

LESSON

16.4

Dot Plots and Data Distribution

COMMON CORE

6.SP.4

Display numerical data in plots on a number line, including dot plots... Also 6.SP.1, 6.SP.2, 6.SP.5c, 6.SP.5d

?

ESSENTIAL QUESTION

How can you summarize and display numeric data?

EXPLORE ACTIVITY

Real World

COMMON CORE

6.SP.1

Variable Data and Statistical Questions

The question “How much does a typical cat weigh?” is an example of a statistical question. A **statistical question** is a question that has many different, or variable, answers.



A Decide whether each of the situations below could yield variable data.

1. Your sister wants to know the typical weight for an adult cat.

2. You want to know how tall your friend is. _____
3. You want to know how far your house is from school. _____
4. A car owner wants to know how much money people usually pay for a new tire. _____
5. How many students were in line for lunch at the cafeteria today at 12:30? _____

B For which of the situations in part **A** can you write a statistical question? Write questions for these situations.

Reflect

1. Choose one of the questions you wrote in part **B**. How might you find answers to this question? What units would you use for the answers?

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Making a Dot Plot

Statistical questions are answered by collecting and analyzing data. One way to understand a set of data is to make a visual display. A **dot plot** is a visual display in which each piece of data is represented by a dot above a number line. A dot plot shows the frequency of each data value.

EXAMPLE 1

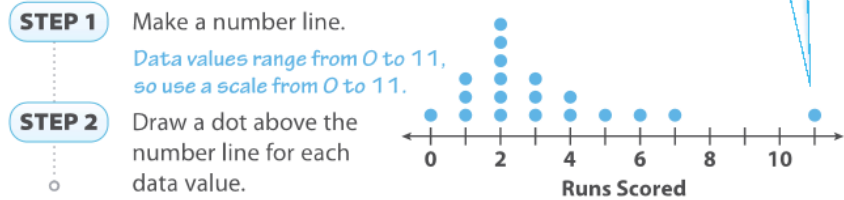
Real World

COMMON CORE 6.SP.4

A baseball team manager records the number of runs scored by the team in each game for several weeks. Use the data to make a dot plot.

1, 3, 1, 7, 2, 0, 11, 2, 2, 3, 1, 3, 4, 2, 2, 4, 5, 2, 6

The team usually scores between 0 and 7 runs in a game, but in one game they scored 11 runs.



Reflect

- 2. How many games did the team play during the season? How can you tell from looking at the dot plot?

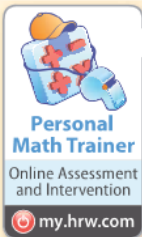
- 3. At how many games did the team score 2 runs or fewer? How do you know?

YOUR TURN

4. A different baseball team scores the following numbers of runs in its games for several weeks:
4, 4, 6, 1, 2, 4, 1, 2, 5, 3, 3, 5, 4, 2



Use the data to make a dot plot. Tell how many games the team played, and identify the data value with the greatest frequency.



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Interpreting a Dot Plot

A dot plot can give you a visual picture of the spread, center, and shape of a data distribution.

You can describe the spread of a data set by identifying the least and greatest values. You can also look for **outliers** which are data values that are either much greater or much less than the other data values.

You can describe the center and shape of a data set in terms of *peaks*, *clusters*, or *symmetry*. A symmetric distribution has approximately the same number of data values on either side of the center.



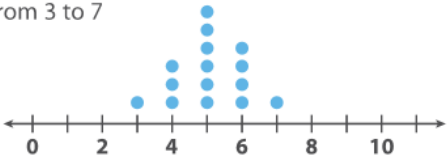
EXAMPLE 2

COMMON CORE 6.SP.2

Describe the spread, center, and shape of each data distribution.

- A** The data values are spread out from 3 to 7 with no outliers.

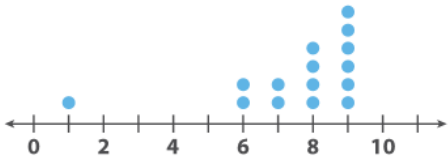
The data has a cluster from 3 to 7 with one peak at 5, which is the center of the distribution.



The distribution is symmetric. The data values are clustered around the center of the distribution.

- B** The data values are spread out from 1 to 9. The data value 1 appears to be an outlier.

The data has a cluster from 6 to 9 with one peak at 9, which is the greatest value in the data set.

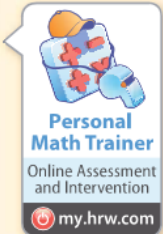


The distribution is not symmetric. The data values are clustered at one end of the distribution.

My Notes

YOUR TURN

5. Describe the spread, center, and shape of the data distribution from Example 1.





Finding Measures from a Dot Plot

You can also find and calculate measures of center and spread from a dot plot.

EXAMPLE 3

COMMON
CORE

6.SP.5d, 6.SP.5c

The dot plot shows the number of runs scored by a baseball team in each game for several weeks from Example 1.



- A** Find the mean, median, and range of the data.

STEP 1

To find the mean, find the sum of the data values and divide by the number of data values.

$$\frac{1(0) + 3(1) + 6(2) + 3(3) + 2(4) + 1(5) + 1(6) + 1(7) + 1(11)}{19} = \frac{61}{19} \approx 3.2$$

The mean is about 3.2.

STEP 2

To find the median, count the dots from left to right until you find the middle value. You may need to find the mean of two middle values.

The median is 2.

STEP 3

To find the range, read the least and greatest values from the dot plot. Subtract the least value from the greatest.

$$11 - 0 = 11$$

The range is 11.

Math Talk

Mathematical Practices

Why is the question in **B** a statistical question?

- B** How many runs does the team typically score in a game? Explain.

The mean number of runs is 3.2. The median number of runs is 2.

The shape of the dot plot suggests that the outlier 11 may be affecting these measures of center. To see if that is the case, find the mean and median without including the outlier. Compare these values with the original values.

STEP 1

Find the mean without including the outlier.

$$\frac{1(0) + 3(1) + 6(2) + 3(3) + 2(4) + 1(5) + 1(6) + 1(7)}{18} = \frac{50}{18} \approx 2.8$$

Without the outlier, the mean is 2.8, which is less than the original mean of 3.2.

STEP 2

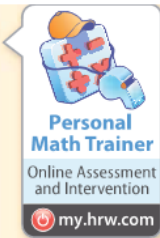
Find the median without including the outlier.

Counting from left to right, the median is still 2.

Given that it is not affected by the outlier, the median may be more typical of the data. The team typically scores two runs per game.

YOUR TURN

6. Find the mean, median, and range of the data from Your Turn question 4. What is the typical number of runs the team scores in a game? Justify your answer.



Guided Practice

Tell whether the situation could yield variable data. If possible, write a statistical question. (Explore Activity)

1. The town council members want to know how much recyclable trash a typical household in town generates each week.

Kate asked some friends how many movies they saw last winter. Use her data for 2 and 3.

Movies Seen Last Winter

0, 1, 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5,
6, 6, 7, 7, 7, 8, 8, 9, 9, 17

2. Make a dot plot of the data. (Example 1)



3. Find the mean, median, and range of the data. (Example 3)

4. Describe the spread, center, and shape of the data. (Example 2)



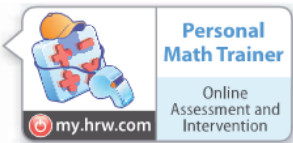
ESSENTIAL QUESTION CHECK-IN

5. What are some measures of center and spread that you can find from a dot plot? How can making a dot plot help you visualize a data distribution?

Name _____ Class _____ Date _____

16.4 Independent Practice

COMMON CORE 6.SP.1, 6.SP.2, 6.SP.4, 6.SP.5c, 6.SP.5d



6. **Vocabulary** Describe how a statistical question yields an answer with variability. Give an example.

For 7–10, determine whether the question is a statistical question. If it is a statistical question, identify the units for the answer.

7. An antique collector wants to know the age of a particular chair in a shop.

8. How tall do the people in your immediate and extended family tend to be?



9. How tall is Sam?

10. How much did your classmates typically spend on music downloads last year?

For 11–14, use the following data. The data give the number of days of precipitation per month during one year in a city.

12 10 11 9 9 10 12 9 8 7 9 10

11. Make a dot plot of the data.



12. What does each dot represent? How many months are represented?

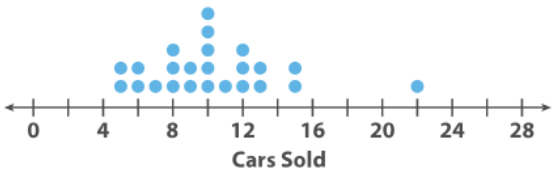
13. Describe the shape, center, and spread of the data distribution. Are there any outliers?

14. Find the mean, median, and range of the data.

15. **What If?** During one month there were 7 days of precipitation. What if there had only been 3 days of precipitation that month? How would that change the measures of center?

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For 16–20, use the dot plot of the number of cars sold at a car dealership per week during the first half of the year.



16. Find the mean, median, and range.
 Mean = _____ Median = _____
 Range = _____
17. The owner of the car dealership decides to treat the value 22 as an outlier. Which measure of center or spread is affected the most if the owner removes this outlier? Explain.

18. How many cars are sold in a typical week at the dealership? Explain.

19. Write an expression that represents the total number of cars sold during the first half of the year.

20. Describe the spread, center, and shape of the data distribution.

21. **Vocabulary** Explain how you can tell the frequency of a data value by looking at a dot plot.

For 22–26 use the following data. The data give the number of runs scored by opponents of the Boston Red Sox in June 2010.

4, 4, 9, 0, 2, 4, 1, 2, 11, 8, 2, 2, 5, 3, 2, 5, 6, 4, 0

22. Make a dot plot for the data.



23. How many games did the Boston Red Sox play in June 2010? Explain.

24. Which data value in your dot plot has the greatest frequency? Explain what that frequency means for this data.

25. Find the mean, median, and range of the data.

26. What is a statistical question that you could answer using the dot plot? Answer your question and justify your response.

H.O.T.

FOCUS ON HIGHER ORDER THINKING

Work Area

27. A pediatrician records the ages of the patients seen in one day:
1, 2, 5, 7, 9, 17, 13, 16, 18, 12, 3, 5, 1.
- a. **Explain the Error** Assuming that some of the patients are infants who are less than 1 year old, what information did the pediatrician forget to write down?
- b. **Critical Thinking** Can you make a dot plot of the pediatrician's data? Can you find the mean, median, and range? Why or why not?

28. **Multistep** A nurse measured a patient's heart rate at different times over several days.

Heart Rate (beats per minute)
86, 87, 89, 87, 86, 88, 90, 85, 82, 86, 83, 85, 84, 86



- a. Make a dot plot.
- b. Describe the shape, center, and spread of the data. Then find the mean, median, range, and IQR for the data.
- c. **What If?** The nurse collected the data when the patient was resting. How might the dot plot and the measures change if the nurse collects the data when the patient is exercising?

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