LESSON MAKER PRO

# Spot the Shift

*Read the shape, center, and spread of data.*

**HIGH SCHOOL · MT.CORE.DATA.INT.4**

**MT.CORE.DATA.INT.4** "Interpret differences in the shape, center, and spread of quantitative data distributions, in context, accounting for possible effects of outliers on measures of central tendency and variability."

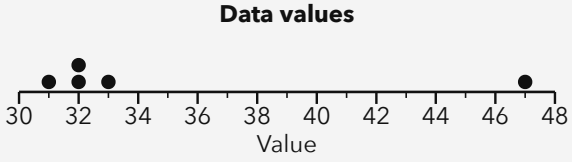
NAME _____ DATE _____

## WHAT CHANGES?

The mean uses every value, while the median is the middle value when the data are ordered. Range is the greatest value minus the least value, and IQR is Q3 minus Q1. A value far from the rest can pull the mean and stretch the range, so compare the numbers with the shape of the plot.

### WORKED EXAMPLE

How does the far-right value affect the mean, median, and range of this dot plot?

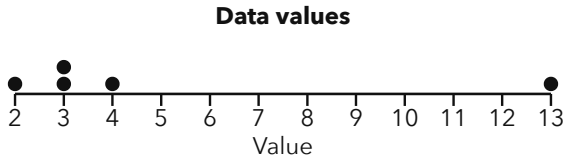



1. The middle value is 32, so the median is 32.
2. The mean is (31 + 32 + 32 + 33 + 47) / 5 = 35.
3. The range is 47 - 31 = 16.
4. Without 47, the mean is 128 / 4 = 32, the median is 32, and the range is 33 - 31 = 2.

**Answer: The far-right value raises the mean from 32 to 35 and increases the range from 2 to 16. The median stays 32.**

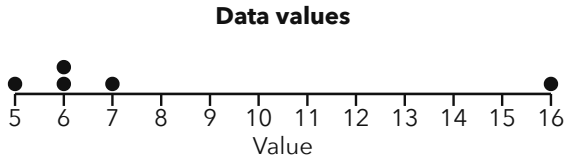
## PRACTICE 6 problems

**1** Find the mean and median of the data in the dot plot.



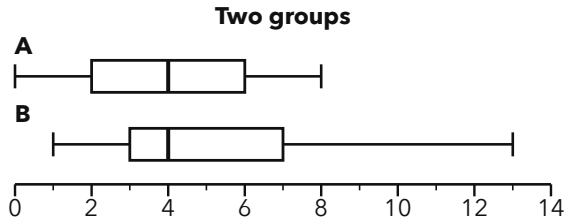

ANSWER _____

**2** Find the range of the dot plot. Then find the range if its greatest value is removed.



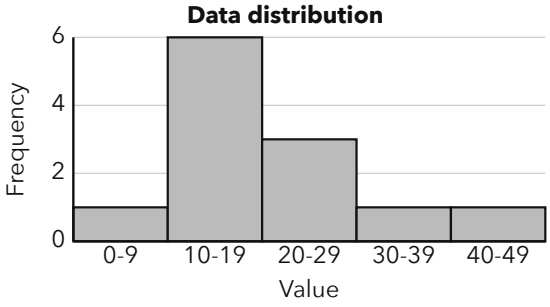

**ANSWER** _____

**3** Which group has the greater range? Do the groups have different IQRs?




**ANSWER** _____

**4** Which interval contains the two middle observations? Does the distribution have a longer tail to the left or to the right?




**ANSWER** _____

**5** The wait times, in minutes, are 1, 2, 2, 3, and 12. If 12 is removed, what are the new mean and range?

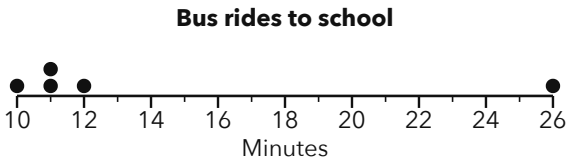
**ANSWER** _____

**6** Five scores have a mean of 8 and a median of 7. A score of 9, which is above the median, changes to 19. Find the new mean. Does the median change?

**ANSWER** _____

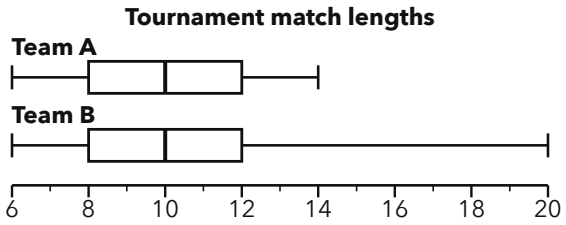
## APPLY IT Show your work

**1** You track five bus rides to school. Use the dot plot to find the mean and median ride times. Then find both measures without the longest ride. What effect did that ride have?




**ANSWER** _____

**2** Two gaming teams tracked how long their tournament matches lasted. Use the box plots to compare their medians, IQRs, and ranges. Which team's times are more spread out by range?




**ANSWER** _____

## CHALLENGE One step up

Five daily screen-time totals, in hours, are 1, 2, 2, 3, and x. Their mean is 4. Find x. Then compare the mean, median, and range with and without x, and explain which measures change.

WORK SPACE AND ANSWER

**ANSWER KEY** # Spot the Shift



## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Find the mean and median of the data in the dot plot. | **Mean: 5. Median: 3.** |
| 2 | Find the range of the dot plot. Then find the range if its greatest value is removed. | **Original range: 11. Range without 16: 2.** |
| 3 | Which group has the greater range? Do the groups have different IQRs? | **Group B has the greater range, 12 compared with 8. Both IQRs are 4.** |
| 4 | Which interval contains the two middle observations? Does the distribution have a longer tail to the left or to the right? | **Both middle observations are in 10-19. The tail is longer to the right.** |
| 5 | The wait times, in minutes, are 1, 2, 2, 3, and 12. If 12 is removed, what are the new mean and range? | **New mean: 2 minutes. New range: 2 minutes.** |
| 6 | Five scores have a mean of 8 and a median of 7. A score of 9, which is above the median, changes to 19. Find the new mean. Does the median change? | **The new mean is 10. The median stays 7.** |

## PART 2 · APPLY IT

1. **With all five rides, the mean is 14 minutes and the median is 11 minutes. Without the longest ride, both are 11 minutes. The longest ride raises the mean by 3 minutes but does not change the median.** The five times total 70 minutes, so their mean is 70 / 5 = 14. Removing 26 leaves a total of 44 minutes across four rides, so the new mean is 11; the middle value stays 11.
2. **Both medians are 10 minutes, and both IQRs are 4 minutes. Team A's range is 8 minutes; Team B's is 14 minutes, so Team B is more spread out by range.** Read each median at 10 and subtract Q1 from Q3: 12 - 8 = 4. Subtract each minimum from its maximum to get ranges of 8 and 14.

## CHALLENGE

**The total is 5 × 4 = 20 hours, and the known values total 8 hours, so x = 12. With 12, the mean is 4, the median is 2, and the range is 11. Without 12, the mean is 2, the median is 2, and the range is 2. Removing the high value lowers the mean and range, but the middle stays at 2.**

Accept equivalent comparisons that name the correct measures and units. For the histogram, the 6th and 7th observations both fall in the 10-19 interval.