



common core

Performance Coach



Sample Lesson

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6.RP.3.a

6.RP.2, 6.RP.3.b

6.RP.3.c

6.RP.3.d

6.NS.1

6.NS.2

6.NS.3

6.NS.3

6.NS.4

6.NS.5

6.NS.6.a, 6.NS.6.c

6.NS.7.a, 6.NS.7.b

6.NS.7.c, 6.NS.7.d

6.NS.6.b, 6.NS.6.c

6.NS.8

6.EE.1

6.EE.2.a, 6.EE.2.b, 6.EE.6

6.EE.2.c, 6.EE.3

6.EE.3, 6.EE.4

6.EE.6

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Standards

6.EE.5, 6.EE.7
6.EE.5, 6.EE.8
6.EE.9
6.G.1
6.G.2
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6.SP.4, 6.SP.5.d
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6.SP.4
6.SP.4

Dot Plots

Student Edition pages 304–313

LESSON OVERVIEW

Objectives

Students will:

- Find measures of center given a dot plot
- Complete a dot plot given a set of data
- Summarize data sets in relation to their context

Discussion Questions

- MP5** What information is easier to see on a dot plot than in a list of data?
- MP6** Why is it important to use regular intervals on the number line of a dot plot?
- MP7** How does finding the number of data values in a data list compare to finding the number of data values in a dot plot of the same data?

Differentiation Support

Lesson Support Provide students with a copy of Math Tool: Number Lines. Students can graph the dot plots for the Examples and Lesson Practice questions using the number lines. If students have trouble keeping the dots aligned correctly, suggest that they use Math Tool: Rectangular Grid as a means of keeping the dots vertically aligned above the correct values.

Lesson Extension Have students find the mean, median, mode, and range of the data set in Example 2. Ask them to explain if it is possible to find these values using a dot plot. If so, students should describe their methods.

Standards

6.SP.4, 6.SP.5.d

Key Terms

cluster	frequency
dot plot	gap

Materials

- Math Tool: Number Lines, p. C7 (Student Edition p. 365)
- Math Tool: Rectangular Grid, p. C18 (Student Edition p. 387)

1 GETTING THE IDEA

Lesson Opener

Draw a number line from 1 to 6 and write the data set 6, 1, 5, 2 on the board. Ask: *How could we show this data set on this number line?* (Put a dot at 1, 2, 5, and 6.) Expand the data set to 6, 1, 5, 2, 5, 5, 5, 6, 2, 6, 5, 5, 2. *How could we change this graph to display a larger data set?* (Put a dot for each value above the number line.) Add dots to the dot plot to show the larger set of data. Ask: *There are three 2s, so how*

many dots should be above 2? (3) *Why are there no dots above 3 or 4?* (There are no values for 3 or 4 in the data set.) Student answers will help you assess their understanding of the concepts needed for them to move successfully into understanding, analyzing, and making dot plots. Discuss the meaning of the vocabulary words *cluster*, *dot plot*, *frequency*, and *gap* as presented in this lesson. Review the meanings of *mean*, *median*, *mode*, and *range*.

▲ **ELL Support** Have students add cluster, dot plot, frequency, and gap to their dictionaries. Suggest that students draw a dot plot with a cluster and a gap and label them. Record below the dot plot the frequency of each value. Have students review mean, median, mode, and range in their dictionaries. Have them find these values for the example dot plot they drew.

The cognate for frequency in Spanish is frecuencia.

► Example 1

Ask students to pretend they had the data set in a list instead of a dot plot. Ask: *How would you find the mean?* (Add all the data values and divide by the total number of data values.) Explain that this dot plot is a way of displaying all the scores without having to write out a list of scores. When reviewing Step 2, ask: *How does the dot plot make finding the mean easier than using a list of the scores?*

▲ **Journal Prompt** **MP1** *How would the mean change if one score of 100 changed to a score of 50? Would this change also affect the median and mode? If so, how?*

► Example 2

Draw the students' attention to the data list. Ask: *How many guesses are there?* (28) *How does the table in Step 1 help you organize the 28 guesses? How does knowing the frequency of each guess help you to make a dot plot of the data?*

▲ **Common Error** Students may not include the values in their tables for which there are no data values, e.g., 51. Explain that this is not wrong, but when making the dot plot they will need to include those values on the number line. Ask: *How many dots should you put above a value that is not in the data set?* (none)

► Example 3

There are different strategies a student could use to eliminate the plots that do not show the given data. Remind students that, no matter how they eliminate choices, they should always double-check the choice that remains as the correct answer. Ask: *How many values are in this data set?* (16) *How can you use this number to eliminate dot plots?* (Eliminate dot plot B, since it has only 15 dots.) *Does Choice C have the correct number of data values?* (yes) Review checking the data on the correct dot plot in Step 3.

► Example 4

Explain that the data set that is set up in Step 1 is not the only data set that would work, but finding one data set that shows the mean and median to be 25 is all that is needed. Ask: *Would the median still be 25 if the data set were changed to 10, 10, 10, 10, 24, 26, 27, 30, 43, 60?* (yes) *If the mean is 25, what must the sum of all the data be?* ($10 \times 25 = 250$) *Could the data set be 10, 10, 10, 10, 24, 26, 27, 30, 43, 60?* (yes)

2 COACHED EXAMPLE

Ask a volunteer to read the word problem. Discuss the meaning of the ranges for the values on the number line. Ask: *Can you find the exact ages from this dot plot?* (no) *Can you determine how many hours each family member played computer games in a week?* (No, we just know they played 10 or more hours.) *What might be a reason for the large gap*

between 25 and 35? (People this age might spend more time working outside their homes.) Work with students to ensure they have completed the sentence frames correctly.

For answers, see page A30.

3 LESSON PRACTICE

Problems 3 and 4 would be good problems to use as a quick check for student's understanding of the concepts taught in this lesson. If students are having difficulty on problem 6, suggest they cover up the

choices and make their own dot plot of the data and then compare it to the choices.

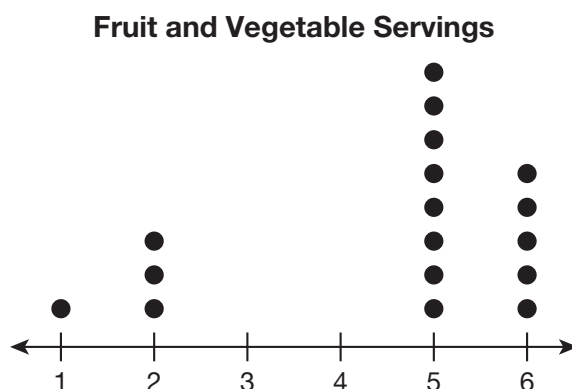
For answers, see page A30.

Dot Plots

1 GETTING THE IDEA

A **dot plot**, or **line plot**, organizes and displays data along a number line. Each dot stands for a piece of data. The **frequency** of each data value, or the number of times it occurs in the set, is shown by the number of dots above the value on the number line.

This dot plot shows the number of fruit and vegetable servings eaten by students in a day. It was created from this data: 6, 1, 5, 5, 5, 5, 6, 2, 6, 5, 5, 2, 5, 5, 6, 6, 2



There are 8 dots above 5 on the number line. That means that 8 students reported eating 5 servings a day.

There are no dots above 3 on the number line. That means that no students reported eating 3 servings a day.

A **cluster** is a set of closely grouped data. A **gap** in a data set is where no data values occur. On the dot plot above, a cluster occurs at 5 and 6 servings per day. A gap occurs at 3 and 4 servings per day. It is important to use regular intervals on the number line of a dot plot so that gaps can be observed. Numbers should not be skipped just because there are no data points.

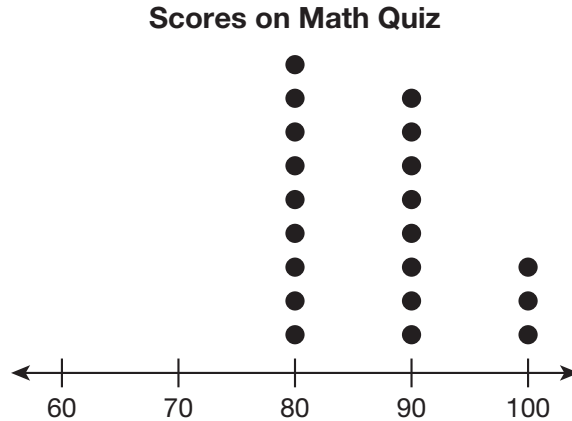
By looking at a dot plot, you can quickly find the mode or modes of a data set by seeing which number has the most dots above it. It is clear in the plot above that the number 5 has the greatest frequency, so it is the mode of the data.

To calculate the range of the data set above, we can see that the greatest value is 6 and the least value is 1. So, the range of the data is $6 - 1 = 5$.

A dot plot can be used to find the measures of center of the data set it displays.

Example 1

The line plot shows student scores on a math quiz. Find the mean score.



Strategy Find the sum of the scores. Then divide by the number of scores.

Step 1 Record the frequency of each score. Count the number of dots above each score.

There are 9 students who scored 80.

There are 8 students who scored 90.

There are 3 students who scored 100.

Step 2 Multiply each score by its frequency.

$$9 \times 80 = 720$$

$$8 \times 90 = 720$$

$$3 \times 100 = 300$$

Step 3 Add the products to find the sum of all the students' scores.

$$720 + 720 + 300 = 1,740$$

Step 4 Divide by the number of scores. The number of dots is the number of scores.

There are a total of $9 + 8 + 3$, or 20 dots.

$$1,740 \div 20 = 87$$

Solution The mean score on the math quiz is 87.

Example 2

Visitors at the school fair guessed the number of marbles in a jar to try to win a prize. Their guesses are shown below. Make a dot plot for the set of data.

54	50	60	55	50	60	60	59	52	50	55	50	60	55
60	55	50	60	50	60	60	55	55	50	60	50	58	55

Strategy Find the frequency of each guess. Mark dots on a number line to display the data.

Step 1

Make a table.

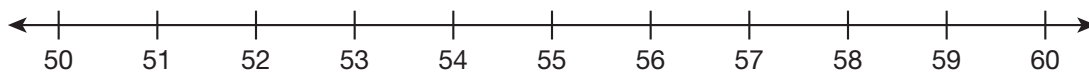
Count and record the number of times each number was guessed.

Guess	50	51	52	53	54	55	56	57	58	59	60
Frequency	8	0	1	0	1	7	0	0	1	1	9

Step 2

Draw a number line. Mark it from the least to the greatest number of guesses.

The guesses ranged from 50 to 60. Mark units of one from 50 to 60.

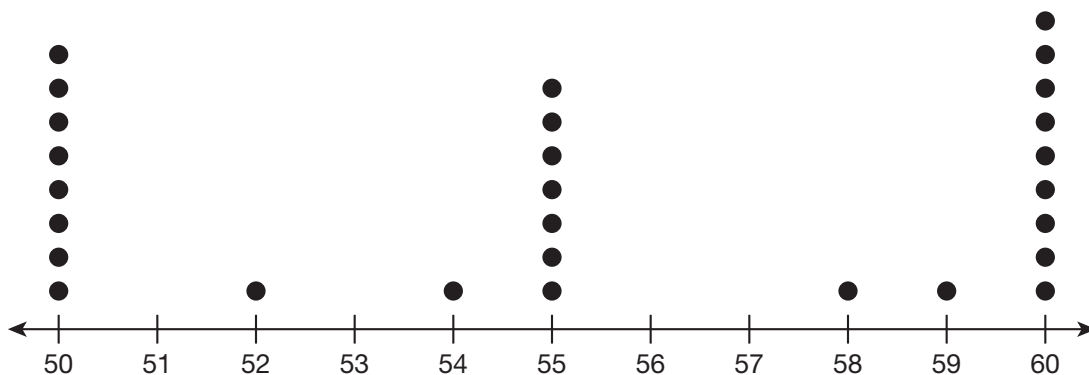


Step 3

Mark the frequency of each guess with dots above the number line.

Mark 8 dots above 50, 1 dot above 52, 1 dot above 54, 7 dots above 55, 1 dot above 58, 1 dot above 59, and 9 dots above 60.

Guesses for Number of Marbles



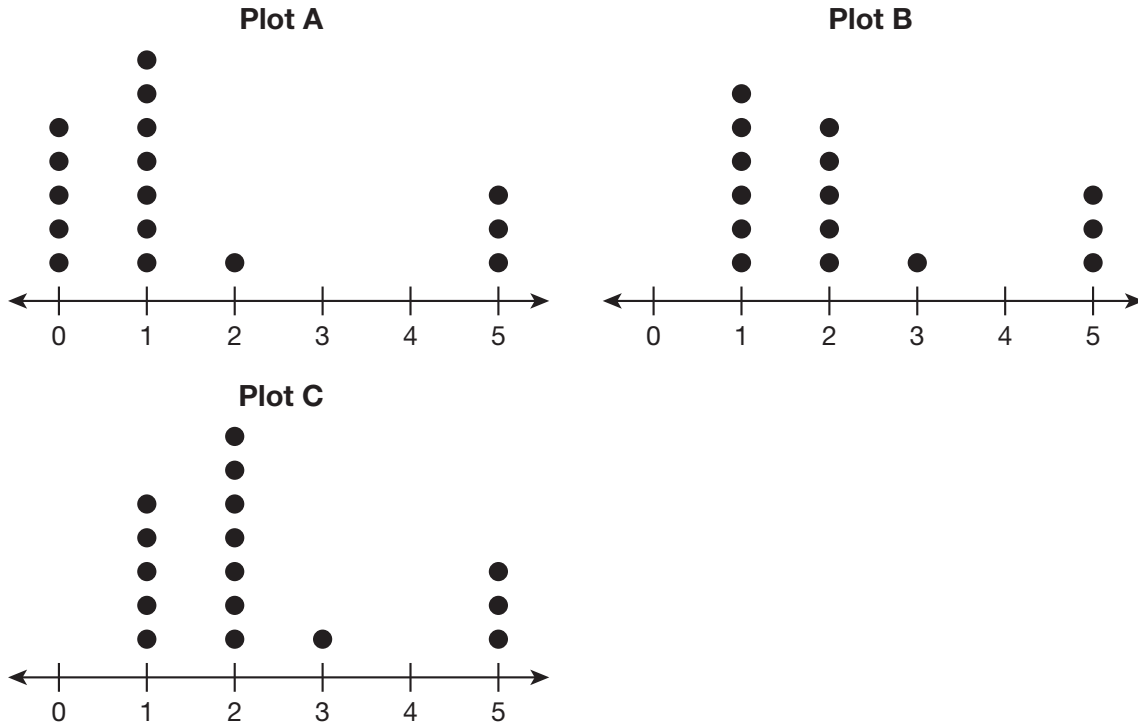
Solution The dot plot in Step 3 shows the set of data.

Example 3

The set of data shows the number of pets that Jason's classmates have.

2	5	2	1	1	3	1	1
2	5	5	2	2	2	2	1

Which dot plot displays the data?



Strategy Compare the frequencies and distribution on each plot with the data.

Step 1 Look at the range of the data.

The responses for number of pets ranged from 1 to 5.

Plot A shows dots above 0. The answer cannot be Plot A.

Step 2 Look at the mode of the data.

Plot B shows a mode of 1. Plot C shows a mode of 2.

The mode for the number of pets is 2. The answer cannot be Plot B.

Step 3 Check that the data in Plot C matches the given data.

There are 5 students with 1 pet, 7 students with 2 pets, 1 student with 3 pets, and 3 students with 5 pets. No students have 0 or 4 pets.

Solution Plot C displays the data.

Example 4

A dot plot shows the weights of the dogs owned by ten students. The heaviest dog weighs 60 pounds. No dog weighs less than 10 pounds. Is it possible for the mean and median of this data to be 25?

Strategy Create a data set in order to produce the desired outcome.

Step 1

List possible data values from least to greatest that would have a median of 25.

Use four data values less than 25. Remember that there are no data values less than 10.

Make the middle two numbers 25 so that the median is 25.

Make the tenth number 60 to represent the heaviest dog.

10, 10, 10, 10, 25, 25, ____, ____, ____, 60

Step 2

Write an equation for the mean to find the unknown values.

Use your data set and the mean of 25 to write and solve an equation.

The sum of the known data values is $10 + 10 + 10 + 10 + 25 + 25 + 60$, or 150.

There are three unknown data values. Let x represent the sum of the three unknown data values.

$$\frac{(150 + x)}{10} = 25 \quad \text{Multiply both sides by 10.}$$

$$150 + x = 250 \quad \text{Subtract 150 from both sides.}$$

$$x = 100$$

Step 3

Select three values greater than or equal to 25 whose sum is 100.

The remaining three values could be 25, 25, and 50.

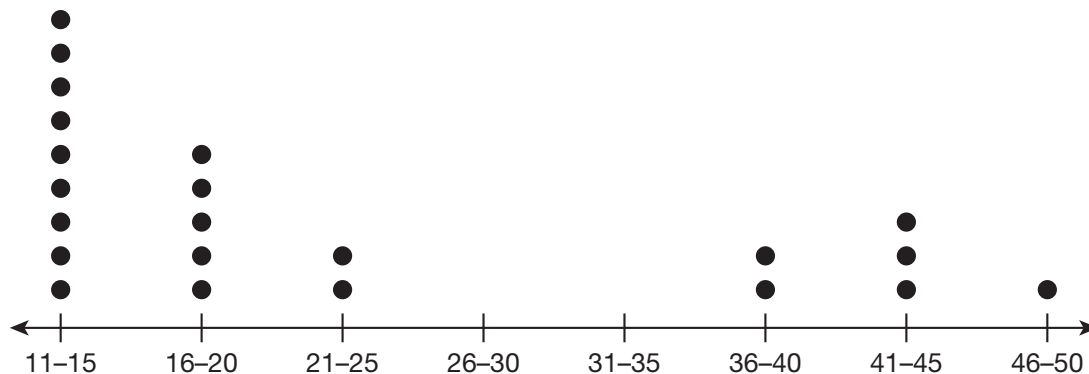
The data set for the dot plot could be 10, 10, 10, 10, 25, 25, 25, 25, 50, and 60.

Solution Yes, it is possible for the data set described to have a mean and median equal to 25.

2 COACHED EXAMPLE

Five students asked the members of their family if they play 10 or more hours of computer games in a week. They sorted the results by age and displayed the data on a dot plot, including a dot for each person who played at least 10 hours in a week.

Computer Game Playing by Age



What observations about the data help you describe the relationship between playing computer games and age?

Clusters of data occur between the ages of 11 and 25 and between the ages of _____ and _____.

The most frequent ages of family members who play computer games for 10 or more hours are between _____ and _____.

The second most frequent are ages _____ to _____.

There is a gap in the frequency of responses for ages between _____ and _____.

The mode of the data is the ages _____ to _____.

The median of this data is the ages between _____ and _____.

What conclusions might be made about the families' computer game playing and leisure time?

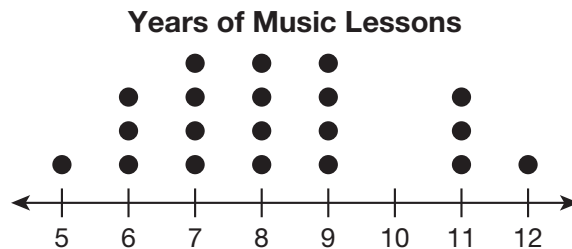
3 LESSON PRACTICE

- 1 The dot plot shows the typical sizes for birds Daniel saw on his bird watching trip. Select True or False for each statement.



- A. Daniel did not see any 8-inch birds. True False
- B. The mode for the data is 7. True False
- C. The median for the data is 6. True False
- D. The mean for the data is 7. True False

Students interviewed the musicians in a youth orchestra. They asked the musicians how many years they had taken music lessons. Use the dot plot to answer questions 2 and 3.



- 2 Find the mean for the data.
The mean number of years of music lessons is _____.
- 3 Select the statements about the music lesson data that are true. Circle all that apply.
- A. The musician who has studied the longest is 12 years old.
- B. The data has more than one mode.
- C. The median for the data is 8.
- D. Twelve students took music lessons for 8 or more years.
- E. There is a gap in the data.

- 4 On Pep Rally Day, Chloe counted the number of people in each classroom who wore the school colors. Each classroom has 28 students. The table below shows her data.

Fourth-grade classes	20 20 18 20 20
Fifth-grade classes	19 19 18 19
Sixth-grade classes	25 25 26 25 25

Use Chloe's data to draw a dot plot. Be sure to give your dot plot a title.



- 5 A dot plot shows the number of home runs that ten baseball players hit in one season. The best hitter had 12 home runs. Four students hit 2 homeruns. The median and mean are both 6. Could the dot plot show the following data set for this season? Select Yes or No.

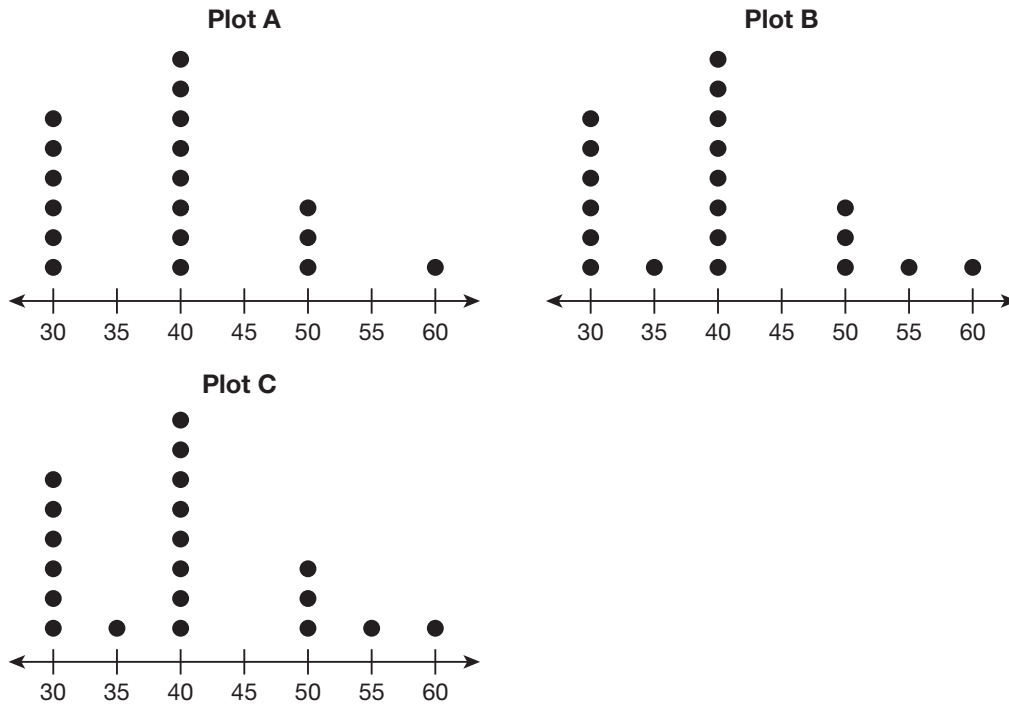
- A.** 2, 2, 2, 2, 6, 6, 7, 9, 10, 12 Yes No
- B.** 2, 2, 2, 2, 6, 6, 8, 9, 11, 12 Yes No
- C.** 2, 2, 2, 2, 6, 6, 8, 8, 10, 12 Yes No
- D.** 2, 2, 2, 2, 6, 6, 9, 9, 9, 12 Yes No
- E.** 2, 2, 2, 2, 6, 6, 9, 9, 10, 12 Yes No

6

Sofia wants to buy some new inline skates, so she compares the prices of different models. This data shows the cost of children's inline skates at a sporting goods store.

30	30	50	40	50	60	30	40	40	40
40	30	30	40	40	55	35	50	40	30

Prices of Inline Skates



Part A

Which of the dot plots displays the data correctly?

Plot _____ displays the data.

Part B

For each of the incorrect dot plots, describe what is wrong.

7

Jose and Michele are playing a video game. Their scores are shown on the dot plots. Whose mean score and median score are closer together? Show your work. Compare any clusters or gaps in the dot plots. Interpret your findings.

