Comparing Mean and Median

Lesson # 14

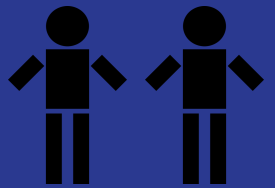
Let’s compare the mean and median of data sets.

Today’s Goals

- ❏ I can determine when the mean or median is more appropriate to describe the center of data.
- ❏ I can explain how the distribution of data affects the mean and the median.

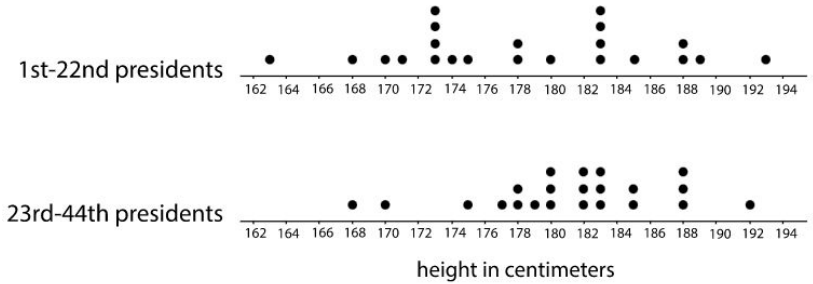
Heights of Presidents

Warm Up



Work quietly (2 min)

Here are two dot plots. The first dot plot shows the heights of the first 22 U.S. presidents. The second dot plot shows the heights of the next 22 presidents.



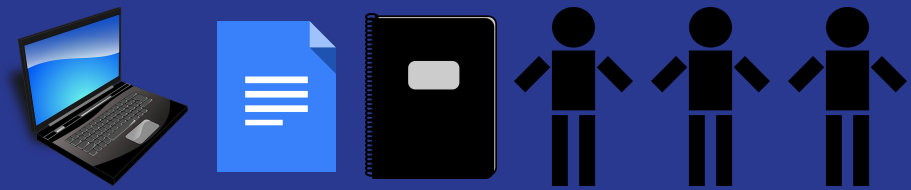
Based on the two dot plots, decide if you agree or disagree with each of the following statements. Be prepared to explain your reasoning.

1. The median height of the first 22 presidents is 178 centimeters.
2. The mean height of the first 22 presidents is about 183 centimeters.
3. A typical height for a president in the second group is about 182 centimeters.
4. U.S. presidents have become taller over time.
5. The heights of the first 22 presidents are more alike than the heights of the second 22 presidents.
6. The MAD of the second data set is greater than the MAD of the first set.

The Tallest and Smallest in the World

Activity 1

- MLR7: Compare and Connect



Work with your group on the first 3 questions, then pause (8–10 min)

I will provide the height data for your class. Use the data to complete the following questions.

1. Find the mean height of your class in centimeters.
2. Find the median height in centimeters. Show your reasoning.
3. Suppose that the world's tallest adult, who is 251 centimeters tall, joined your class.
    a. Discuss the following questions with your group and explain your reasoning.
        - How would the mean height of the class change?
        - How would the median height change?
    b. Find the new mean.
    c. Find the new median.
    d. Which measure of center—the mean or the median—changed more when this new person joined the class? Explain why the value of one measure changed more than the other.

Answer the last set of questions with your group (3-5 min)

4. The world's smallest adult is 63 centimeters tall. Suppose that the world's tallest and smallest adults both joined your class.

a. Discuss the following questions with your group and explain your reasoning.
   - How would the mean height of the class change from the original mean?
   - How would the median height change from the original median?

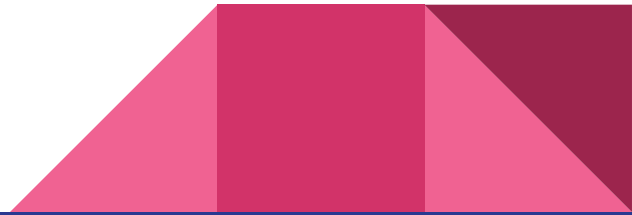
b. Find the new mean.

c. Find the new median.

d. How did the measures of center—the mean and the median—change when these two people joined the class? Explain why the values of the mean and median changed the way they did.

Let’s Talk About It

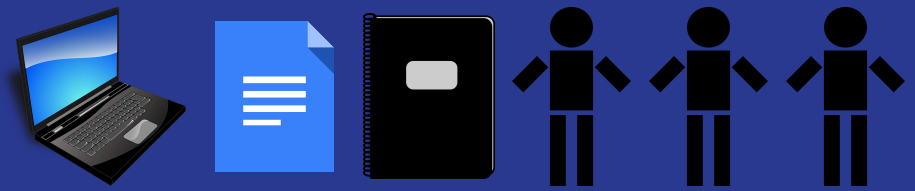
- What effect does the smallest person in the world have on the mean? Why?
- Which would affect the mean more: the height of the tallest person, or the height of the smallest person? Why?
- Suppose a new student who has a height close to the mean joined the class. Would her height affect the mean? Why or why not?
- Does adding two values—one unusually high and one unusually low—affect the median? Why or why not?



Mean or Median?

Activity 2

- Take Turns
- MLR8: Discussion Supports

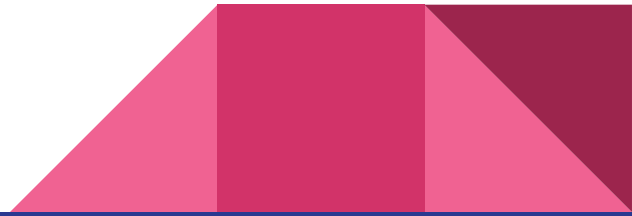


Work to sort the cards with your group, then pause (3-4 min)

1. I will give you six cards. Each has either a dot plot or a histogram. Sort the cards into *two* piles based on the distributions shown. Be prepared to explain your reasoning.
2. Discuss your sorting decisions with another group. Did you have the same cards in each pile? If so, did you use the same sorting categories? If not, how are your categories different?

Let’s Talk About It

- What do you notice about the shape and features of distributions that have roughly equal mean and median?
- What about the shape and features of a distribution that has very different mean and median?
- In the second group, why might the mean and the median be so different?

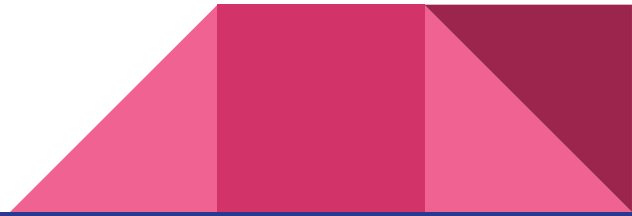


Answer the remaining questions with your group (3-4 min)

1. Use the information on the cards to answer the following questions.
   a. Card A: What is a typical age of the dogs being treated at the animal clinic?
   b. Card B: What is a typical number of people in the Irish households?
   c. Card C: What is a typical travel time for the New Zealand students?
   d. Card D: Would 15 years old be a good description of a typical age of the people who attended the birthday party?
   e. Card E: Is 15 minutes or 24 minutes a better description of a typical time it takes the students in South Africa to get to school?
   f. Card F: Would 21.3 years old be a good description of a typical age of the people who went on a field trip to Washington, D.C.?
2. How did you decide which measure of center to use for the dot plots on Cards A–C? What about for those on Cards D–F?

Let’s Talk About It

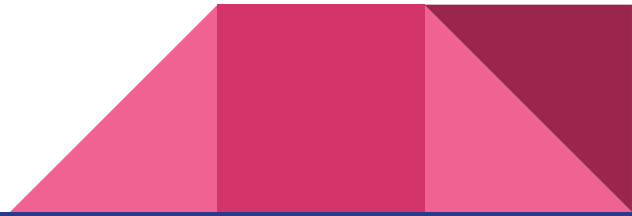
- For data sets with non-symmetrical distributions, why does the median turn out to be a better measure of center for non-symmetrical data sets?
- Does it matter which measure we chose to describe a typical value? For example, in Card F, would it matter if we said that a typical age for the people who went on the field trip to D.C. was about 21 years old?



Are you ready for more?

Most teachers use the mean to calculate a student's final grade, based on that student's scores on tests, quizzes, homework, projects, and other graded assignments.

Diego thinks that the median might be a better way to measure how well a student did in a course. Do you agree with Diego? Explain your reasoning.



Lesson Synthesis

Sometimes the two measures of center could be the same or very close, but other times they could be very different.

- When are the mean and median likely to be close together?
- When are they likely to be different?
- Why might the median be a more useful measure of center when the distribution is not symmetrical?“In the situations we saw today, did it matter which measure we choose to describe a typical value?
- A student reports that 7 is a typical number of pets that students in her class have. Do you think she used the mean number of pets or the median? How do you know?
- Can you think of other real-world situations where reporting the mean or median can be misleading?

Today’s Goals

- ❏ I can determine when the mean or median is more appropriate to describe the center of data.
- ❏ I can explain how the distribution of data affects the mean and the median.

Which Measure of Center to Use?

Cool Down