

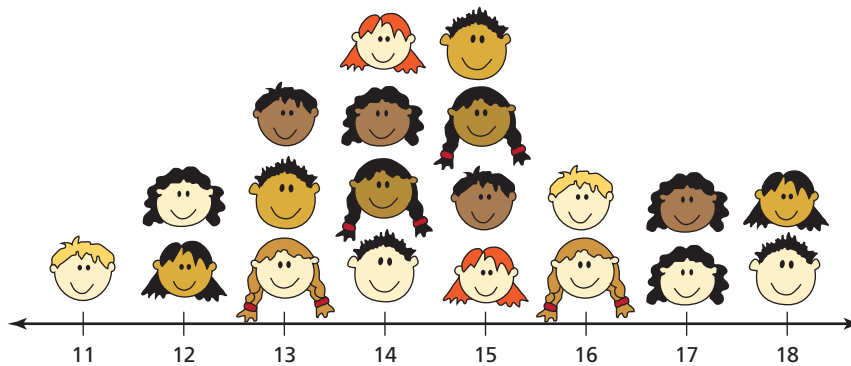
5.5 Median, Mode, and Range

Essential Question Describe situations in real life where the mean is not a good representation of the average.

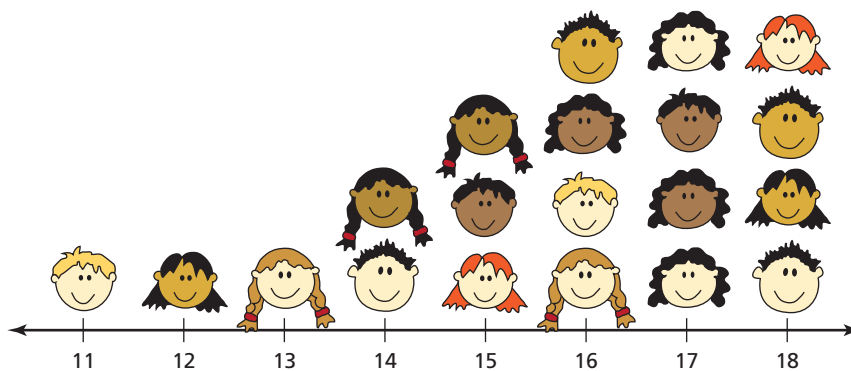
1 ACTIVITY: Comparing Three Samples

Work with a partner. Surveys are taken in three grade 6–12 schools. Make up a story about the three surveys. Find the mean for each survey. Do you think the mean is a good way to represent the “average” of each group? Why or why not?

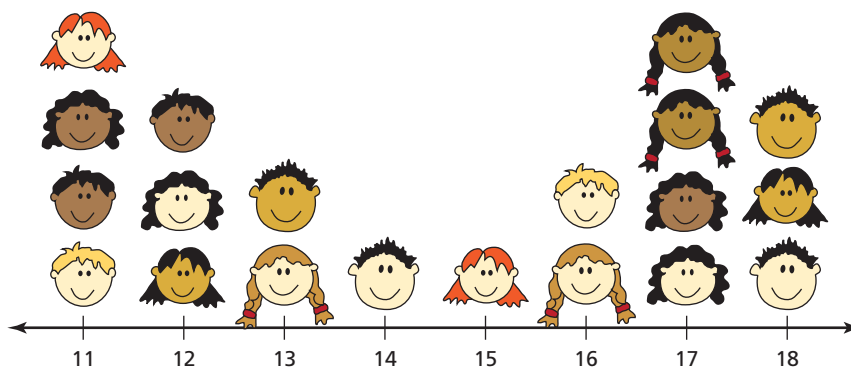
a.



b.



c.



2

ACTIVITY: When the Mean is Misleading

Work with a partner. Read and re-read each **statement**. Think of a better way to represent the “average” so that the statement is not so misleading.

- a. Someone is trying to criticize a small high school by saying “Last year, the average age of the graduating class was 22 years old.” When you look into the facts, you find that the class had a senior citizen who went back to school to earn a diploma. Here are the ages for the class.

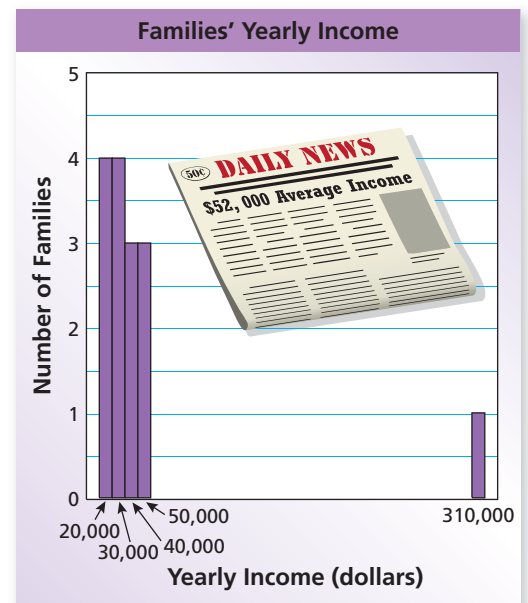
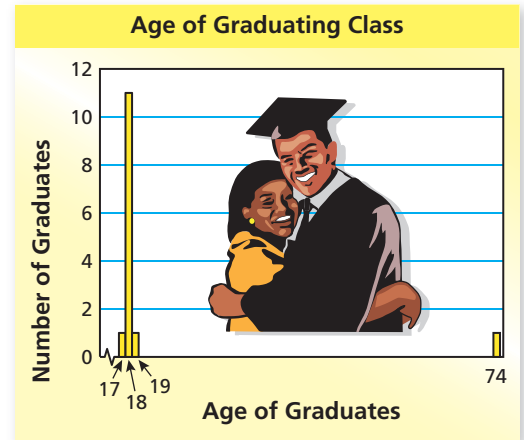
18, 18, 18, 18, 18, 17, 18,
19, 18, 18, 18, 18, 18, 74

What percent of the ages are *below* the mean?

- b. There is a small town where most of the people are having a difficult time getting by because of low incomes. Someone is trying to ignore the problem and writes an article in the newspaper saying “It is not so bad in the town. The average income for a family is \$52,000 a year.” Here are the incomes.

\$20,000, \$20,000, \$20,000,
\$20,000, \$30,000, \$30,000,
\$30,000, \$30,000, \$40,000,
\$40,000, \$40,000, \$50,000,
\$50,000, \$50,000, \$310,000

What percent of the families have incomes *below* the mean?



What Is Your Answer?

3. **IN YOUR OWN WORDS** Describe situations in real life where the mean is not a good representation of the average. What measures (other than mean) can you use to describe an average?

Practice

Use what you learned about the mean to complete Exercises 5 and 6 on page 220.

Key Vocabulary

measure of central tendency, p. 218
median, p. 218
mode, p. 218
range, p. 219

Study Tip

The mode is the only measure of central tendency that can be used to describe a set of data that is *not* made up of numbers.

A **measure of central tendency** is a measure that represents the *center* of a data set. The mean is one type of measure of central tendency. Here are two others.

Key Ideas

Median

Words Order the data. For a set with an odd number of values, the **median** is the middle value. For a set with an even number of values, the **median** is the mean of the two middle values.

Numbers Data: 5, 8, 9, 12, 14 The median is 9.

Data: 2, 3, 5, 7, 10, 11

The median is $\frac{5 + 7}{2}$, or 6.

Mode

Words The **mode** of a data set is the value or values that occur most often. Data can have one mode, more than one mode, or no mode. When all values occur only once, there is no mode.

Numbers Data: 11, 13, 15, 15, 18, 21, 24, 24

The modes are 15 and 24.

EXAMPLE 1 Finding the Median and Mode

Bowling Scores

120	135	160	125	90
205	160	175	105	145

Find the median and mode of the bowling scores.

90, 105, 120, 125, 135, 145, 160, 160, 175, 205 Order the data.

Median: $\frac{135 + 145}{2} = \frac{280}{2}$, or 140 Add the two middle values and divide by 2.

Mode: 90, 105, 120, 125, 135, 145, 160, 160, 175, 205

The value 160 occurs most often.

∴ The median is 140. The mode is 160.

On Your Own

Find the median and mode of the data.

- 20, 4, 17, 8, 12, 9, 5, 20, 13
- 100, 75, 90, 80, 110, 102

EXAMPLE 2 Finding the Mode

Favorite Types of Movies

Comedy Drama Horror
 Horror Drama Horror
 Comedy Comedy Action
 Action Comedy Action
 Horror Drama Comedy
 Comedy Comedy Horror
 Horror Comedy Action
 Horror Action Drama

The list shows the favorite types of movie for students in a class. Organize the data in a frequency table. Then find the mode.

Type	Tally	Frequency
Action		5
Comedy		8
Drama		4
Horror		7

The number of tally marks is the frequency.

Make a tally for each vote.

Comedy received the most votes.

∴ So, the mode is comedy.

Now You're Ready Exercises 7–15

On Your Own

3. In Example 2, one member of the class was absent and ends up voting for horror. Does this change the mode? Explain.

The **range** of a data set is the difference between the greatest value and the least value. The range describes how spread out the data are.

EXAMPLE 3 Standardized Test Practice

Snake	Record Length (inches)
Copperhead	53
Cottonmouth	74.5
Diamondback rattlesnake	96
Timber rattlesnake	74.5
Pygmy rattlesnake	31
Coral snake	47.5

The table shows the record lengths of six venomous snakes. What is the range of the lengths?

- (A) 43.5 inches (B) 48.5 inches
 (C) 65 inches (D) 74.5 inches

31, 47.5, 53, 74.5, 74.5, 96 Order the data from least to greatest.

The least value is 31. The greatest value is 96. So, the range is $96 - 31$, or 65 inches.

∴ The correct answer is (C).



On Your Own

4. The data set shows how many inches of rain fell in several cities during a storm.

3.9, 4.25, 4.1, 3.7, 3.8, 4.3, 3.8, 4.5

Find the range of the data.

Vocabulary and Concept Check

- NUMBER SENSE** Give an example of a data set that has no mode.
- WRITING** Which is affected more by an outlier: the mean or the median? Explain.
- REASONING** What two data values do you need to know to find the range? Explain.
- NUMBER SENSE** A data set has a mean of 7, a median of 5, and a mode of 8. Which of the numbers 7, 5, and 8 *must* be in the data set? Explain.

Practice and Problem Solving

Find the mean of the data. Is the mean a good “average”? If not, what would be a better “average”? Explain.

5. 8, 29, 30, 30, 30

6. 16, 24, 13, 66, 22, 26, 22, 28

Find the median, mode(s), and range of the data.

1 3 7. 3, 5, 7, 9, 11, 3, 8

8. 14, 19, 16, 13, 16, 14

9. 93, 81, 94, 71, 89, 92, 94, 99

10. 44, 13, 36, 52, 19, 27, 33

11. 12, 33, 18, 28, 29, 12, 17, 4, 2

12. 55, 44, 40, 55, 48, 44, 58, 67

13. **ERROR ANALYSIS** Describe and correct the error in finding the median and range of the data.

The diagram shows a data set: 63, 55, 49, 58, 50, 59, 51. A box above says "The median is 58." with a red X next to it. A box below says "The range is 63 - 51, or 12." Arrows point from the boxes to the values 58 and 51 in the data set.

Find the mode(s) of the data.

2 14.

Shirt Color		
Black	Blue	Red
Pink	Black	Black
Gray	Green	Blue
Blue	Blue	Red
Yellow	Blue	Blue
Black	Orange	Black
Black		

15.

Talent Show Acts		
Singing	Dancing	Comedy
Singing	Singing	Dancing
Juggling	Dancing	Singing
Singing	Poetry	Dancing
Comedy	Magic	Dancing
Poetry	Singing	Singing

16. **REASONING** In Exercises 14 and 15, can you find the mean and median of the data? Explain.
17. **REASONING** How does an outlier affect the range of a data set? Explain.

18. **SUPREME COURT** The data show the years of service of the justices of the Supreme Court as of 2008. Find the mean, median, mode(s), and range of the data.
2, 14, 15, 20, 3, 22, 18, 33, 17

Find the mean, median, mode(s), and range of the data.

19. 5, 13, 24, 28, 5, 19, 20, 16, 0, 19
20. 77, 73, 75, 78, 79, 72, 74, 68, 81, 83, 76
21. 4.7, 8.51, 6.5, 7.42, 9.64, 7.2, 9.3
22. $8\frac{1}{2}$, $6\frac{5}{8}$, $3\frac{1}{8}$, $5\frac{3}{4}$, $6\frac{5}{8}$, $5\frac{1}{4}$, $10\frac{5}{8}$, $4\frac{1}{2}$



23. **BASEBALL** Find the median, mode, and range of the ages of players on the Little League team. Explain how you found your answers.
24. **HOMEWORK** Write down the number of minutes you spent on homework each day of the past week.
a. Find the mean, median, mode(s), and range of the data.
b. How do you think your success as a student is related to the median of your data? the mode? the range?

25. **MOTOCROSS** The ages of the racers in a bicycle motocross race are 14, 22, 20, 25, 26, 17, 21, 30, 27, 25, 14, and 29. The 30-year-old drops out of the race and is replaced with a 15-year-old. How are the mean, median, mode, and range of the ages affected?

26. **REASONING** The median of the data is 37 and the range is 29. What is the missing value? Explain how you found your answer.

48, 56, 29, , 42, 27

27. **Open-Ended** Write a set of data with six values that has a mean of 28, a median of 29, and a range of 18.



Fair Game Review what you learned in previous grades & lessons

Identify the outlier. Find the mean of the data set with and without the outlier.

28. 22, 25, 17, 27, 29, 83, 26, 20, 20, 21
29. 64, 71, 58, 60, 65, 35, 70, 74

30. **MULTIPLE CHOICE** A parking lot contains 18 vans, 26 SUVs, and 24 cars. What is the ratio of vans to the total number of vehicles?

(A) $\frac{9}{25}$

(B) $\frac{8}{17}$

(C) $\frac{9}{34}$

(D) $\frac{3}{4}$