6, 7, 9, 9

The median is **5**.

Now, find the **first quartile** and the **third quartile**.

To find the **first quartile**, find the median of the lower half of the data. Since there are four data values in the lower half of the data, you'll need to find the average of the two middle numbers. Add them together and divide the sum by two.

1, 2, | 4, 4

$$\frac{2 + 4}{2} = 3$$

So, the first quartile is **3**.

To find the **third quartile**, find the median of the upper half of the data. Since there are four data values in the upper half of the data, you'll need to find the average of the two middle numbers. Add them together and divide the sum by two.

6, 7, | 9, 9

$$\frac{7 + 9}{2} = 8$$

So, the third quartile is **8**.

Lastly, find the **minimum** and **maximum**.

The minimum is the smallest number, which is **1**. The maximum is the largest number, which is **9**.

Now you can make the box and whisker plot! Start by plotting the five-number summary using a number line.
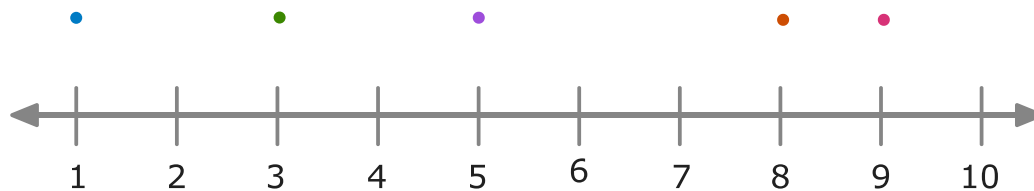
Then draw a box around the first and third quartiles, and draw a vertical line to show the median. Finally, draw the whiskers to show the minimum and maximum.
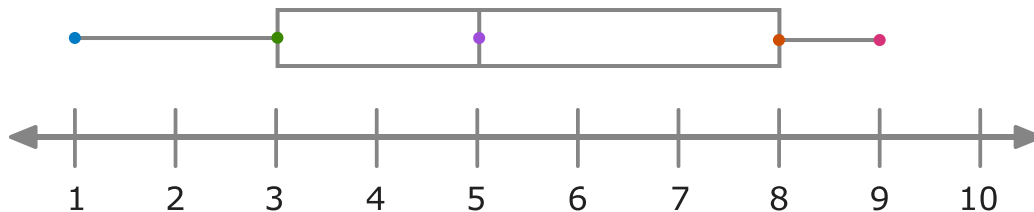
Go to IXL to try some practice problems!

For an engineering project, each student in Mr. McDonald's science class made a catapult and measured how far it flung a marshmallow. This box plot shows the results.

Marshmallow distance (in.)
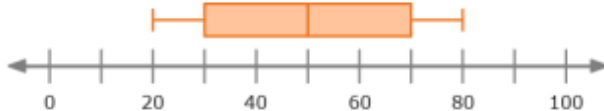
What fraction of the catapults flung a marshmallow 30 inches or less?

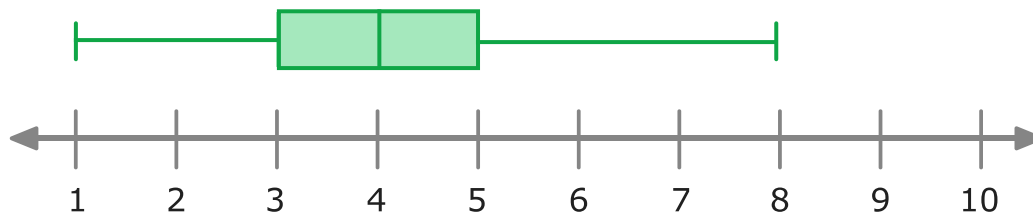Box plots E9F

Finding the range of a data set

The range of a data set is the difference between the maximum and minimum.

range = max − min

You can find the range of a data set from a box and whisker plot. Let's try it!

The box and whisker plot below shows the number of blueberry pies Brooke sold at her bakery each day over the last month.

Blueberry pies sold each day

The maximum number of pies is 8. The minimum number of pies is 1.

Subtract these values to find the range!

8 − 1 = 7

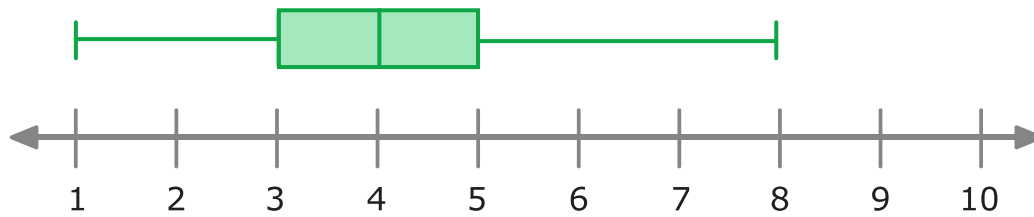So, the range of this data set is 7 pies.

Finding the interquartile range of a data set

The **interquartile range**, or **IQR**, of a data set is the difference between the third quartile and the first quartile.

IQR = Q_3 − Q_1

Find the IQR of the data set from the box and whisker plot below.
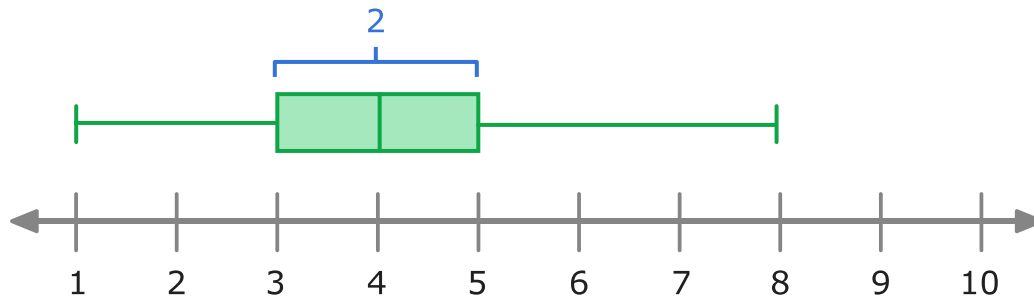
Blueberry pies sold each day

The third quartile is 5 pies. The first quartile is 3 pies. Subtract to find the IQR!

5 – 3 = 2

Or, look at the length of the box to find the IQR!
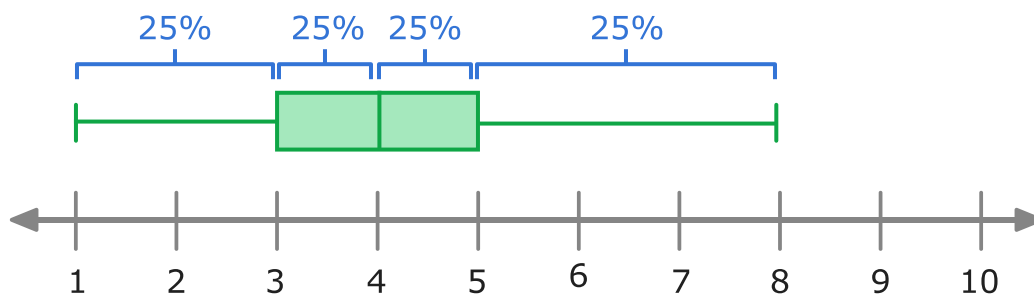
Blueberry pies sold each day

So, the interquartile range of this data set is 2 pies.

Understanding quartiles

Box and whisker plots use **quartiles** to divide the data into quarters, or four parts. Each part of a box and whisker plot represents about 25% of the data.

Blueberry pies sold each day

On about 25% of the days last month, 1 to 3 blueberry pies were sold.

You could also say that on about 50% of the days last month, 3 to 5 blueberry pies were sold.

Visit IXL for more related skills and lessons!

Skills

Box plots E9F

Lessons

Interquartile range

Mean, median, mode, and range