

Outlier Impact Lab

See how extreme values stretch a boxplot.

GRADE 8 • 8.PS.2.f

8.PS.2.f "Describe how the presence of an extreme data point (outlier) affects the shape and spread of the data distribution of a boxplot."

NAME _____

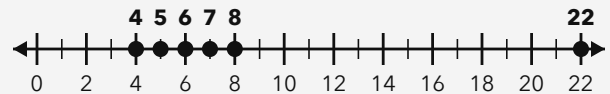
DATE _____

SPOT THE STRETCH

An extreme data point (called an outlier here) is far from the main cluster. These boxplots use the minimum and maximum as whisker ends. A high extreme stretches the right end and increases the overall range; a low extreme stretches the left end. This worksheet compares visible extremes, without a formal outlier cutoff.

WORKED EXAMPLE

Use the marked data points. How does the far-right value affect a boxplot?



1. The value 22 is far from the cluster from 4 to 8.
2. With 22, the range is $22 - 4 = 18$.
3. Without 22, the range is $8 - 4 = 4$.
4. The right end is stretched, so the boxplot is skewed right.

Answer: 22 increases the range from 4 to 18 and stretches the right side.

PRACTICE 4 problems

- 1** A boxplot has a minimum of 12, Q1 of 15, median of 18, Q3 of 21, and maximum of 41. Which value is likely an outlier? How does it affect the boxplot?

ANSWER _____

- 2** The data are 3, 9, 10, 11, 29. Describe how 29 affects a boxplot.

ANSWER _____

- 3** One data value is 2, while all other values are from 16 to 24. Which side of the boxplot is stretched?

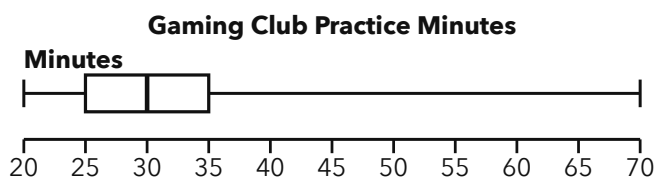
ANSWER _____

- 4** The data are 11, 12, 13, 14, 36. Find the range with 36 and the range without 36.

ANSWER _____

APPLY IT Show your work

- 1** The boxplot shows gaming club practice minutes. Which value appears extreme? State its effect on shape and overall range.



ANSWER _____

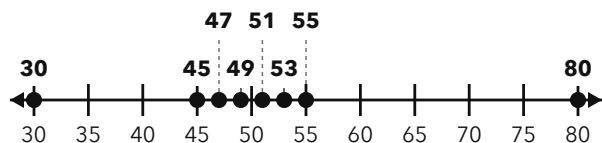
- 2** A student practiced guitar for 40, 42, 43, 44, 45, 46, and 90 minutes on seven days. When shown in a boxplot, how would 90 affect the shape and range? Give the range with it and without it.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Use the marked data points. A boxplot uses the minimum and maximum as whisker ends. Explain how 30 and 80 affect the overall range and shape compared with the middle six values.



PRACTICE 1

A boxplot has a minimum of 12, Q1 of 15, median of 18, Q3 of 21, and maximum of 41. Which value is likely an outlier? How does it affect the boxplot?

41; it stretches the right whisker, increases the range, and makes the distribution skew right.

PRACTICE 2

The data are 3, 9, 10, 11, 29. Describe how 29 affects a boxplot.

29 is an extreme high value relative to the cluster from 3 to 11. It makes the range 26 instead of 8 and stretches the boxplot to the right.

PRACTICE 3

One data value is 2, while all other values are from 16 to 24. Which side of the boxplot is stretched?

The left side is stretched, and the distribution is skewed left.

PRACTICE 4

The data are 11, 12, 13, 14, 36. Find the range with 36 and the range without 36.

With 36, the range is 25. Without 36, the range is 3.

APPLY IT 1

70 minutes is the extreme value. It stretches the right side, makes the distribution skew right, and makes the overall range 50 minutes. Read the minimum as 20 and maximum as 70, so $70 - 20 = 50$. The large gap from 35 to 70 creates a long right end.

APPLY IT 2

90 is a high outlier that stretches the right side and makes the distribution skew right. The range is 50 minutes with 90 and 6 minutes without it. With 90, subtract 40 from 90. Without 90, subtract 40 from 46.

CHALLENGE

The middle six values have a range of $55 - 45 = 10$. Values 30 and 80 make the overall range $80 - 30 = 50$ and stretch both ends. The high end extends farther: 80 is 25 above 55, while 30 is 15 below 45. The result is not symmetric.

Accept equivalent wording such as long right whisker or stretched right side. For the challenge, students should state that both extreme values increase the range and stretch opposite ends. Use the stated minimum-to-maximum whisker convention. The standard uses outlier informally for an extreme point; a separate 1.5-IQR classification is not required here. In the challenge, accept both-end stretching with a longer high-end extension; do not require a symmetric shape.