Lesson 8-2
Summarize Data Using Mean, Median, Mode, and Range

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I can...
identify the mean, median, mode, and range of a data set.

MAFS.6.SP.1.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. Also 6.SP.2.5c

MAFS.K12.MP.2.1, MP.3.1, MP.7.1, MP.8.1

Solve & Discuss It!

ACTIVITY

Eight students were surveyed about the number of hours they spend each week reading for fun. Order their responses from least to greatest values. What do you notice about the number of hours these students spent reading each week?

Hours spent reading for fun each week:
11, 4, 7, 13, 3, 7, 12, 5

Look for Relationships
How does ordering the responses from least to greatest help you analyze the data set?

Focus on math practices

Critique Reasoning Jamal says that the middle value in a data set is the number that occurs most often. Evan disagrees. Why does Jamal say what he says and why does Evan disagree? Explain.

Essential Question How can you use a single measure to describe a data set?

VISUAL LEARNING ASSESS

EXAMPLE 1 Use the Mean to Describe a Data Set

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Carla is in a bowling league. The league is ranking the teams by average score. What is the mean, or average, final score of the five bowlers on Carla's team?

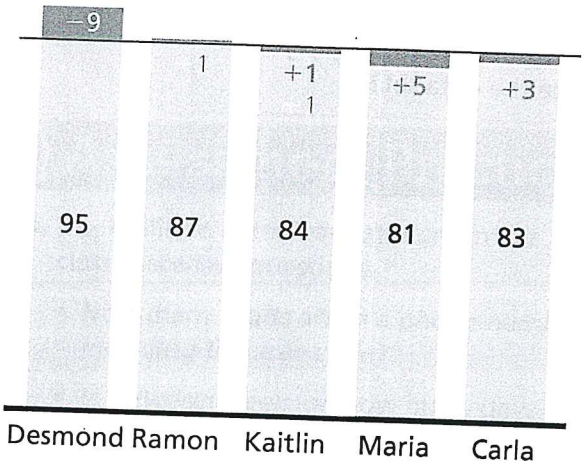
The **mean**, or average, is the sum of all the values in a data set divided by the total number of data values in the set.

Generalize You can summarize a data set by using a mean.

	9	10	FINAL SCORE
Desmond	86 | 7 | 2	95 | 6 | 3	95
Ramon	80 | 4 | 2	87 | 7 | 0	87
Kaitlin	77 | 5 | 1	84 | 4 | 3	84
Maria	74 | 2 | 4	81 | 5 | 2	81
Carla	75 | 3 | 3	83 | 6 | 2	83

Team Average n

To find the mean, equally share the final scores among the five bowlers.



The mean is 86.

To calculate the mean, add the scores in the data set. Then divide the sum by the number of values in the data set.

$$\begin{array}{r} {\scriptstyle 2}\\ 95\\ 87\\ 84\\ 81\\ +\,83\\ \hline 430 \end{array} \qquad \begin{array}{r} 86\\ 5\overline{)430}\\ -\,40\\ \hline 30\\ -\,30\\ \hline 0 \end{array}$$

The mean, or average, final score is 86.

A mean is a measure of center. A measure of center summarizes a data set with a single value.

Try It!

The next week, Maria bowls a 151-point game. The other bowlers match their scores. What is the new mean final score for the team? Explain.

Convince Me! How did the mean final score change from the Example to the Try It!?

EXAMPLE 2 Use the Median to Describe a Data Set

ACTIVITY ASSESS

Trey and Sarah each download songs to their music libraries. Their players list each type of music and the total playing time in minutes for each type. How can Trey and Sarah each summarize their data sets using the median?

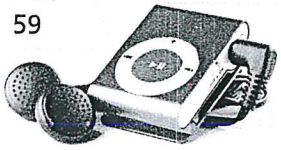
The **median** is a measure of center. It is the middle data value. To find the median, order the values from least to greatest, then find the middle value.

Trey's Music Library

Music Type	Minutes
Blues	62
Classical	72
Country	61
Gospel	67
Jazz	67
Movie Soundtrack	63
Popular	59

Sarah's Music Library

Music Type	Minutes
Rock	37
Rap	42
Hip Hop	38
Bluegrass	46
New Age	51
Opera	35



Find the median for Trey's data set.

59, 61, 62, (63), 67, 67, 72

↑ median

Trey's median playing time is 63 minutes.

Find the median for Sarah's data set.

35, 37, (38, 42), 46, 51

40

↑ median

The median is the average of the two middle values.

Sarah's median playing time is 40 minutes.

EXAMPLE 3 Use the Mode to Describe a Data Set

Look at Trey's and Sarah's music libraries. How can Trey and Sarah each summarize their data sets using the mode?

The **mode** is a measure of center. It is the value that occurs most often. A data set can have one mode, no mode, or more than one mode.

Find the mode for Trey's data set.

59, 61, 62, 63, (67), (67), 72

↓ mode

The value 67 appears twice. Every other value only appears once.

Trey's mode playing time is 67 minutes.

Find the mode for Sarah's data set.

35, 37, 38, 42, 46, 51

No values repeat in Sarah's data set.

There is no mode playing time in Sarah's data set.

Try It!

Nadia's grades on four quizzes were 95, 75, 85, and 95. Find the mean, median, and mode for Nadia's grades.

EXAMPLE 4 Use the Range to Describe a Data Set

Look at Trey's and Sarah's music libraries. What is the range of the playing times in each of their data sets?

The **range** is a measure of variability. A measure of variability describes how the values in a data set vary with a single number. The range is the difference of the greatest value and the least value.

Trey's Music Library

Music Type	Minutes
Blues	62
Classical	72
Country	61
Gospel	67
Jazz	67
Movie Soundtrack	63
Popular	59

Sarah's Music Library

Music Type	Minutes
Rock	37
Rap	42
Hip Hop	38
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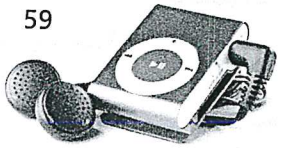


Find the range for Trey's data set.

least value → (59), 61, 62, 63, 67, 67, (72) ← greatest value

72 − 59 = (13) ← range

The range of playing times is 13 minutes.

Find the range for Sarah's data set.

least value → (35), 37, 38, 42, 46, (51) ← greatest value

51 − 35 = (16) ← range

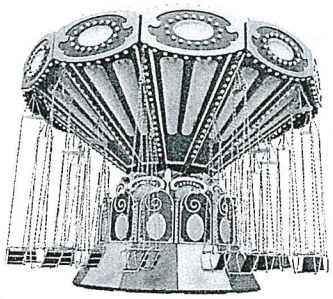
The range of playing times is 16 minutes.

EXAMPLE 5 Use the Mean, Median, Mode, and Range to Describe a Data Set

Seven people waited in line for the "Whirl and Twirl" carnival ride. Find the mean, median, mode, and range of the wait times for the carnival ride. What do the mean, median, and mode tell you about the wait times? What does the range, as a measure of variability, tell you about the wait times?

Carnival Ride Wait Times

Person	Wait time (min.)
A	12
B	12
C	15
D	10
E	14
F	15
G	13



Mean: 13

Median: 13

Modes: 12 and 15

Range: 5

The mean, median, and mode each give a measure of the typical wait time for the ride. The mean and median wait times were 13 minutes. Two pairs each waited 12 or 15 minutes. The range uses a single number to describe how the wait times vary. The wait times vary by 5 minutes.

Try It!

Find the mean, median, mode, and range for the following set of data.

4, 6, 8, 3, 2, 1, 0, 12, 9

KEY CONCEPT

KEY CONCEPT

You can summarize a set of data using a measure of center, such as the mean, median, or mode, or a measure of variability, such as the range.

Mean

$(7 + 10 + 16 + 9 + 12 + 21 + 14 + 8 + 13 + 15) \div 10 = 12.5$

Median

7, 8, 9, 10, 12, 13, 14, 15, 16, 21

$(12 + 13) \div 2 = 12.5$

Mode

7, 8, 9, 10, 12, 13, 14, 15, 16, 21

There is no mode.

Range

7, 8, 9, 10, 12, 13, 14, 15, 16, 21

$21 - 7 = 14$

The average number of hours of TV watched each week is 12.5 hours. The range of hours watched is 14 hours.

Number of Hours of TV Watched in a Week	
Juan	7
Tyrone	10
Abigail	16
Lateisha	9
Helen	12
Albert	21
Tim	14
Josh	8
Anita	13
Henry	15

Do You Understand?

1. **Essential Question** How can you use a single measure to describe a data set?

2. Maddie scored 3 goals, 2 goals, and 4 goals during her last three soccer games. How can you find the mean, or average, number of goals Maddie scored?

3. **Use Structure** Why is it important to order the data when finding the median?

Do You Know How?

The table shows data about the students in three classes.

Teacher	Boys	Girls
Ms. Green	15	14
Mr. Nesbit	12	12
Ms. Jackson	12	16

4. What is the mean number of boys in the three classes? What is the mean number of girls in the three classes?

5. What is the mode of the number of girls in the three classes?

6. What is the median number of students in the three classes?

Name:

PRACTICE TUTORIAL

Practice & Problem Solving

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In 7–10, use the data shown in the table to find each mean.

7. Technical marks from judges

8. Presentation marks from judges

9. Find the combined marks, or total score, awarded by each of the 7 judges. Record your answers in the table.

10. What is the mean total score awarded by the judges?

A U.S. Figure Skater's Scores

Judge	Technical Marks	Presentation Marks	Total Score
A	5.9	5.4	
B	5.8	5.7	
C	5.8	5.6	
D	5.6	5.3	
E	5.9	5.5	
F	5.6	5.3	
G	6.0	5.7	

In 11–14, use the data in the table.

States Traveled To or Lived In

1, 3, 5, 2, 5, 2, 10, 7, 1, 2, 4, 1, 2, 7, 12

11. Order the data from least to greatest.

12. What are the median, mode, and range of the data?

13. **Use Structure** The student who traveled to 3 states visited 3 new states during a vacation. Does increasing the 3 to 6 change the median? If so, how?

14. **Look for Relationships** Does increasing the 3 to 6 change the mode? If so, how?

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In 15–17, use the data table.

15. What is the average low temperature forecasted for the five days?

16. What is the average high temperature forecasted for the five days?

17. The forecast for Wednesday is later changed to a high of 70°F. Without calculating the new mean, describe how this changes the mean high temperature for the 5 days.

Forecasted Temperatures

Day	Low (°F)	High (°F)
Monday	42	55
Tuesday	44	57
Wednesday	45	60
Thursday	34	45
Friday	40	50

18. **Vocabulary** What term is used to describe the difference between the greatest and the least values of a data set?

19. **Critique Reasoning** Lewis thinks that since the data 5, 0, 4, 0, 0 has a mode of 0, the data has no mode. Critique Lewis's reasoning.

20. Chester scored 84, 88, and 80 on his first 3 math tests. How can you find Chester's mean, or average, score on these tests?

21. **Reasoning** Use the information in Exercise 20. Suppose Chester scores a 90 on his next test. Without doing any calculations, will Chester's mean score increase, decrease, or stay the same? Explain.

22. On Monday, Jeremiah collects data on the number of cars that pass through an intersection each hour from 6 A.M. to 10 A.M. He records the following data: 15, 27, 37, 29, and 12. If Jeremiah removes the 12 from his data set, will the mean change? Explain.

23. On Tuesday, Jeremiah finds the mean number of cars that pass through the same intersection from 6 A.M. to 10 A.M. was 22. Using the data from Exercise 22, how many fewer cars passed through the intersection on Tuesday?

In 24–26, use the data table.

24. What are the median, mode, and range of these data?

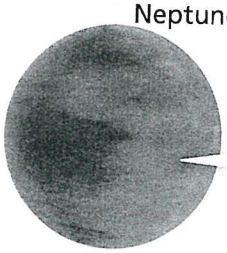
25. What is the mean number of moons for the 8 planets, rounded to the nearest whole number?

26. If you include Pluto's moons in the data, the median is 5.

a. How many moons does Pluto have? Explain.

b. Would including Pluto affect the range of the data? Explain.

Known Number of Moons of the Planets	
Mercury	0
Venus	0
Earth	1
Mars	2
Jupiter	50
Saturn	53
Uranus	27
Neptune	13



Pluto is a dwarf planet.

27. **Higher Order Thinking** Is the median always, sometimes, or never one of the data values? Explain.

28. **Critique Reasoning** Maria says the mean of the scores 7, 8, 3, 0, 2 is 5, because she added the scores and divided by 4. Is she correct? Explain why or why not.

Assessment Practice

29. The cost of 8 different sets of golf clubs is shown in the data table. A new brand of golf clubs for $533 is now being sold at the shop. Which of the following statements about the data is true? 6.SP.1.3

Ⓐ The mean cost will decrease.

Ⓑ The range of the costs will increase.

Ⓒ The mean cost will stay the same.

Ⓓ The range of the costs will stay the same.

Price of Golf Clubs (dollars per set)
265
237
325
281
265
252
494
273