

Grade 6 - Mean, Median, Spread and Box Plots - Lesson

Common Core 6.SP.A.3, 6.SP.B.5c, 6.SP.B.5d · maths-pdf.fr/en/

The mean is the sum of the data divided by the number of values, the median is the middle value, and the mode is the most common value. Spread is measured by the range, the interquartile range (IQR), or the mean absolute deviation (MAD). A box plot shows the five-number summary. With outliers, use the median.

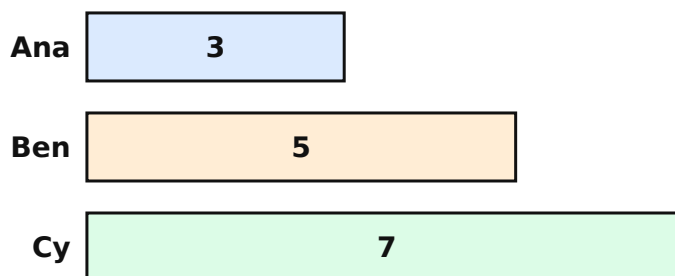
Grade 6 · Common Core State Standards: **6.SP.A.3, 6.SP.B.5c, 6.SP.B.5d**

Key facts

- Mean = sum divided by the number of values; median = middle value.
- Range = greatest minus least; IQR = Q3 minus Q1.
- MAD is the average distance of the values from the mean.
- A box plot shows the minimum, Q1, median, Q3, and maximum.
- Outliers pull the mean but not the median.

What are the mean, median, and mode?

The **mean** is the sum of the values divided by how many there are. It is the equal share if everyone had the same amount. The **median** is the middle value of the ordered data, or the mean of the two middle values. The **mode** is the most common value.

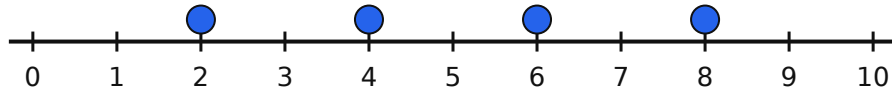


The mean is the amount each would have if the total were shared equally.

For 4, 8, 6, 10, 12, the sum is 40, so the mean is $40 \div 5 = 8$. The median is 8 as well.

How do you measure spread?

The **range** is the greatest value minus the least. The **mean absolute deviation (MAD)** is the average distance of the values from the mean. For 2, 4, 6, 8 the mean is 5, the distances are 3, 1, 1, 3, and the MAD is $\frac{8}{4} = 2$.

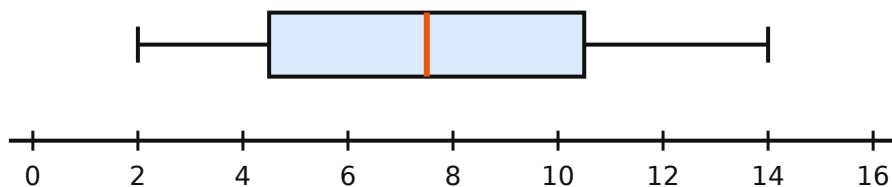


Each value is 3, 1, 1, or 3 away from the mean 5; the MAD is 2.

What is a box plot?

Five-number summary

The **five-number summary** is the minimum, first quartile (Q1), median, third quartile (Q3), and maximum. The **interquartile range (IQR)** is Q3 minus Q1. A box plot draws a box from Q1 to Q3 with a line at the median.



A box plot shows the five-number summary.

For 2, 4, 5, 7, 8, 9, 12, 14, the median is 7.5, Q1 is 4.5, Q3 is 10.5, and the IQR is $10.5 - 4.5 = 6$. The box holds the middle half of the data.

Which measures should you use?

Measure	Tells
Mean	balance point
Median	middle value
Range	greatest - least
IQR	spread of middle half
MAD	average distance from mean

Choose the measure that fits the shape of the data.

1. Draw a dot plot, histogram, or box plot first to see the shape.
2. If the data are fairly symmetric, the mean and MAD describe it well.
3. If the data are skewed or have outliers, use the median and the IQR.
4. Always say what the numbers mean in the story.

Example: Salaries of 30, 32, 35, 36, 38, and 250 thousand dollars have a mean of about 70.2 but a median of 35.5. The outlier 250 pulls the mean up, so the median describes a typical salary better.

Questions about mean, median, spread and box plots

How do you find the mean?

Add all the values and divide by how many values there are. The mean of 4, 8, 6, 10, 12 is 40 divided by 5, which is 8.

How do you find the median when there is an even number of values?

Order the data and take the mean of the two middle values. For 2, 4, 6, 10 the median is $(4 + 6) / 2 = 5$.

What is the interquartile range?

The IQR is Q3 minus Q1. It shows how spread out the middle half of the data is.

What is the mean absolute deviation?

The MAD is the average of the distances of each value from the mean. For 2, 4, 6, 8, the mean is 5 and the MAD is 2.

When should you use the median instead of the mean?

Use the median when the data are skewed or have an outlier, because outliers pull the mean but barely change the median.