

LESSON
16-3

Box Plots

Reteach

A **box plot** gives you a visual display of how data are distributed.

Here are the scores Ed received on 9 quizzes: 76, 80, 89, 90, 70, 86, 87, 76, 80.

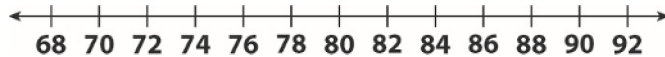
Step 1: List the scores in order from least to greatest.

Step 2: Identify the least and greatest values.

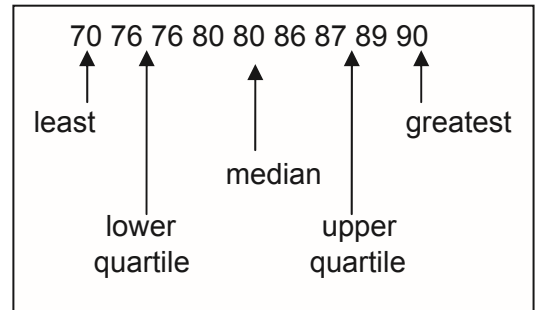
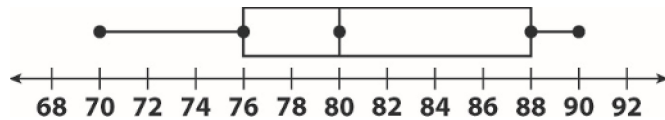
Step 3: Identify the median.
If there is an odd number of values, the median is the middle value.

Step 4: Identify the lower quartile and upper quartile. If there is an even number of values above or below the median, the lower or upper quartile is the average of the two middle values.

Step 5: Draw a number line that includes the values in the given data.



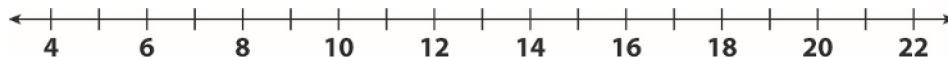
Step 6: Place dots above the number lines at each value you identified in Steps 2–4. Draw a box starting at the lower quartile and ending at the upper quartile. Mark the median, too.



Use the data at the right for Exercises 1–5. Complete each statement.

20	6	15
10	14	15
8	10	12

- List the data in order: _____
- Least value: _____ Greatest value: _____
- Median: _____
- Lower quartile: _____ Upper quartile: _____
- Draw a box plot for the data.



LESSON
16-3

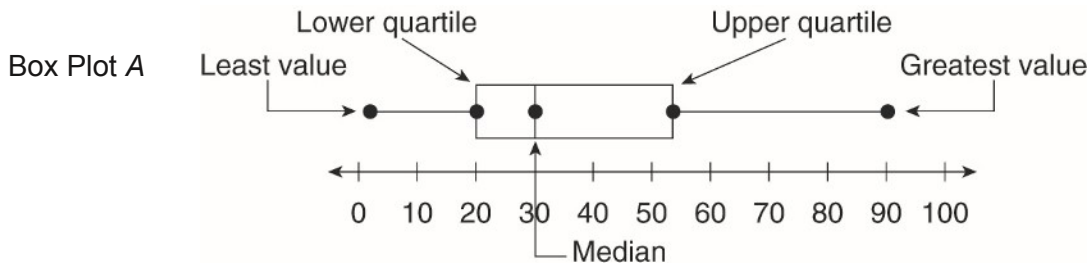
Box Plots

Success for English Learners

A **box plot** shows a set of data divided into four equal parts.

Problem 1

A box plot shows how the values in a data set are distributed or spread out.



Problem 2

To make a box plot, start by putting the data in order from least to greatest.

Identify the least and greatest values. In box plot A, the least value is 2 and the greatest value is 90.

Identify the middle value. This is the **median**. The median for box plot A is 30.

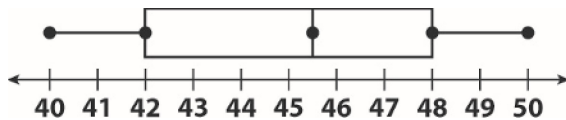
Identify the lower quartile. The **lower quartile** is the middle value between the least value and the median. In box plot A, the lower quartile is 20.

Identify the upper quartile. The **upper quartile** is the middle value between the median and the greatest value. In box plot A, the upper quartile is 53.

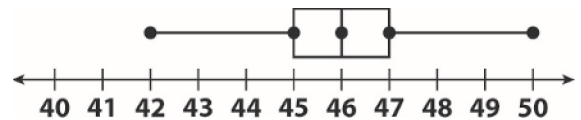
Plot each identified value on a number line and draw a box from the lower quartile to the upper quartile with a line drawn at the median. Draw a line segment from the least value to the lower quartile and from the upper quartile to the greatest value.

Use box plot B and box plot C to complete the table.

Box Plot B



Box Plot C



	Median	Least Value	Greatest Value	Lower Quartile	Upper Quartile
1. Box Plot B					
2. Box Plot C					

3. Which box plot has the middle half of the data closer together? _____

LESSON
16-3

Box Plots

Practice and Problem Solving: A/B

The high temperatures for 2 weeks are shown at the right. Use the data set for Exercises 1–7.

High Temperatures						
69	73	72	66	64	64	61
70	78	78	74	69	61	62

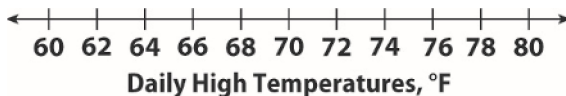
1. Order the data from least to greatest.

2. Find the median. _____

3. Find the lower quartile. _____

4. Find the upper quartile. _____

5. Make a box plot for the data.



6. Find the IQR. _____

7. Find the range. _____

Use the situation and data given below to complete Exercises 8–10.

Two classes collected canned food for the local food bank. Below are the number of cans collected each week.

Class A: 18 20 15 33 30 23 38 34 40 28 18 33

Class B: 18 27 29 20 26 26 29 30 24 28 29 28

8. Arrange the data for each class in order from least to greatest.

Class A: _____

Class B: _____

9. Find the median, the range, and the IQR of each data set.

Class A: median: _____ range: _____ IQR: _____

Class B: median: _____ range: _____ IQR: _____

10. Compare and contrast the box plots for the two data sets.

LESSON
16-3

Box Plots

Practice and Problem Solving: D

Weekly Earnings (\$)
20 12 10 6 12 15 8 15

The data set at the right shows the money Joe earned in 8 weeks. Use the data set to complete Exercises 1–7. The first one is done for you.

1. Order the data from least to greatest.

6, 8, 10, 12, 12, 15, 15, 20

2. Find the median. _____
3. Find the lower quartile. _____
4. Find the upper quartile. _____
5. Complete the box plot for the data.



6. Find the IQR. _____
7. Find the range. _____

Use the situation and data given below to complete Exercises 8–11.

Below are the number of books read each week for Juan and Mia.

Juan: 2, 6, 4, 1, 2, 6, 8, 4, 3

Mia: 6, 6, 2, 5, 2, 2, 4, 5, 6

8. Arrange the data for each person in order from least to greatest.

Juan: _____

Mia: _____

9. Who had the higher median number of books read? _____
10. Who had the greater range in number of books read? _____
11. Who had the higher IQR in number of books read? _____

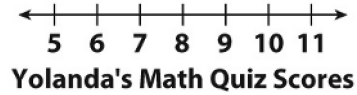
LESSON
16-4

Dot Plots and Data Distribution

Reteach

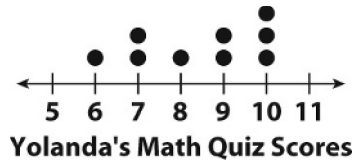
A **dot plot** gives you a visual display of how data are distributed.

Example: Here are the scores Yolanda received on math quizzes: 6, 10, 9, 9, 10, 8, 7, 7, and 10. Make a dot plot for Yolanda's quiz scores.



Step 1: Draw a number line.

Step 2: Write the title below the number line.



Step 3: For each number in the data set, put a dot above that number on the number line.

Describe the dot plot by identifying the **range**, the **mean**, and the **median**.

Range: Greatest value – least value

Step 4: Identify the range. $10 - 6 = 4$

Mean: $\frac{\text{Sum of data values}}{\text{Number of data values}}$

Step 5: Find the mean. $76 \div 9 = 8.4$

Step 6: Find the median. 9

Median: Middle value

Use the data set at the right to complete Exercises 1–4.

1. Draw a dot plot for the data.

Game Scores			
12	6	15	10
14	15	8	10
12	21	15	8



2. Find the range. _____

3. Find the mean. _____

4. Find the median. _____

LESSON
16-4

Dot Plots and Data Distribution

Success for English Learners

A **dot plot** provides a visual way to display data.

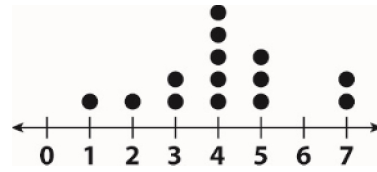
Problem 1

The data below is shown in the dot plot at the right.

Summer Hours I Spent
Horseback Riding

1, 7, 4, 3, 5, 4, 2,

7, 4, 4, 3, 5, 5, 4

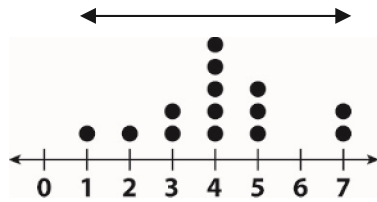


Summer Hours I Spent
Horseback Riding

Problem 2

You can describe the spread, the center, and the shape of a dot plot.

Spread: Range or difference between least and greatest values



Measures of **center**:

Mean: $\frac{\text{Sum of data values}}{\text{Number of data values}}$

Median: Middle value

The **shape** of this dot plot is **symmetrical**, which means there are about the same number of dots on one side of the center of the range as on the other side of center.

1. How would you describe the spread of the dot plot?

2. Find the mean of the data. _____

3. Find the median of the data. _____

4. What does it mean if the shape of a dot plot is **not** symmetrical?

LESSON
16-4

Dot Plots and Data Distribution

Practice and Problem Solving: A/B

Tell whether each question is a statistical question. If it is a statistical question, identify the units for the answer.

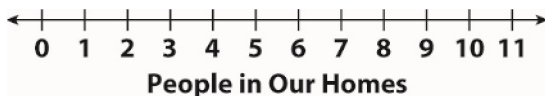
- How far do you travel to get to school? _____
- How tall is the door to this classroom? _____

Use the data set at the right and the description below to complete Exercises 3–6.

The class took a survey about how many people live in each student’s home. The results are shown at the right.

People in Our Homes
4, 2, 5, 4, 2, 6, 4, 3, 4, 3, 5, 6,
2, 7, 3, 2, 5, 3, 4, 11, 4, 5, 3

- Make a dot plot of the data.



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

mean: _____; median: _____; range: _____

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

- Which number is an outlier in the data set? Explain what effect the outlier has on the measures of center and spread.

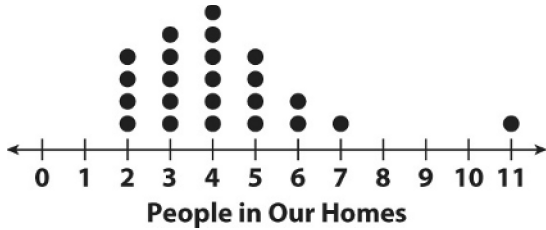
- Survey 12 students to find how many people live in their homes. Record the data below. Make a box plot at the right.



LESSON 16-4

Practice and Problem Solving: A/B

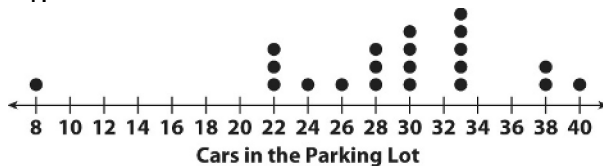
1. statistical; Sample answer: miles
2. not statistical
- 3.



4. mean: 4.2; median: 4; range: 9
5. The spread is from 2 to 11, 11 appears to be an outlier. There is a cluster from 2 to 7 with a peak at 4. The distribution is not symmetric.
6. 11; The outlier raises the mean by 0.3 and increases the spread by 4. It does not change the median.
7. Check student's work.

Practice and Problem Solving: C

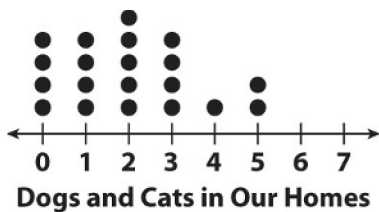
1.



2. mean: 29; median: 30; range: 32
3. The spread is from 8 to 40, 8 appears to be an outlier. There is a cluster from 28 to 33 with a peak at 33. The distribution is not symmetric.
4. 8; The outlier lowers the mean by 1 and increases the spread by 14. It does not change the median.
- 5–8. Check student's work.

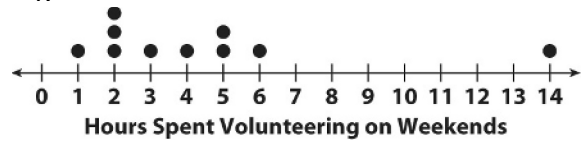
Practice and Problem Solving: D

1.



2. mean: 2; median: 2; range: 5
3. B. not symmetric

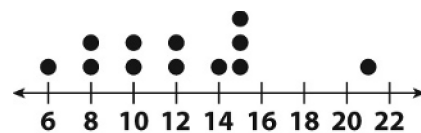
4.



5. mean: 4.4; median: 3.5; range: 13
6. B. not symmetric
7. an outlier

Reteach

1.



2. 15
3. 12.2
4. 12

Reading Strategies

1. The range is 8. The spread of the data is from 0 to 8 with 8 being an outlier.
2. The mean is 2.1 and the median is 2.
3. Sample answer: There are about the same number of dots on each side of the center of the range.

Success for English Learners

1. The spread of the data is 1 to 7, which is a range of 6.
2. 4.1
3. 4
4. There are more dots on one side of the center of the range than on the other side.

LESSON 16-5

Practice and Problem Solving: A/B

1.

Players' Heights	
Heights (in.)	Frequency
65–69	1
70–74	3
75–79	6
80–84	8
85–89	1

LESSON
16-4

Dot Plots and Data Distribution

Practice and Problem Solving: D

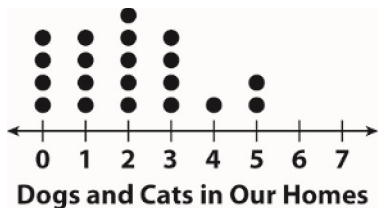
Use the data set at the right and the description below for Exercises 1–3. The first one is done for you.

The class took a survey about how many dogs and cats each student has. The results are shown in the data set.

Dogs and Cats in Our Homes

1, 0, 3, 5, 1, 3, 2, 4, 2, 1,
2, 0, 5, 3, 1, 2, 0, 0, 2, 3

1. Make a dot plot of the data.



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

mean: _____; median: _____; range: _____

3. Choose the best description of shape of the data distribution.

A. symmetric B. not symmetric

Answer the questions below.

4. The data set at the right shows the hours that a group of students spent volunteering each weekend. Make a dot plot of the data. Then use your dot plot to complete Exercises 5–7.

Hours Spent Volunteering on Weekends

5, 3, 2, 6, 5, 4, 2, 14, 1, 2



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

mean: _____; median: _____; range: _____

6. Choose the best description of shape of the data distribution.

A. symmetric B. not symmetric

7. 14 is far away from the other data. What is 14 called? _____

Name _____

Date _____

Box & Whisker Plots

Read each question and circle the correct answer.

1. The median is the _____ of a set of data.

- A. middle number
- B. largest number

- C. smallest number
- D. first number

2. The smallest number in a data set is called the

- A. median.
- B. minimum.

- C. maximum.
- D. mean.

3. In the song, 25 percent of the class weighed less than 6 pounds, 1 ounce at birth. 6 pounds, 1 ounce is the

- A. median.
- B. upper quartile.

- C. lower quartile.
- D. minimum.

4. In the song, 7 pounds, 5 ounces was the median weight of the students at birth. Which of these is correct?

- A. 25 percent of the students weighed less than 7 pounds, 5 ounces.
- B. Half the students weighed less than 7 pounds, 5 ounces, and half the students weighed more.

- C. 75 percent of the students weighed more than 7 pounds, 5 ounces.
- D. Half the students weighed 7 pounds, 5 ounces.

5. In the song, the heaviest baby weighed 10 pounds at birth. 10 pounds is the

- A. minimum.
- B. median.

- C. mean.
- D. maximum.

6. What does the interquartile range represent?

- A. the lower 50 percent of the data
- B. the higher 50 percent of the data
- C. the middle 50 percent of the data
- D. the middle data point

7. What is the function of the “whiskers” in a box and whisker plot?

- A. They represent the interquartile range.
- B. They link the interquartile range to the minimum and maximum.
- C. They compare the lower quartile to the upper quartile.
- D. They compare the median to the interquartile range.

8. What is the minimum of the following set of data?

6.6, 5.2, 5.3, 6.1, 7.4, 5.9, 6.3

- A. 5.2
- B. 5.9
- C. 6.6
- D. 7.4

9. What is the median of the following set of data?

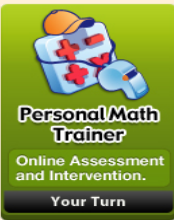
0.6, 0.5, 0.9, 0.4, 0.3, 0.7, 0.2

- A. 0.4
- B. 0.9
- C. 0.5
- D. 0.65

10. What is the maximum of the following set of data?

1.2, 1.3, 1.2, 1.5, 1.6, 1.1, 1.0

- A. 1.0
- B. 1.3
- C. 1.5
- D. 1.6



YOUR TURN

Add or subtract. Write each sum or difference in simplest form.

15. $\frac{5}{14} + \frac{1}{6}$ _____

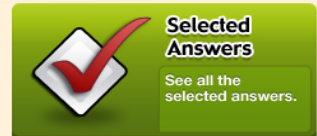
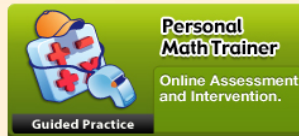
16. $\frac{5}{12} - \frac{3}{20}$ _____

17. $\frac{5}{12} - \frac{3}{8}$ _____

18. $1\frac{3}{10} + \frac{1}{4}$ _____

19. $\frac{2}{3} + 6\frac{1}{5}$ _____

20. $3\frac{1}{6} - \frac{1}{7}$ _____



Guided Practice

Multiply. Write each product in simplest form. (Example 1)

1. $\frac{1}{2} \times \frac{5}{8}$ _____

2. $\frac{3}{5} \times \frac{5}{9}$ _____

3. $\frac{3}{8} \times \frac{2}{5}$ _____

4. $2\frac{3}{8} \times 16$ _____

5. $1\frac{4}{5} \times \frac{5}{12}$ _____

6. $1\frac{2}{10} \times 5$ _____

Find each amount. (Example 2)

7. $\frac{1}{4}$ of 12 bottles of water = _____ bottles

8. $\frac{2}{3}$ of 24 bananas = _____ bananas

9. $\frac{3}{5}$ of \$40 restaurant bill = \$ _____

10. $\frac{5}{6}$ of 18 pencils = _____ pencils

Add or subtract. Write each sum or difference in simplest form.

11. $\frac{3}{8} + \frac{5}{24}$ _____

12. $\frac{1}{20} + \frac{5}{12}$ _____

13. $\frac{9}{20} - \frac{1}{4}$ _____

14. $\frac{9}{10} - \frac{3}{14}$ _____

15. $3\frac{3}{8} + \frac{5}{12}$ _____

16. $5\frac{7}{10} - \frac{5}{18}$ _____

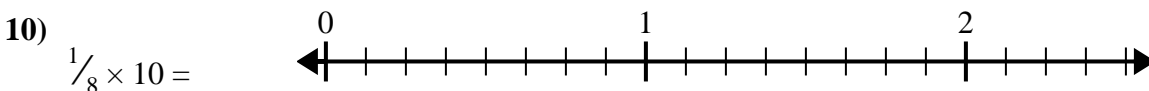
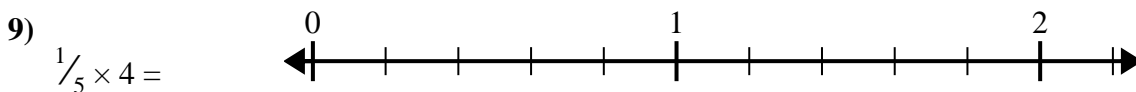
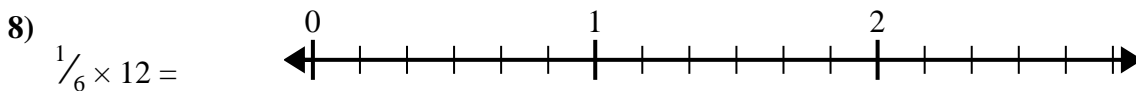
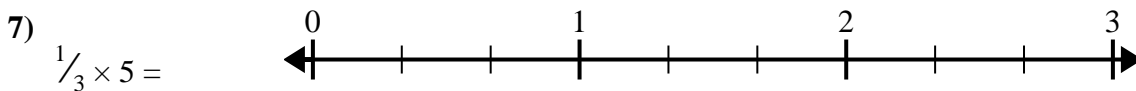
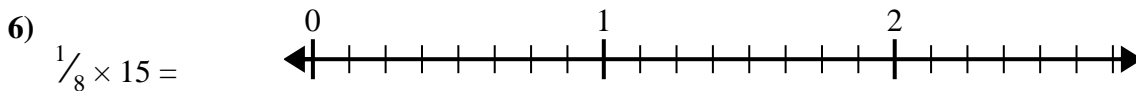
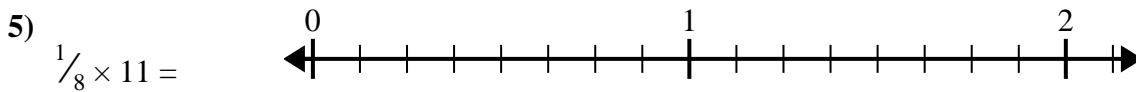
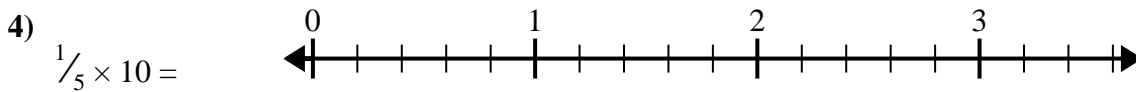
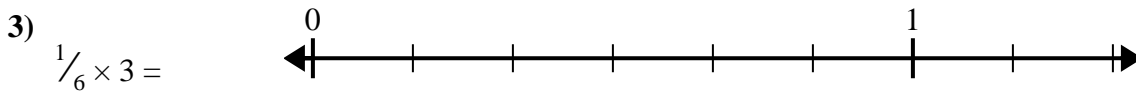
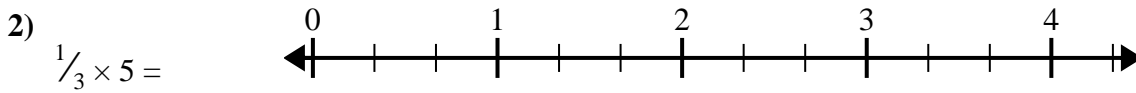
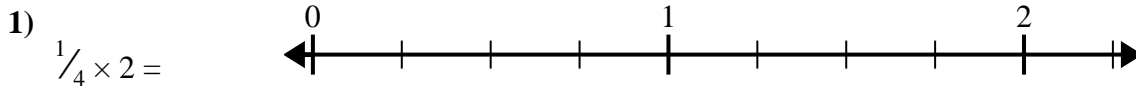


ESSENTIAL QUESTION CHECK-IN

17. How can knowing the GCF and LCM help you when you add, subtract, and multiply fractions?



Use the numberline to solve.



Answers

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

LESSON

4.2 Dividing Fractions

COMMON CORE 6.NS.1

Interpret and compute quotients of fractions, ..., e.g., by using visual fraction models...



ESSENTIAL QUESTION

How do you divide fractions?

EXPLORE ACTIVITY 1



COMMON CORE 6.NS.1

Modeling Fraction Division

In some division problems, you may know a number of groups and need to find how many or how much are in each group. In other division problems, you may know how many there are in each group, and need to find the number of groups.

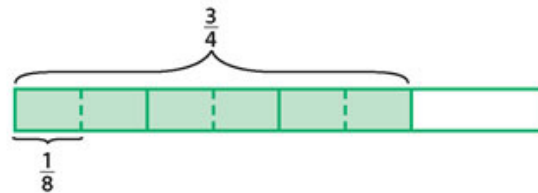


- A** You have $\frac{3}{4}$ cup of salsa for making burritos. Each burrito requires $\frac{1}{8}$ cup of salsa. How many burritos can you make?

To find the number of burritos that can be made, you need to determine how many $\frac{1}{8}$ -cup servings are in $\frac{3}{4}$ cup. Use the diagram. How many eighths

are there in $\frac{3}{4}$? _____

You have enough salsa to make _____ burritos.

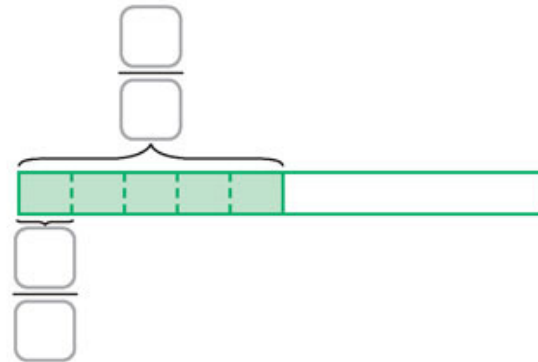


- B** Five people share $\frac{1}{2}$ pound of cheese equally. How much cheese does each person receive?

To find how much cheese each person receives, you need to determine how much is in each of _____ parts.

How much is in each part? _____

Each person will receive _____ pound.



Reflect

1. Write the division shown by each model.

© Houghton Mifflin Harcourt Publishing Company



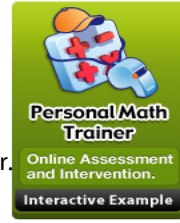
Reciprocals

Another way to divide fractions is to use *reciprocals*. Two numbers whose product is 1 are **reciprocals**.

$$\frac{3}{4} \times \frac{4}{3} = \frac{12}{12} = 1 \quad \frac{3}{4} \text{ and } \frac{4}{3} \text{ are reciprocals}$$

To find the reciprocal of a fraction, switch the numerator and denominator.

$$\frac{\text{numerator}}{\text{denominator}} \cdot \frac{\text{denominator}}{\text{numerator}} = 1$$



Math Talk
Mathematical Practices

How can you check that the reciprocal in **A** is correct?

EXAMPLE 1 COMMON CORE Prep for 6.NS.1

Find the reciprocal of each number.

A $\frac{2}{9}$ $\frac{9}{2}$ Switch the numerator and denominator.

The reciprocal of $\frac{2}{9}$ or $\frac{9}{2}$.

B $\frac{1}{8}$ $\frac{8}{1}$ Switch the numerator and denominator

The reciprocal of $\frac{1}{8}$ is $\frac{8}{1}$, or 8.

C 5

$5 = \frac{5}{1}$ Rewrite as a fraction.

$\frac{5}{1}$ $\frac{1}{5}$ Switch the numerator and the denominator

The reciprocal of 5 is $\frac{1}{5}$.

Reflect

2. Is any number its own reciprocal? If so, what number(s)? Justify your answer.

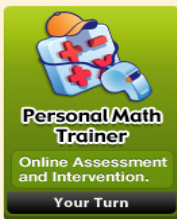
3. **Communicate Mathematical Ideas** Does every number have a reciprocal? Explain.

4. The reciprocal of a whole number is a fraction with _____ in the numerator.

YOUR TURN

Find the reciprocal of each number.

5. $\frac{7}{8}$ _____ 6. 9 _____ 7. $\frac{1}{11}$ _____



EXPLORE ACTIVITY 2

COMMON CORE 6.NS.1

Using Reciprocals to Find Equivalent Values

A Complete the table below.

Division	Multiplication
$\frac{6}{7} \div \frac{2}{7} = 3$	$\frac{6}{7} \times \frac{7}{2} =$
$\frac{5}{8} \div \frac{3}{8} = \frac{5}{3}$	$\frac{5}{8} \times \frac{8}{3} =$
$\frac{1}{6} \div \frac{5}{6} = \frac{1}{5}$	$\frac{1}{6} \times \frac{6}{5} =$
$\frac{1}{4} \div \frac{1}{3} = \frac{3}{4}$	$\frac{1}{4} \times \frac{3}{1} =$

B How does each multiplication problem compare to its corresponding division problem?

C How does the answer to each multiplication problem compare to the answer to its corresponding division problem?

Reflect**8. Make a Conjecture** Use the pattern in the table to make a conjecture about how you can use multiplication to divide one fraction by another.

9. Write a division problem and a corresponding multiplication problem like those in the table. Assuming your conjecture in **8** is correct, what is the answer to your division problem?
