

Measures of Center and Variability

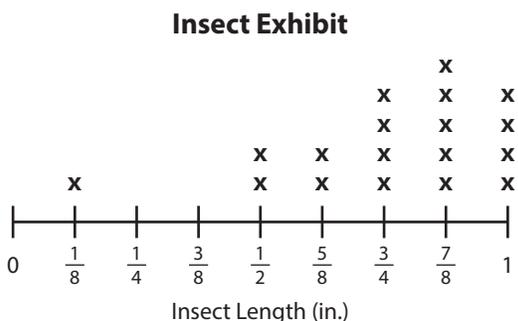
Name: _____

Prerequisite: Distribution of Data

Study the example showing how to interpret the distribution of data in a line plot. Then solve problems 1–8.

Example

There are several rare insects on display at the insect exhibit at a science museum. The line plot shows the lengths of the insects to the nearest $\frac{1}{8}$ inch. What is the distribution of the lengths of the insects?



Most of the data points are between $\frac{3}{4}$ and 1, so the insect lengths are clustered between $\frac{3}{4}$ and 1 inch.

- The longest insect is how many times as long as the shortest insect? Write an equation to show your solution.

- Do any insects have a length that is very different from the rest of the insects? If so, what is the length?

- How would the line plot change if the insect lengths were clustered between $\frac{1}{8}$ and $\frac{1}{4}$ inch?

Vocabulary

distribution shows how spread out or how clustered data values are.

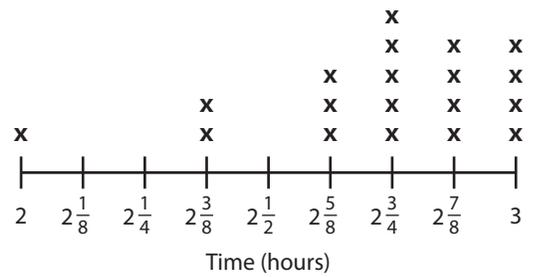


Solve.

Use the line plot for problems 4–8.

The line plot shows the amount of time it took some runners to finish a charity race to the nearest $\frac{1}{8}$ hour.

Fund-Raiser Run



4 Tell whether each statement about the data in the line plot is *True* or *False*.

- a. None of the runners finished in exactly $2\frac{1}{2}$ hours. True False
- b. A time of 2 hours is uncommon. True False
- c. The most common time is $2\frac{3}{4}$ hours. True False
- d. Most runners finished in around $2\frac{7}{8}$ hours. True False

5 By how much do the times vary? Explain.

6 Between which two times did most of the runners finish?

7 Are any of the times very different from most of the times? If so, which time?

8 Suppose the times for 10 additional runners were recorded, including a new slowest time and a new fastest time. What would be a set of reasonable times based on the data in the line plot? Explain.



Mean

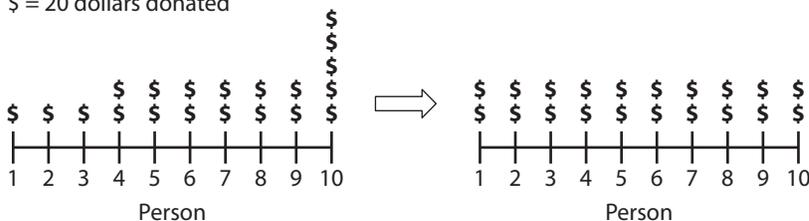
Study the example showing how to describe the center of a data set using mean. Then solve problems 1–8.

Example

Ten people were asked how much money they plan to donate to the new library fund. Their answers were \$20, \$20, \$20, \$40, \$40, \$40, \$40, \$40, \$40, and \$100. What is the mean, or average, donation?

You can draw a graph that represents how much each person plans to donate. Then, to find the mean, move the symbols to show what each person would donate if all of them donated the same amount.

\$ = 20 dollars donated



1 What is the mean donation? Explain how the graph on the right shows the mean.

2 Complete the equations to show another way to find the mean.

_____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ = _____

_____ ÷ 10 = _____

3 Are there any outliers in the data? If so, calculate the mean without the outliers and explain how the mean is affected.



Solve.

Use the following situation to solve problems 4–6.

The numbers of hours that 12 students say they typically spend on homework in a week are 0, 2, 8, 8, 8, 8, 8, 8, 8, 10, 10, 10, and 10.

- 4** What is the mean number of hours?

Show your work.

Solution: _____

- 5** What are the outliers in the data set? How do you know that they are outliers?

- 6** Explain how the outliers affect the mean. Then find the mean without the outliers to justify your answer.

- 7** The mean of six values is 7. There is one outlier that pulls the mean higher than the center. What could the data set be? What is the mean without the outlier?

- 8** Dee's scores for a computer game are 20, 18, 22, 12, 25, and 20. Li's scores are 21, 20, 20, 16, 21, and 16. Who has the higher mean score? By how much?

Show your work.

Solution: _____

Median and Mode

Study the example showing how to describe the center of a data set using median and mode. Then solve problems 1–8.

Example

A team's scores for ten basketball games are 46, 42, 43, 44, 42, 40, 42, 42, 44, and 43. Find the median and the mode of the basketball scores.

List the scores in order from least to greatest to find the median. The median is the middle number. When there are two middle numbers, the median is the mean, or average, of the two numbers.

40, 42, 42, 42, 42, 43, 43, 44, 44, 46

$$42 + 43 = 85 \qquad 85 \div 2 = 42.5$$

The median score is 42.5.

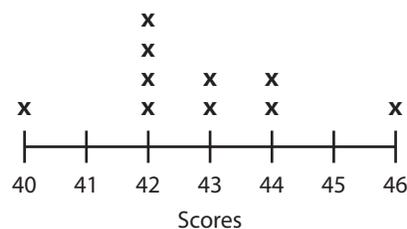
The number that appears most often in a data set is the mode. The mode of this data set is 42.

- 1 Jason says that more than half of the values of any data set are above the median. Is he correct? Explain.

- 2 What would the median score be if 40 were removed from the set of scores?

- 3 The line plot shows the basketball scores from above. Explain how the line plot shows the mode.

Basketball Games



Solve.

Use the following situation to solve problems 4–6.

The heights, in inches, of some small trees for sale at a garden store are 62, 62, 59, 61, 59, 70, 59, and 62.

4 What is the median height?

Show your work.

Solution: _____

5 What is the mode? Explain.

6 What is the mean height? Explain why the mean height is different from the median.

7 Imena's math test scores are 83, 93, 78, 89, and 83. She has one more math test this semester. What score must she get on the test to have a median score of 85?

Show your work.

Solution: _____

8 Does the median of a data set have to be a value of the data set? Explain.

Variability

Study the example showing how to describe the spread of data sets. Then solve problems 1–10.

Example

Ten people donated the following amounts of money at a school fundraiser: \$5, \$30, \$10, \$10, \$5, \$5, \$20, \$30, \$20, \$15. What is the range of the data?

Range is the difference between the greatest and least values. Range gives you an idea of how spread out data values are. Here, the smallest donation is \$5 and the largest donation is \$30, so the range is $\$30 - \$5 = \$25$.

1 MAD is another way to measure spread. It is the average distance each value is from the mean. The mean of the donation amounts in the table is 15.

- Find the absolute value of each deviation. Write the answers in the table.
- What is the MAD? Show how you found the MAD.

2 What does the MAD tell you about this data set?

3 Compare each deviation to the mean. When is the deviation positive? When is it negative? When is it zero?

Donation	Deviation from Mean	Absolute Value of Deviation
5	-10	
5	-10	
5	-10	
10	-5	
10	-5	
15	0	
20	5	
20	5	
30	15	
30	15	



Solve.

Use the table to solve problems 5–8.

The data values in the table represent the ages of children at a park.

Age (years)	Deviation from Mean	Absolute Value of Deviation
4	-4	4
6	-2	
6	-2	
8	0	
8	0	
8	0	
10	2	
10	2	
10	2	
10	2	

- 5 What is the range of the data values? Write an equation to show your solution.

- 6 The mean of the data values is 8. Use the mean to complete the table.

- 7 What is the MAD?

Show your work.

Solution: _____

- 8 What does the MAD tell you about the data set?

- 9 Could the MAD of a data set be a negative value? Explain.

- 10 The MAD of a set of six data values is 10. The mean is 20. What could the data values be? Show that the mean is 20 and the MAD is 10.

Show your work.

Solution: _____



Measures of Center and Variability

Solve the problems.

- 1** The lengths, in seconds, of eight commercials are 15, 15, 15, 15, 20, 20, 30, and 30. The mean of the times is 20 seconds. What is the mean absolute deviation (MAD)? What does the MAD tell you?

Show your work.

How do you find mean absolute deviation?



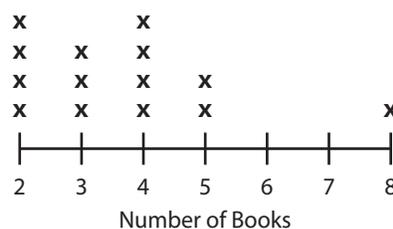
Solution: _____

- 2** The line plot shows the number of books that each of 14 students checked out of the library.

Which statements are true? Select all that apply.

- A** The data points are clustered near 5.
- B** The range of the data is 6.
- C** The graph is skewed left.
- D** There are no outliers in the data set.

Library Books



What does the distribution of the data in the line plot tell you?



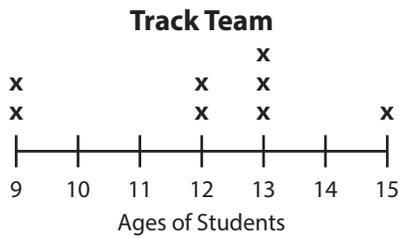
- 3** A set of six data values have the same mean, median, and mode. The data values are not all the same. What could the data values and the mean, median, and mode be?

How can you find the median of a set of data with an even number of values?



Solve.

- 4** The line plot shows the ages of eight students on the track team.



What does each X in the line plot represent?



Tell whether each statement is *True* or *False*.

- a. The modes are 9 and 12. True False
- b. The median is 12.5. True False
- c. The mean is 12. True False
- d. The range is 13. True False

- 5** In a survey, 10 students and 10 teachers were asked how many hours of sleep they get at night. Here are the survey results:

Students: 6, 7, 8, 8, 9, 9, 10, 10, 10, 10

Teachers: 4, 5, 6, 6, 7, 7, 8, 8, 8, 8

What is the mean of each data set? What do the means tell you about each data set? Use the means to compare the data sets.

Show your work.

Remember that the mean of a data set is the same as the average value.



Solution: _____
