

# Add and Subtract Fractions with Unlike Denominators

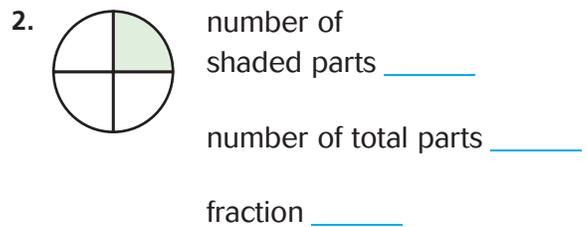
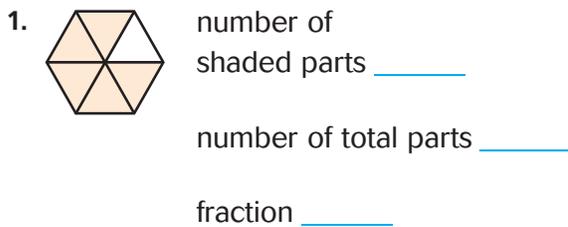
## Show What You Know



Check your understanding of important skills.

Name \_\_\_\_\_

► **Part of a Whole** Write a fraction to name the shaded part.



► **Add and Subtract Fractions** Write the sum or difference in simplest form.

3.  $\frac{3}{6} + \frac{1}{6} =$  \_\_\_\_\_

4.  $\frac{4}{10} + \frac{1}{10} =$  \_\_\_\_\_

5.  $\frac{7}{8} - \frac{3}{8} =$  \_\_\_\_\_

6.  $\frac{9}{12} - \frac{2}{12} =$  \_\_\_\_\_

► **Multiples** Write the first six nonzero multiples.

7. 5 \_\_\_\_\_

8. 3 \_\_\_\_\_

9. 7 \_\_\_\_\_



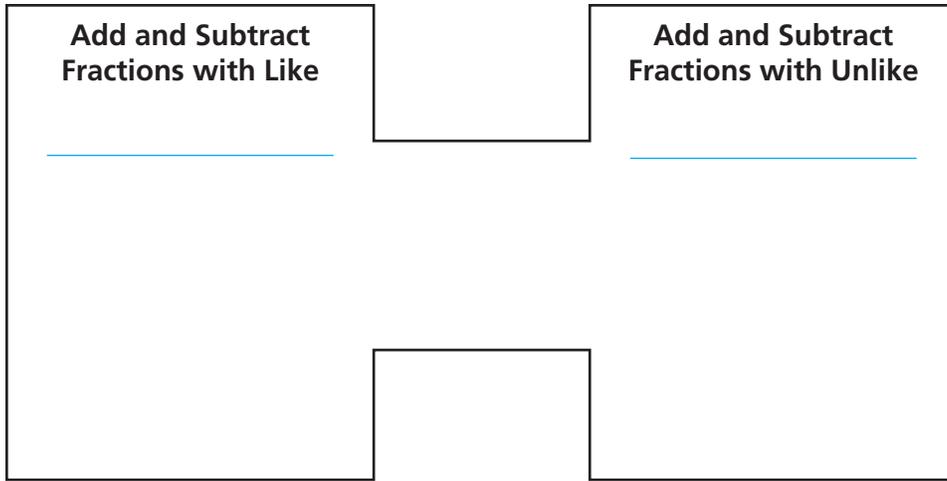
There are 30 senators and 60 members of the House of Representatives in the Arizona Legislature. Suppose 20 senators and 25 representatives came to a committee meeting. Be a math detective to write a fraction that compares the number of legislators that attended to the total number of legislators.



# Vocabulary Builder

## ► Visualize It

Use the ✓ words to complete the H-diagram.



### Review Words

- benchmark
- ✓common multiple
- ✓denominators
- ✓difference
- ✓equivalent fractions
- mixed number
- ✓numerators
- ✓simplest form
- ✓sum

### Preview Words

- ✓common denominator

## ► Understand Vocabulary

Draw a line to match the word with its definition.

- |                         |  |
|-------------------------|--|
| 1. common multiple      | • a number that is made up of a whole number and a fraction  |
| 2. benchmark            | • a number that is a multiple of two or more numbers   |
| 3. simplest form        | • a common multiple of two or more denominators  |
| 4. mixed number         | • the form of a fraction in which the numerator and denominator have only 1 as their common factor |
| 5. common denominator   | • a familiar number used as a point of reference   |
| 6. equivalent fractions | • fractions that name the same amount or part  |

Name \_\_\_\_\_

## Addition with Unlike Denominators

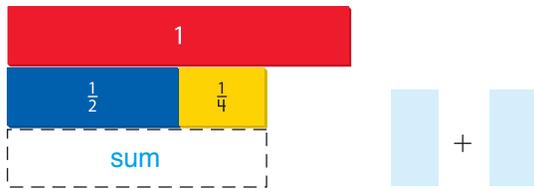
**Essential Question** How can you use models to add fractions that have different denominators?

### Investigate

Hilary is making a tote bag for her friend. She uses  $\frac{1}{2}$  yard of blue fabric and  $\frac{1}{4}$  yard of red fabric. How much fabric does Hilary use?

**Materials** ■ fraction strips ■ MathBoard

- Find  $\frac{1}{2} + \frac{1}{4}$ . Place a  $\frac{1}{2}$  strip and a  $\frac{1}{4}$  strip under the 1-whole strip on your MathBoard.
- Find fraction strips, all with the same denominator, that are equivalent to  $\frac{1}{2}$  and  $\frac{1}{4}$  and fit exactly under the sum  $\frac{1}{2} + \frac{1}{4}$ . Record the addends, using like denominators.



- Record the sum in simplest form.  $\frac{1}{2} + \frac{1}{4} = \underline{\hspace{2cm}}$

So, Hilary uses \_\_\_\_\_ yard of fabric.



### Math Talk

**MATHEMATICAL PRACTICES**

How can you tell if the sum of the fractions is less than 1?

## Draw Conclusions

- Describe** how you would determine what fraction strips, all with the same denominator, would fit exactly under  $\frac{1}{2} + \frac{1}{3}$ . What are they?

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- H.O.T.** **Explain** the difference between finding fraction strips with the same denominator for  $\frac{1}{2} + \frac{1}{3}$  and  $\frac{1}{2} + \frac{1}{4}$ .

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# Make Connections

Sometimes, the sum of two fractions is greater than 1. When adding fractions with unlike denominators, you can use the 1-whole strip to help determine if a sum is greater than 1 or less than 1.

Use fraction strips to solve.  $\frac{3}{5} + \frac{1}{2}$

### STEP 1

Work with another student. Place three  $\frac{1}{5}$  fraction strips under the 1-whole strip on your MathBoard. Then place a  $\frac{1}{2}$  fraction strip beside the three  $\frac{1}{5}$  strips.

### STEP 2

Find fraction strips, all with the same denominator, that are equivalent to  $\frac{3}{5}$  and  $\frac{1}{2}$ . Place the fraction strips under the sum. At the right, draw a picture of the model and write the equivalent fractions.

$$\frac{3}{5} = \underline{\hspace{2cm}} \quad \frac{1}{2} = \underline{\hspace{2cm}}$$

### STEP 3

Add the fractions with like denominators. Use the 1-whole strip to rename the sum in simplest form.

**Think:** How many fraction strips with the same denominator are equal to 1 whole?

$$\frac{3}{5} + \frac{1}{2} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}, \text{ or } \underline{\hspace{2cm}}$$

### Math Talk

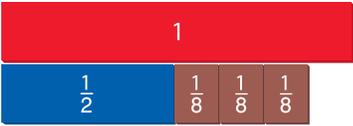
MATHEMATICAL PRACTICES

In what step did you find out that the answer is greater than 1? **Explain.**

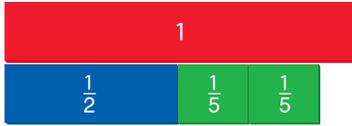
# Share and Show



Use fraction strips to find the sum. Write your answer in simplest form.

1. 

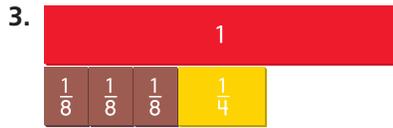
$$\frac{1}{2} + \frac{3}{8} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

2. 

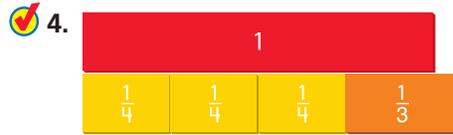
$$\frac{1}{2} + \frac{2}{5} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Name \_\_\_\_\_

Use fraction strips to find the sum. Write your answer in simplest form.



$$\frac{3}{8} + \frac{1}{4} = \underline{\quad} + \underline{\quad} = \underline{\quad}$$



$$\frac{3}{4} + \frac{1}{3} = \underline{\quad} + \underline{\quad} = \underline{\quad}$$

Use fraction strips to find the sum. Write your answer in simplest form.

5.  $\frac{2}{5} + \frac{3}{10} = \underline{\quad}$

6.  $\frac{1}{4} + \frac{1}{12} = \underline{\quad}$

7.  $\frac{1}{2} + \frac{3}{10} = \underline{\quad}$

8.  $\frac{2}{3} + \frac{1}{6} = \underline{\quad}$

9.  $\frac{5}{8} + \frac{1}{4} = \underline{\quad}$

10.  $\frac{1}{2} + \frac{1}{5} = \underline{\quad}$

11.  $\frac{3}{4} + \frac{1}{6} = \underline{\quad}$

12.  $\frac{1}{2} + \frac{2}{3} = \underline{\quad}$

13.  $\frac{7}{8} + \frac{1}{4} = \underline{\quad}$

14.  **Write Math** Explain how using fraction strips with like denominators makes it possible to add fractions with unlike denominators.

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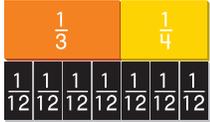
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# Problem Solving

## H.O.T. Pose a Problem

15. Maya makes trail mix by combining  $\frac{1}{3}$  cup of mixed nuts and  $\frac{1}{4}$  cup of dried fruit. What is the total amount of ingredients in her trail mix?



$$\frac{1}{3} + \frac{1}{4} = \frac{7}{12}$$

Maya uses  $\frac{7}{12}$  cup of ingredients.



Write a new problem using different amounts for each ingredient. Each amount should be a fraction with a denominator of 2, 3, or 4. Then use fraction strips to solve your problem.

### Pose a problem.

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### Solve your problem. Draw a picture of the fraction strips you use to solve the problem.

- **Explain** why you chose the amounts you did for your problem.

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Name \_\_\_\_\_

## Subtraction with Unlike Denominators

**Essential Question** How can you use models to subtract fractions that have different denominators?

### Investigate

Mario fills a hummingbird feeder with  $\frac{3}{4}$  cup of sugar water on Friday. On Monday, Mario sees that  $\frac{1}{8}$  cup of sugar water is left. How much sugar water did the hummingbirds drink?

**Materials** ■ fraction strips ■ MathBoard

- Find  $\frac{3}{4} - \frac{1}{8}$ . Place three  $\frac{1}{4}$  strips under the 1-whole strip on your MathBoard. Then place a  $\frac{1}{8}$  strip under the  $\frac{1}{4}$  strips.
- Find fraction strips all with the same denominator that fit exactly under the difference  $\frac{3}{4} - \frac{1}{8}$ .



- Record the difference.  $\frac{3}{4} - \frac{1}{8} = \underline{\hspace{2cm}}$

So, the hummingbirds drank \_\_\_\_\_ cup of sugar water.



### Math Talk

MATHEMATICAL PRACTICES

How can you tell if the difference of the fractions is less than 1? **Explain.**

## Draw Conclusions . . . . .

- Describe** how you determined what fraction strips, all with the same denominator, would fit exactly under the difference. What are they?

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- H.O.T.** **Explain** whether you could have used fraction strips with any other denominator to find the difference. If so, what is the denominator?

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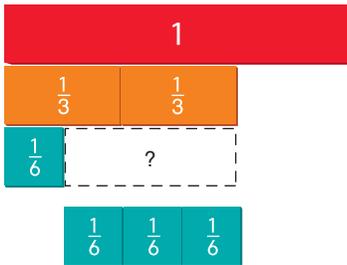
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# Make Connections . . . . .

Sometimes you can use different sets of same-denominator fraction strips to find the difference. All of the answers will be correct.

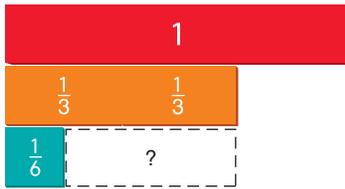
Solve.  $\frac{2}{3} - \frac{1}{6}$

**A** Find fraction strips, all with the same denominator, that fit exactly under the difference  $\frac{2}{3} - \frac{1}{6}$ .



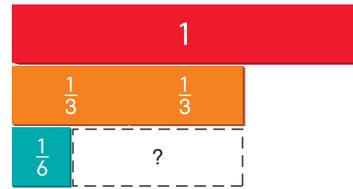
$$\frac{2}{3} - \frac{1}{6} = \frac{3}{6}$$

**B** Find another set of fraction strips, all with the same denominator, that fit exactly under the difference  $\frac{2}{3} - \frac{1}{6}$ . Draw the fraction strips you used.



$$\frac{2}{3} - \frac{1}{6} = \underline{\hspace{2cm}}$$

**C** Find other fraction strips, all with the same denominator, that fit exactly under the difference  $\frac{2}{3} - \frac{1}{6}$ . Draw the fraction strips you used.



$$\frac{2}{3} - \frac{1}{6} = \underline{\hspace{2cm}}$$

While each answer appears different, all of the answers can be simplified to         .

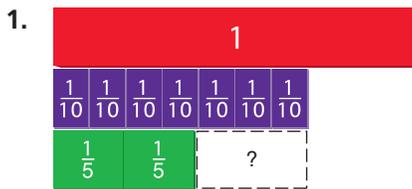
**MATHEMATICAL PRACTICES**

**Math Talk**

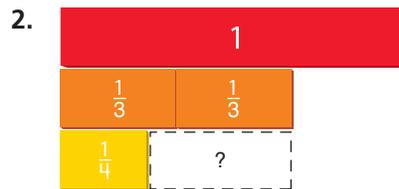
Which other fraction strips with the same denominator could fit exactly in the difference of  $\frac{2}{3} - \frac{1}{6}$ ?

## Share and Show

Use fraction strips to find the difference. Write your answer in simplest form.



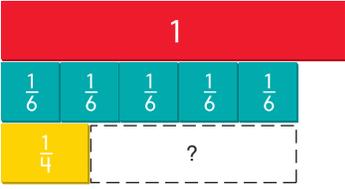
$$\frac{7}{10} - \frac{2}{5} = \underline{\hspace{2cm}}$$



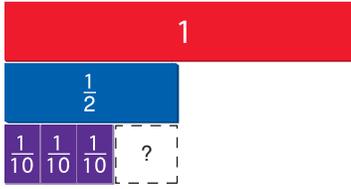
$$\frac{2}{3} - \frac{1}{4} = \underline{\hspace{2cm}}$$

Name \_\_\_\_\_

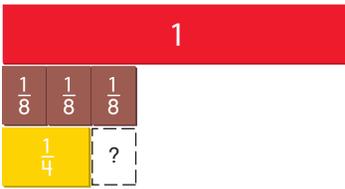
Use fraction strips to find the difference. Write your answer in simplest form.

3. 

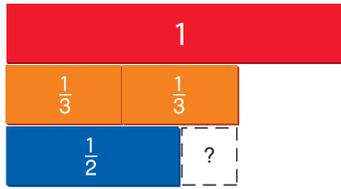
$\frac{5}{6} - \frac{1}{4} = \underline{\hspace{2cm}}$

4. 

$\frac{1}{2} - \frac{3}{10} = \underline{\hspace{2cm}}$

5. 

$\frac{3}{8} - \frac{1}{4} = \underline{\hspace{2cm}}$

6. 

$\frac{2}{3} - \frac{1}{2} = \underline{\hspace{2cm}}$

Use fraction strips to find the difference. Write your answer in simplest form.

7.  $\frac{3}{5} - \frac{3}{10} = \underline{\hspace{2cm}}$

8.  $\frac{5}{12} - \frac{1}{3} = \underline{\hspace{2cm}}$

9.  $\frac{1}{2} - \frac{1}{10} = \underline{\hspace{2cm}}$

10.  $\frac{3}{5} - \frac{1}{2} = \underline{\hspace{2cm}}$

11.  $\frac{7}{8} - \frac{1}{4} = \underline{\hspace{2cm}}$

12.  $\frac{5}{6} - \frac{2}{3} = \underline{\hspace{2cm}}$

13.  $\frac{3}{4} - \frac{1}{3} = \underline{\hspace{2cm}}$

14.  $\frac{5}{6} - \frac{1}{2} = \underline{\hspace{2cm}}$

15.   $\frac{3}{4} - \frac{7}{12} = \underline{\hspace{2cm}}$

16.  **Write Math** **Explain** how your model for  $\frac{3}{5} - \frac{1}{2}$  is different from your model for  $\frac{3}{5} - \frac{3}{10}$ .

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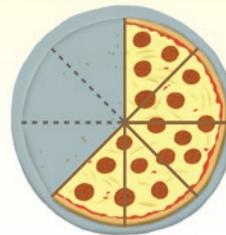
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**UNLOCK the Problem** REAL WORLD

17. The picture at the right shows how much pizza was left over from lunch. Jason eats  $\frac{1}{4}$  of the whole pizza for dinner. Which subtraction sentence represents the amount of pizza that is remaining after dinner?



- (A)  $1 - \frac{1}{4} = \frac{3}{4}$
- (B)  $\frac{5}{8} - \frac{1}{4} = \frac{3}{8}$
- (C)  $\frac{3}{8} - \frac{1}{4} = \frac{2}{8}$
- (D)  $1 - \frac{3}{8} = \frac{5}{8}$

- a. What problem are you being asked to solve? \_\_\_\_\_  
\_\_\_\_\_
- b. How will you use the diagram to solve the problem? \_\_\_\_\_  
\_\_\_\_\_
- c. Jason eats  $\frac{1}{4}$  of the whole pizza. How many slices does he eat? \_\_\_\_\_
- d. Redraw the diagram of the pizza. Shade the sections of pizza that are remaining after Jason eats his dinner.
- e. Write a fraction to represent the amount of pizza that is remaining.  
\_\_\_\_\_
- f. Fill in the bubble for the correct answer choice above.

18. The diagram shows what Tina had left from a yard of fabric. She now uses  $\frac{2}{3}$  yard of fabric for a project. How much of the original yard of fabric does Tina have left after the project?



- (A)  $\frac{2}{3}$  yard
- (B)  $\frac{1}{2}$  yard
- (C)  $\frac{1}{3}$  yard
- (D)  $\frac{1}{6}$  yard

Name \_\_\_\_\_

## Estimate Fraction Sums and Differences

**Essential Question** How can you make reasonable estimates of fraction sums and differences?

### UNLOCK the Problem REAL WORLD

Kimberly will be riding her bike to school this year. The distance from her house to the end of the street is  $\frac{1}{6}$  mile. The distance from the end of the street to the school is  $\frac{3}{8}$  mile. About how far is Kimberly's house from school?



You can use benchmarks to find reasonable estimates by rounding fractions to 0,  $\frac{1}{2}$ , or 1.

#### One Way Use a number line.

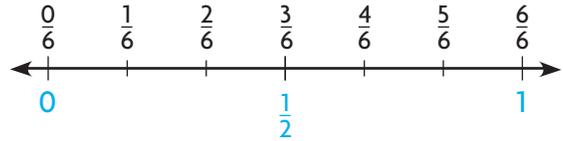
Estimate.  $\frac{1}{6} + \frac{3}{8}$

**STEP 1** Place a point at  $\frac{1}{6}$  on the number line.

The fraction is between \_\_\_\_\_ and \_\_\_\_\_.

The fraction  $\frac{1}{6}$  is closer to the benchmark \_\_\_\_\_.

Round to \_\_\_\_\_.

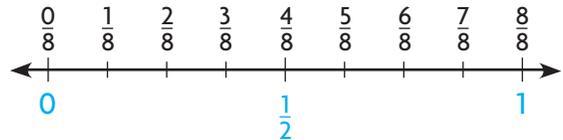


**STEP 2** Place a point at  $\frac{3}{8}$  on the number line.

The fraction is between \_\_\_\_\_ and \_\_\_\_\_.

The fraction  $\frac{3}{8}$  is closer to the benchmark \_\_\_\_\_.

Round to \_\_\_\_\_.



**STEP 3** Add the rounded fractions.

$$\begin{array}{r} \frac{1}{6} \\ + \frac{3}{8} \\ \hline \end{array} \rightarrow \begin{array}{c} \boxed{\phantom{0}} \\ + \\ \boxed{\phantom{0}} \\ \hline \end{array}$$

So, Kimberly's house is about \_\_\_\_\_ mile from the school.



Name \_\_\_\_\_

# Share and Show

Estimate the sum or difference.

1.  $\frac{5}{6} + \frac{3}{8}$

a. Round  $\frac{5}{6}$  to its closest benchmark. \_\_\_\_\_

b. Round  $\frac{3}{8}$  to its closest benchmark. \_\_\_\_\_

c. Add to find the estimate. \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_

2.  $\frac{5}{9} - \frac{3}{8}$

3.  $\frac{6}{7} + 2\frac{4}{5}$

 4.  $\frac{5}{6} + \frac{2}{5}$

5.  $3\frac{9}{10} - 1\frac{2}{9}$

6.  $\frac{4}{6} + \frac{1}{9}$

 7.  $\frac{9}{10} - \frac{1}{9}$

## On Your Own .....

Estimate the sum or difference.

8.  $\frac{5}{8} - \frac{1}{5}$

9.  $\frac{1}{6} + \frac{3}{8}$

10.  $\frac{6}{7} - \frac{1}{5}$

11.  $\frac{11}{12} + \frac{6}{10}$

12.  $\frac{9}{10} - \frac{1}{2}$

13.  $\frac{3}{6} + \frac{4}{5}$

14.  $\frac{5}{6} - \frac{3}{8}$

15.  $\frac{1}{7} + \frac{8}{9}$

16.  $3\frac{5}{12} - 3\frac{1}{10}$

**Math Talk** **MATHEMATICAL PRACTICES**  
**Explain** how you know whether your estimate for  $\frac{9}{10} + 3\frac{6}{7}$  would be greater than or less than the actual sum.

**Problem Solving** REAL WORLD

SHOW YOUR WORK

17. Lisa and Valerie are picnicking in Trough Creek State Park in Pennsylvania. Lisa has brought a salad that she made with  $\frac{3}{4}$  cup of strawberries,  $\frac{7}{8}$  cup of peaches, and  $\frac{1}{6}$  cup of blueberries. About how many total cups of fruit are in the salad?

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18. At Trace State Park in Mississippi, there is a 25-mile mountain bike trail. If Tommy rode  $\frac{1}{2}$  of the trail on Saturday and  $\frac{1}{5}$  of the trail on Sunday, about what fraction of the trail did he ride?

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19. **H.O.T.** Explain how you know that  $\frac{5}{8} + \frac{6}{10}$  is greater than 1.

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20. **Write Math** Nick estimated that  $\frac{5}{8} + \frac{4}{7}$  is about 2. Explain how you know his estimate is not reasonable.

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21. **Test Prep** Jake added  $\frac{1}{8}$  cup of sunflower seeds and  $\frac{4}{5}$  cup of banana chips to his sundae. Which is the best estimate of the total amount of toppings Jake added to his sundae?

- (A) about  $\frac{1}{2}$  cup
- (B) about 1 cup
- (C) about  $1\frac{1}{2}$  cups
- (D) about 2 cups

Name \_\_\_\_\_

## Common Denominators and Equivalent Fractions

**Essential Question** How can you rewrite a pair of fractions so that they have a common denominator?



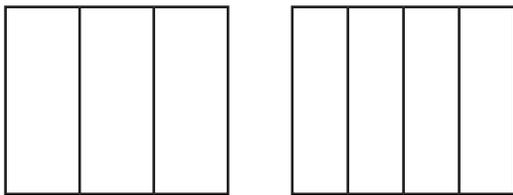
Sarah planted two 1-acre gardens. One had three sections of flowers and the other had 4 sections of flowers. She plans to divide both gardens into more sections so that they have the same number of equal-sized sections. How many sections will each garden have?



You can use a **common denominator** or a common multiple of two or more denominators to write fractions that name the same part of a whole.

### One Way Multiply the denominators.

**THINK**



Divide each  $\frac{1}{3}$  into fourths and divide each  $\frac{1}{4}$  into thirds, each of the wholes will be divided into the same size parts, twelfths.

So, both gardens will have \_\_\_\_\_ sections.

**RECORD**

- Multiply the denominators to find a common denominator.  
A common denominator of  $\frac{1}{3}$  and  $\frac{1}{4}$  is \_\_\_\_\_.
- Write  $\frac{1}{3}$  and  $\frac{1}{4}$  as equivalent fractions using the common denominator.

$$\frac{1}{3} = \frac{\square}{\square} \quad \frac{1}{4} = \frac{\square}{\square}$$

### Another Way Use a list.

- Make a list of the first eight nonzero multiples of 3 and 4.

Multiples of 3: 3, 6, 9, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Multiples of 4: 4, 8, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

- Circle the common multiples.
- Use one of the common multiples as a common denominator to write equivalent fractions for  $\frac{1}{3}$  and  $\frac{1}{4}$ .

$$\frac{1}{3} = \frac{\square}{\square} \quad \frac{1}{4} = \frac{\square}{\square}$$

So, both gardens can have \_\_\_\_\_, or \_\_\_\_\_ sections.

**Least Common Denominator** Find the least common denominator of two or more fractions by finding the least common multiple of two or more numbers.

 **Example** Use the least common denominator.

Find the least common denominator of  $\frac{3}{4}$  and  $\frac{1}{6}$ . Use the least common denominator to write an equivalent fraction for each fraction.

**STEP 1** List nonzero multiples of the denominators. Find the least common multiple.

Multiples of 4: \_\_\_\_\_

Multiples of 6: \_\_\_\_\_

So, the least common denominator of  $\frac{3}{4}$  and  $\frac{1}{6}$  is \_\_\_\_\_.

**STEP 2** Using the least common denominator, write an equivalent fraction for each fraction.

**Think:** What number multiplied by the denominator of the fraction will result in the least common denominator?

$$\frac{3}{4} = \frac{?}{12} = \frac{3 \times 3}{4 \times 3} = \frac{\square}{\square} \quad \leftarrow \text{least common denominator}$$

$$\frac{1}{6} = \frac{?}{12} = \frac{1 \times \square}{6 \times \square} = \frac{\square}{\square} \quad \leftarrow \text{least common denominator}$$

$\frac{3}{4}$  can be rewritten as \_\_\_\_\_ and  $\frac{1}{6}$  can be rewritten as \_\_\_\_\_.

## Share and Show



### Math Talk

MATHEMATICAL PRACTICES

**Explain** two methods for finding a common denominator of two fractions.

1. Find a common denominator of  $\frac{1}{6}$  and  $\frac{1}{9}$ . Rewrite the pair of fractions using the common denominator.

- Multiply the denominators.

A common denominator of  $\frac{1}{6}$  and  $\frac{1}{9}$  is \_\_\_\_\_.

- Rewrite the pair of fractions using the common denominator.

$$\frac{1}{6} = \frac{\square}{\square} \quad \frac{1}{9} = \frac{\square}{\square}$$

Use a common denominator to write an equivalent fraction for each fraction.

2.  $\frac{1}{3}, \frac{1}{5}$  common denominator: \_\_\_\_\_

3.  $\frac{2}{3}, \frac{5}{9}$  common denominator: \_\_\_\_\_

 4.  $\frac{2}{9}, \frac{1}{15}$  common denominator: \_\_\_\_\_

Name \_\_\_\_\_

Use the least common denominator to write an equivalent fraction for each fraction.

5.  $\frac{1}{4}, \frac{3}{8}$  least common denominator: \_\_\_\_\_  
\_\_\_\_\_

6.  $\frac{11}{12}, \frac{5}{8}$  least common denominator: \_\_\_\_\_  
\_\_\_\_\_

7.  $\frac{4}{5}, \frac{1}{6}$  least common denominator: \_\_\_\_\_  
\_\_\_\_\_

**Math Talk** **MATHEMATICAL PRACTICES**  
Explain what a common denominator of two fractions represents.

## On Your Own

Use a common denominator to write an equivalent fraction for each fraction.

8.  $\frac{3}{5}, \frac{1}{4}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

9.  $\frac{5}{8}, \frac{1}{5}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

10.  $\frac{1}{12}, \frac{1}{2}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

**Practice: Copy and Solve** Use the least common denominator to write an equivalent fraction for each fraction.

11.  $\frac{1}{6}, \frac{4}{9}$

12.  $\frac{7}{9}, \frac{8}{27}$

13.  $\frac{7}{10}, \frac{3}{8}$

14.  $\frac{1}{3}, \frac{5}{11}$

15.  $\frac{5}{9}, \frac{4}{15}$

16.  $\frac{1}{6}, \frac{4}{21}$

17.  $\frac{5}{14}, \frac{8}{42}$

18.  $\frac{7}{12}, \frac{5}{18}$

**H.O.T.** **Algebra** Write the unknown number for each  $\square$ .

19.  $\frac{1}{5}, \frac{1}{8}$  least common denominator:  $\square$   
 $\square =$  \_\_\_\_\_

20.  $\frac{2}{5}, \frac{1}{\square}$  least common denominator: 15  
 $\square =$  \_\_\_\_\_

21.  $\frac{3}{\square}, \frac{5}{6}$  least common denominator: 42  
 $\square =$  \_\_\_\_\_

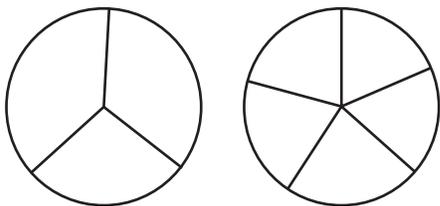
**UNLOCK the Problem** REAL WORLD



22. Katie made two pies for the bake sale. One was cut into three equal slices and the other into 5 equal slices. She will continue to cut the pies so each one has the same number of equal-sized slices. What is the least number of equal-sized slices each pie could have?

- a. What information are you given? \_\_\_\_\_  
\_\_\_\_\_
- b. What problem are you being asked to solve? \_\_\_\_\_  
\_\_\_\_\_
- c. When Katie cuts the pies more, can she cut each pie the same number of times and have all the slices the same size? **Explain.** \_\_\_\_\_  
\_\_\_\_\_

d. Use the diagram to show the steps you use to solve the problem.



e. Complete the sentences.

The least common denominator of

$\frac{1}{3}$  and  $\frac{1}{5}$  is \_\_\_\_\_.

Katie can cut each piece of the first pie

into \_\_\_\_\_ and each piece of the

second pie into \_\_\_\_\_.

That means that Katie can cut each pie into

pieces that are \_\_\_\_\_ of the whole pie.

23. A cookie recipe calls for  $\frac{1}{3}$  cup of brown sugar and  $\frac{1}{8}$  cup of walnuts. Find the least common denominator of the fractions used in the recipe.

\_\_\_\_\_

24. **Test Prep** Which fractions use the least common denominator and are equivalent to  $\frac{5}{8}$  and  $\frac{7}{10}$ ?

(A)  $\frac{10}{40}$  and  $\frac{14}{40}$

(C)  $\frac{25}{80}$  and  $\frac{21}{80}$

(B)  $\frac{25}{40}$  and  $\frac{28}{40}$

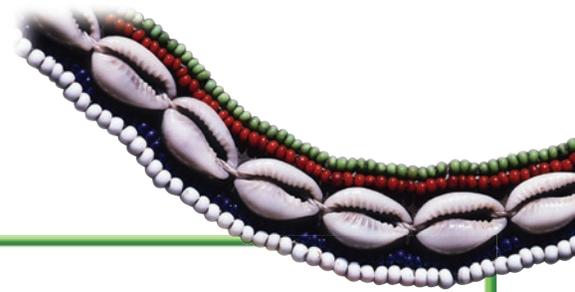
(D)  $\frac{50}{80}$  and  $\frac{56}{80}$

Name \_\_\_\_\_

## Add and Subtract Fractions

**Essential Question** How can you use a common denominator to add and subtract fractions with unlike denominators?

**CONNECT** You can use what you have learned about common denominators to add or subtract fractions with unlike denominators.



### UNLOCK the Problem REAL WORLD

Malia bought shell beads and glass beads to weave into designs in her baskets. She bought  $\frac{1}{4}$  pound of shell beads and  $\frac{3}{8}$  pound of glass beads. How many pounds of beads did she buy?

- Underline the question you need to answer.
- Draw a circle around the information you will use.

**Key** Add.  $\frac{1}{4} + \frac{3}{8}$  Write your answer in simplest form.

### One Way

Find a common denominator by multiplying the denominators.

$$4 \times 8 = \underline{\quad} \leftarrow \text{common denominator}$$

Use the common denominator to write equivalent fractions with like denominators. Then add, and write your answer in simplest form.

$$\begin{array}{r} \frac{1}{4} = \frac{1 \times \square}{4 \times \square} = \frac{\square}{\square} \\ + \frac{3}{8} = + \frac{3 \times \square}{8 \times \square} = + \frac{\square}{\square} \\ \hline \frac{\square}{\square} = \frac{\square}{\square} \end{array}$$

So, Malia bought            pound of beads.

### Another Way

Find the least common denominator.

The least common denominator of  $\frac{1}{4}$  and  $\frac{3}{8}$  is           .

$$\begin{array}{r} \frac{1}{4} = \frac{1 \times \square}{4 \times \square} = \frac{\square}{\square} \\ + \frac{3}{8} \qquad \qquad \qquad + \frac{\square}{\square} \\ \hline \frac{\square}{\square} \end{array}$$

1. **Explain** how you know whether your answer is reasonable. \_\_\_\_\_

## Example

When subtracting two fractions with unlike denominators, follow the same steps you follow when adding two fractions. However, instead of adding the fractions, subtract.

Subtract.  $\frac{9}{10} - \frac{2}{5}$  Write your answer in simplest form.

$$\begin{array}{r} \frac{9}{10} = \\ - \frac{2}{5} = \\ \hline \end{array}$$

Describe the steps you took to solve the problem.

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2. Explain how you know whether your answer is reasonable.

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## Share and Show



Find the sum or difference. Write your answer in simplest form.

1.  $\frac{5}{12} + \frac{1}{3}$

2.  $\frac{2}{5} + \frac{3}{7}$

 3.  $\frac{1}{6} + \frac{3}{4}$

4.  $\frac{3}{4} - \frac{1}{8}$

5.  $\frac{1}{4} - \frac{1}{7}$

 6.  $\frac{9}{10} - \frac{1}{4}$

### Math Talk

#### MATHEMATICAL PRACTICES

Explain why it is important to check your answer for reasonableness.

Name \_\_\_\_\_

## On Your Own

Find the sum or difference. Write your answer in simplest form.

7.  $\frac{3}{8} + \frac{1}{4}$

8.  $\frac{7}{8} + \frac{1}{10}$

9.  $\frac{2}{7} + \frac{3}{10}$

10.  $\frac{5}{6} + \frac{1}{8}$

11.  $\frac{5}{12} + \frac{5}{18}$

12.  $\frac{7}{16} - \frac{1}{4}$

13.  $\frac{5}{6} - \frac{3}{8}$

14.  $\frac{3}{4} - \frac{1}{2}$

15.  $\frac{5}{12} - \frac{1}{4}$

**Practice: Copy and Solve** Find the sum or difference. Write your answer in simplest form.

16.  $\frac{1}{3} + \frac{4}{18}$

17.  $\frac{3}{5} + \frac{1}{3}$

18.  $\frac{3}{10} + \frac{1}{6}$

19.  $\frac{1}{2} + \frac{4}{9}$

20.  $\frac{1}{2} - \frac{3}{8}$

21.  $\frac{5}{7} - \frac{2}{3}$

22.  $\frac{4}{9} - \frac{1}{6}$

23.  $\frac{11}{12} - \frac{7}{15}$

 **Algebra** Find the unknown number.

24.  $\frac{9}{10} - \blacksquare = \frac{1}{5}$

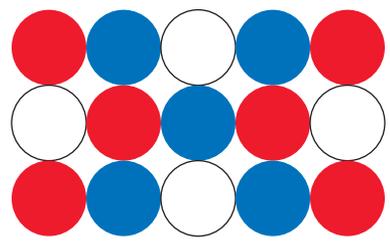
$\blacksquare =$  \_\_\_\_\_

25.  $\frac{5}{12} + \blacksquare = \frac{1}{2}$

$\blacksquare =$  \_\_\_\_\_

# Problem Solving **REAL WORLD**

Use the picture for 26–27.



26. Sara is making a key chain using the bead design shown. What fraction of the beads in her design are either blue or red?

---

27. **H.O.T.** In making the key chain, Sara uses the pattern of beads 3 times. After the key chain is complete, what fraction of the beads in the key chain are either white or blue?

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28. **Write Math** Jamie had  $\frac{4}{5}$  of a spool of twine. He then used  $\frac{1}{2}$  of a spool of twine to make friendship knots. He claims to have  $\frac{3}{10}$  of the original spool of twine left over. **Explain** how you know whether Jamie’s claim is reasonable.

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29. **Test Prep** Which equation represents the fraction of beads that are green or yellow?



- (A)  $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$
- (B)  $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$
- (C)  $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$
- (D)  $\frac{3}{4} + \frac{2}{8} = 1$

**SHOW YOUR WORK**



## Mid-Chapter Checkpoint

### ► Vocabulary

Choose the best term from the box.

1. A \_\_\_\_\_ is a number that is a multiple of two or more numbers. (p. 255)
2. A \_\_\_\_\_ is a common multiple of two or more denominators. (p. 255)

Vocabulary
equivalent fractions
common denominator
common multiple

### ► Concepts and Skills

Estimate the sum or difference.

3.  $\frac{8}{9} + \frac{4}{7}$

4.  $3\frac{2}{5} - \frac{5}{8}$

5.  $1\frac{5}{6} + 2\frac{2}{11}$

Use a common denominator to write an equivalent fraction for each fraction.

6.  $\frac{1}{6}, \frac{1}{9}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

7.  $\frac{3}{8}, \frac{3}{10}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

8.  $\frac{1}{9}, \frac{5}{12}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

Use the least common denominator to write an equivalent fraction for each fraction.

9.  $\frac{2}{5}, \frac{1}{10}$  least common denominator: \_\_\_\_\_  
\_\_\_\_\_

10.  $\frac{5}{6}, \frac{3}{8}$  least common denominator: \_\_\_\_\_  
\_\_\_\_\_

11.  $\frac{1}{3}, \frac{2}{7}$  least common denominator: \_\_\_\_\_  
\_\_\_\_\_

Find the sum or difference. Write your answer in simplest form.

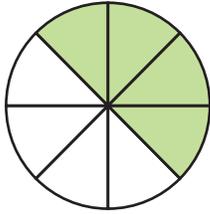
12.  $\frac{11}{18} - \frac{1}{6}$

13.  $\frac{2}{7} + \frac{2}{5}$

14.  $\frac{3}{4} - \frac{3}{10}$

Fill in the bubble completely to show your answer.

15. Mrs. Michaels bakes a pie for her book club meeting. The shaded part of the diagram below shows the amount of pie left after the meeting. That evening, Mr. Michaels eats  $\frac{1}{4}$  of the whole pie. Which fraction represents the amount of pie remaining?



- (A)  $\frac{1}{4}$
- (B)  $\frac{3}{8}$
- (C)  $\frac{5}{8}$
- (D)  $\frac{3}{4}$
16. Keisha bakes a pan of brownies for a family picnic. She takes  $\frac{1}{2}$  of the brownies to the picnic. At the picnic, her family eats  $\frac{3}{8}$  of the whole pan of brownies. Which fraction of the whole pan of brownies does Keisha bring back from the picnic?
- (A)  $\frac{1}{8}$
- (B)  $\frac{1}{4}$
- (C)  $\frac{2}{5}$
- (D)  $\frac{1}{2}$
17. Mario is mixing paint for his walls. He mixes  $\frac{1}{6}$  gallon blue paint and  $\frac{5}{8}$  gallon green paint in a large container. Which fraction represents the total amount of paint Mario mixes?
- (A)  $\frac{2}{3}$  gallon
- (B)  $\frac{3}{7}$  gallon
- (C)  $\frac{9}{12}$  gallon
- (D)  $\frac{19}{24}$  gallon

Name \_\_\_\_\_

## Add and Subtract Mixed Numbers

**Essential Question** How can you add and subtract mixed numbers with unlike denominators?

### UNLOCK the Problem REAL WORLD

Denise mixed  $1\frac{4}{5}$  ounces of blue paint with  $2\frac{1}{10}$  ounces of yellow paint. How many ounces of paint did Denise mix?



**Key** Add.  $1\frac{4}{5} + 2\frac{1}{10}$

To find the sum of mixed numbers with unlike denominators, you can use a common denominator.

- STEP 1** Estimate the sum. \_\_\_\_\_

---

- STEP 2** Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.

---

- STEP 3** Add the fractions. Then add the whole numbers. Write the answer in simplest form.

- What operation should you use to solve the problem?  
\_\_\_\_\_
- Do the fractions have the same denominator?  
\_\_\_\_\_

$$\begin{array}{r}
 1\frac{4}{5} = \square \\
 + 2\frac{1}{10} = + \square \\
 \hline
 \square
 \end{array}$$

So, Denise mixed \_\_\_\_\_ ounces of paint.

**Math Talk** **MATHEMATICAL PRACTICES** Did you use the least common denominator? Explain.

1. **Explain** how you know whether your answer is reasonable. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. What other common denominator could you have used? \_\_\_\_\_  
\_\_\_\_\_

## Example

Subtract.  $4\frac{5}{6} - 2\frac{3}{4}$

You can also use a common denominator to find the difference of mixed numbers with unlike denominators.

**STEP 1** Estimate the difference. \_\_\_\_\_

**STEP 2** Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.

**STEP 3** Subtract the fractions. Subtract the whole numbers. Write the answer in simplest form.

$$\begin{array}{r} 4\frac{5}{6} = \square \\ - 2\frac{3}{4} = - \square \\ \hline \square \end{array}$$

3. **Explain** how you know whether your answer is reasonable. \_\_\_\_\_

## Share and Show



1. Use a common denominator to write equivalent fractions with like denominators and then find the sum. Write your answer in simplest form.

$$\begin{array}{r} 7\frac{2}{5} = \square \\ + 4\frac{3}{4} = + \square \\ \hline \square \end{array}$$

Find the sum. Write your answer in simplest form.

2.  $2\frac{3}{4} + 3\frac{3}{10}$

3.  $5\frac{3}{4} + 1\frac{1}{3}$

 4.  $3\frac{4}{5} + 2\frac{3}{10}$

Name \_\_\_\_\_

Find the difference. Write your answer in simplest form.

5.  $9\frac{5}{6} - 2\frac{1}{3}$

6.  $10\frac{5}{9} - 9\frac{1}{6}$

 7.  $7\frac{2}{3} - 3\frac{1}{6}$

## On Your Own

Find the sum or difference. Write your answer in simplest form.

8.  $1\frac{3}{10} + 2\frac{2}{5}$

9.  $3\frac{4}{9} + 3\frac{1}{2}$

10.  $2\frac{1}{2} + 2\frac{1}{3}$

11.  $5\frac{1}{4} + 9\frac{1}{3}$

12.  $8\frac{1}{6} + 7\frac{3}{8}$

13.  $14\frac{7}{12} - 5\frac{1}{4}$

14.  $12\frac{3}{4} - 6\frac{1}{6}$

15.  $2\frac{5}{8} - 1\frac{1}{4}$

16.  $10\frac{1}{2} - 2\frac{1}{5}$

**Math Talk** **MATHEMATICAL PRACTICES**  
**Explain** why you need to write equivalent fractions with common denominators to add  $4\frac{5}{6}$  and  $1\frac{1}{8}$ .

**Practice: Copy and Solve** Find the sum or difference. Write your answer in simplest form.

17.  $1\frac{5}{12} + 4\frac{1}{6}$

18.  $8\frac{1}{2} + 6\frac{3}{5}$

19.  $2\frac{1}{6} + 4\frac{5}{9}$

20.  $3\frac{5}{8} + \frac{5}{12}$

21.  $3\frac{2}{3} - 1\frac{1}{6}$

22.  $5\frac{6}{7} - 1\frac{2}{3}$

23.  $2\frac{7}{8} - \frac{1}{2}$

24.  $4\frac{7}{12} - 1\frac{2}{9}$

# Problem Solving **REAL WORLD**

Use the table to solve 25–28.

25. Gavin is mixing a batch of Sunrise Orange paint for an art project. How much paint does Gavin mix?

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26. Gavin plans to mix a batch of Tangerine paint. He expects to have a total of  $5\frac{3}{10}$  ounces of paint after he mixes the amounts of red and yellow. **Explain** how you can tell if Gavin's expectation is reasonable.

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27. **H.O.T.** For a special project, Gavin mixes the amount of red from one shade of paint with the amount of yellow from a different shade. He mixes the batch so he will have the greatest possible amount of paint. What amounts of red and yellow from which shades are used in the mixture for the special project? **Explain** your answer.

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28. Gavin needs to make 2 batches of Mango paint. **Explain** how you could find the total amount of paint Gavin mixed.

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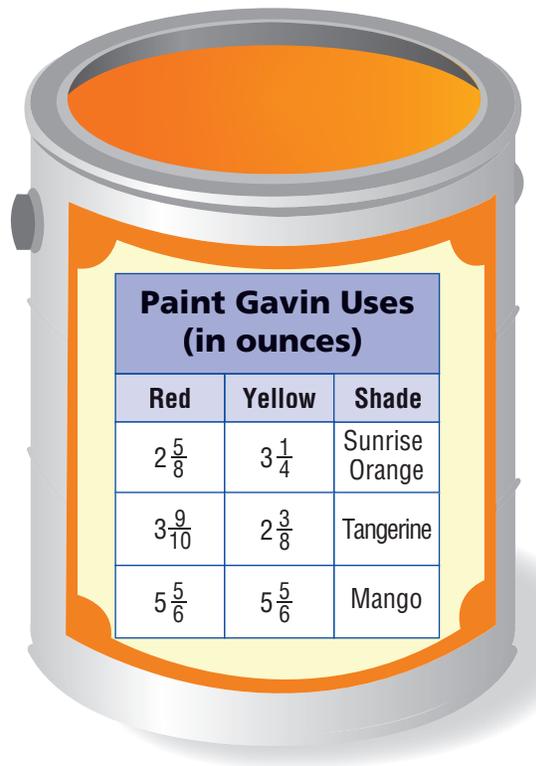
29. **Test Prep** Yolanda walked  $3\frac{6}{10}$  miles. Then she walked  $4\frac{1}{2}$  more miles. How many miles did Yolanda walk?

(A)  $7\frac{1}{10}$  miles

(C)  $8\frac{1}{10}$  miles

(B)  $7\frac{7}{10}$  miles

(D)  $8\frac{7}{10}$  miles



**SHOW YOUR WORK**

Name \_\_\_\_\_

**Subtraction with Renaming****Essential Question** How can you use renaming to find the difference of two mixed numbers?

To practice for a race, Kara is running  $2\frac{1}{2}$  miles. When she reaches the end of her street, she knows that she has already run  $1\frac{5}{6}$  miles. How many miles does Kara have left to run?

- Underline the sentence that tells you what you need to find.
  - What operation should you use to solve the problem?
- \_\_\_\_\_

**One Way** Rename the first mixed number.Subtract.  $2\frac{1}{2} - 1\frac{5}{6}$ **STEP 1** Estimate the difference. \_\_\_\_\_**STEP 2** Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.**STEP 3** Rename  $2\frac{6}{12}$  as a mixed number with a fraction greater than 1.**Think:**  $2\frac{6}{12} = 1 + 1 + \frac{6}{12} = 1 + \frac{12}{12} + \frac{6}{12} = 1\frac{18}{12}$ 

$$2\frac{6}{12} = \underline{\hspace{2cm}}$$

**STEP 4** Find the difference of the fractions. Then find the difference of the whole numbers. Write the answer in simplest form. Check to make sure your answer is reasonable.

$$\begin{array}{r} 2\frac{1}{2} = 2\frac{6}{12} = \square \\ -1\frac{5}{6} = -1\frac{10}{12} = -1\frac{10}{12} \\ \hline \square = \square \end{array}$$

So, Kara has \_\_\_\_\_ mile left to run.

- **Explain** why it is important to write equivalent fractions before renaming. \_\_\_\_\_
- \_\_\_\_\_



## Another Way

Rename both mixed numbers as fractions greater than 1.

Subtract.  $2\frac{1}{2} - 1\frac{5}{6}$

**STEP 1** Write equivalent fractions, using a common denominator.

A common denominator of  $\frac{1}{2}$  and  $\frac{5}{6}$  is 6.

$$2\frac{1}{2} \rightarrow \boxed{\phantom{00}}$$

$$1\frac{5}{6} \rightarrow \boxed{\phantom{00}}$$

**STEP 2** Rename both mixed numbers as fractions greater than 1.

$$2\frac{3}{6} = \boxed{\phantom{00}} \quad \text{Think: } \frac{6}{6} + \frac{6}{6} + \frac{3}{6}$$

$$1\frac{5}{6} = \boxed{\phantom{00}} \quad \text{Think: } \frac{6}{6} + \frac{5}{6}$$

**STEP 3** Find the difference of the fractions. Then write the answer in simplest form.

$$\boxed{\phantom{00}} - \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$2\frac{1}{2} - 1\frac{5}{6} = \underline{\hspace{2cm}}$$

## Share and Show



Estimate. Then find the difference and write it in simplest form.

1. Estimate: \_\_\_\_\_

$$1\frac{3}{4} - \frac{7}{8}$$

2. Estimate: \_\_\_\_\_

$$12\frac{1}{9} - 7\frac{1}{3}$$

Name \_\_\_\_\_

Estimate. Then find the difference and write it in simplest form.

3. Estimate: \_\_\_\_\_

$$4\frac{1}{2} - 3\frac{4}{5}$$

4. Estimate: \_\_\_\_\_

$$9\frac{1}{6} - 2\frac{3}{4}$$

## On Your Own . . . . .

**Math Talk** **MATHEMATICAL PRACTICES** Explain the strategy you could use to solve  $3\frac{1}{9} - 2\frac{1}{3}$ .

Estimate. Then find the difference and write it in simplest form.

5. Estimate: \_\_\_\_\_

$$3\frac{2}{3} - 1\frac{11}{12}$$

6. Estimate: \_\_\_\_\_

$$4\frac{1}{4} - 2\frac{1}{3}$$

7. Estimate: \_\_\_\_\_

$$5\frac{2}{5} - 1\frac{1}{2}$$

8. Estimate: \_\_\_\_\_

$$7\frac{5}{9} - 2\frac{5}{6}$$

9. Estimate: \_\_\_\_\_

$$7 - 5\frac{2}{3}$$

10. Estimate: \_\_\_\_\_

$$2\frac{1}{5} - 1\frac{9}{10}$$

**Practice: Copy and Solve** Find the difference and write it in simplest form.

11.  $11\frac{1}{9} - 3\frac{2}{3}$

12.  $6 - 3\frac{1}{2}$

13.  $4\frac{3}{8} - 3\frac{1}{2}$

14.  $9\frac{1}{6} - 3\frac{5}{8}$

15.  $1\frac{1}{5} - \frac{1}{2}$

16.  $13\frac{1}{6} - 3\frac{4}{5}$

17.  $12\frac{2}{5} - 5\frac{3}{4}$

18.  $7\frac{3}{8} - 2\frac{7}{9}$

**Summarize**

An amusement park in Sandusky, Ohio, offers 17 amazing roller coasters for visitors to ride. One of the roller coasters runs at 60 miles per hour and has 3,900 feet of twisting track. This coaster also has 3 trains with 8 rows per train. Riders stand in rows of 4, for a total of 32 riders per train.

The operators of the coaster recorded the number of riders on each train during a run. On the first train, the operators reported that  $7\frac{1}{4}$  rows were filled. On the second train, all 8 rows were filled, and on the third train,  $5\frac{1}{2}$  rows were filled. How many more rows were filled on the first train than on the third train?

When you *summarize*, you restate the most important information in a shortened form to more easily understand what you have read.

**Summarize the information given.**

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**Use the summary to solve.**

19. Solve the problem above.

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20.  How many rows were empty on the third train? How many additional riders would it take to fill the empty rows? **Explain** your answer.

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Name \_\_\_\_\_

## Patterns with Fractions

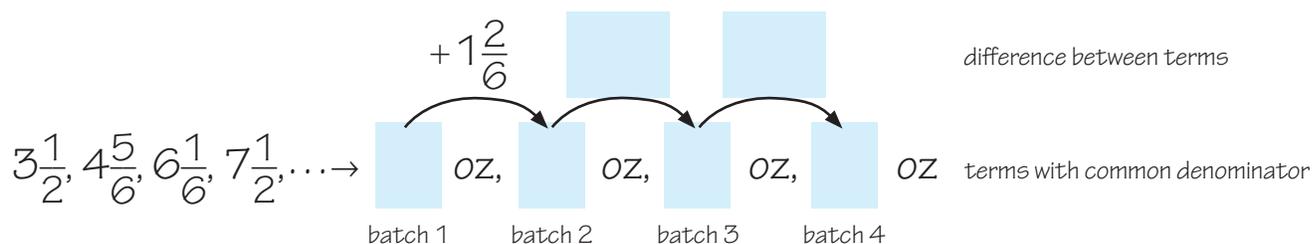
**Essential Question** How can you use addition or subtraction to describe a pattern or create a sequence with fractions?

### UNLOCK the Problem REAL WORLD

Mr. Patrick wants to develop a new chili recipe for his restaurant. Each batch he makes uses a different amount of chili powder. The first batch uses  $3\frac{1}{2}$  ounces, the second batch uses  $4\frac{5}{6}$  ounces, the third uses  $6\frac{1}{6}$  ounces, and the fourth uses  $7\frac{1}{2}$  ounces. If this pattern continues, how much chili powder will he use in the sixth batch?

You can find the pattern in a sequence by comparing one term with the next term.

**STEP 1** Write the terms in the sequence as equivalent fractions with a common denominator. Then examine the sequence and compare the consecutive terms to find the rule used to make the sequence of fractions.



**STEP 2** Write a rule that describes the pattern in the sequence.

- Is the sequence increasing or decreasing from one term to the next? **Explain.**

\_\_\_\_\_

\_\_\_\_\_

Rule: \_\_\_\_\_

**STEP 3** Extend the sequence to solve the problem.

$$3\frac{1}{2}, 4\frac{5}{6}, 6\frac{1}{6}, 7\frac{1}{2}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$$

So, Mr. Patrick will use \_\_\_\_\_ ounces of chili powder in the sixth batch.



**Example** Find the unknown terms in the sequence.

$$1\frac{3}{4}, 1\frac{9}{16}, 1\frac{3}{8}, 1\frac{3}{16}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \frac{7}{16}, \frac{1}{4}$$

**STEP 1** Write the terms in the sequence as equivalent fractions with a common denominator.

$\underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$

**STEP 2** Write a rule describing the pattern in the sequence.

- What operation can be used to describe a sequence that increases?

$\underline{\hspace{2cm}}$

- What operation can be used to describe a sequence that decreases?

$\underline{\hspace{2cm}}$

Rule:  $\underline{\hspace{3cm}}$

**STEP 3** Use your rule to find the unknown terms. Then complete the sequence above.

**MATHEMATICAL PRACTICES**

**Math Talk**

**Explain** how you know whether your rule for a sequence would involve addition or subtraction.

### Try This!

- A** Write a rule for the sequence. Then find the unknown term.

$$1\frac{1}{12}, \frac{5}{6}, \underline{\hspace{1cm}}, \frac{1}{3}, \frac{1}{12}$$

Rule:  $\underline{\hspace{3cm}}$

- B** Write the first four terms of the sequence.

Rule: start at  $\frac{1}{4}$ , add  $\frac{3}{8}$

$\underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$

Name \_\_\_\_\_

## Share and Show



Write a rule for the sequence.

1.  $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, \dots$

**Think:** Is the sequence increasing or decreasing?

Rule: \_\_\_\_\_

2.  $\frac{1}{9}, \frac{1}{3}, \frac{5}{9}, \dots$

Rule: \_\_\_\_\_

Write a rule for the sequence. Then, find the unknown term.

3.  $\frac{3}{10}, \frac{2}{5}, \underline{\hspace{2cm}}, \frac{3}{5}, \frac{7}{10}$

Rule: \_\_\_\_\_

4.  $10\frac{2}{3}, 9\frac{11}{18}, 8\frac{5}{9}, \underline{\hspace{2cm}}, 6\frac{4}{9}$

Rule: \_\_\_\_\_

5.  $1\frac{1}{6}, \underline{\hspace{2cm}}, 1, \frac{11}{12}, \frac{5}{6}$

Rule: \_\_\_\_\_

6.  $2\frac{3}{4}, 4, 5\frac{1}{4}, 6\frac{1}{2}, \underline{\hspace{2cm}}$

Rule: \_\_\_\_\_

## On Your Own

Write a rule for the sequence. Then, find the unknown term.

7.  $\frac{1}{8}, \frac{1}{2}, \underline{\hspace{2cm}}, 1\frac{1}{4}, 1\frac{5}{8}$

Rule: \_\_\_\_\_

8.  $1\frac{2}{3}, 1\frac{3}{4}, 1\frac{5}{6}, 1\frac{11}{12}, \underline{\hspace{2cm}}$

Rule: \_\_\_\_\_

9.  $12\frac{7}{8}, 10\frac{3}{4}, \underline{\hspace{2cm}}, 6\frac{1}{2}, 4\frac{3}{8}$

Rule: \_\_\_\_\_

10.  $9\frac{1}{3}, \underline{\hspace{2cm}}, 6\frac{8}{9}, 5\frac{2}{3}, 4\frac{4}{9}$

Rule: \_\_\_\_\_

Write the first four terms of the sequence.

11. Rule: start at  $5\frac{3}{4}$ , subtract  $\frac{5}{8}$

\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_

12. Rule: start at  $\frac{3}{8}$ , add  $\frac{3}{16}$

\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_

13. Rule: start at  $2\frac{1}{3}$ , add  $2\frac{1}{4}$

\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_

14. Rule: start at  $\frac{8}{9}$ , subtract  $\frac{1}{18}$

\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_

**Problem Solving** REAL WORLD

15. When Bill bought a marigold plant, it was  $\frac{1}{4}$  inch tall. After the first week, it measured  $1\frac{1}{12}$  inches tall. After the second week, it was  $1\frac{11}{12}$  inches. After week 3, it was  $2\frac{3}{4}$  inches tall. Assuming the growth of the plant was constant, what was the height of the plant at the end of week 4?

---

16. **H.O.T.** **What if** Bill's plant grew at the same rate but was  $1\frac{1}{2}$  inches when he bought it? How tall would the plant be after 3 weeks?

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17. **Write Math** Vicki wanted to start jogging. The first time she ran, she ran  $\frac{3}{16}$  mile. The second time, she ran  $\frac{3}{8}$  mile, and the third time, she ran  $\frac{9}{16}$  mile. If she continued this pattern, when was the first time she ran more than 1 mile? **Explain.**

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18. Mr. Connors drove  $78\frac{1}{3}$  miles on Monday,  $77\frac{1}{12}$  miles on Tuesday, and  $75\frac{5}{6}$  miles on Wednesday. If he continues this pattern on Thursday and Friday, how many miles will he drive on Friday?

---

19. **Test Prep** Zack watered his garden with  $1\frac{3}{8}$  gallons of water the first week he planted it. He watered it with  $1\frac{3}{4}$  gallons the second week, and  $2\frac{1}{8}$  gallons the third week. If he continued watering in this pattern, how much water did he use on the fifth week?

- (A)  $2\frac{1}{2}$  gallons
- (B)  $2\frac{7}{8}$  gallons
- (C)  $3\frac{1}{4}$  gallons
- (D)  $6\frac{7}{8}$  gallons



SHOW YOUR WORK

Name \_\_\_\_\_

**Problem Solving**

**Practice Addition and Subtraction**

**Essential Question** How can the strategy *work backward* help you solve a problem with fractions that involves addition and subtraction?



The Diaz family is cross-country skiing the Big Tree trails, which have a total length of 4 miles. Yesterday, they skied the  $\frac{7}{10}$  mile Oak Trail. Today, they skied the  $\frac{3}{5}$  mile Pine Trail. If they plan to ski all of the Big Tree trails, how many more miles do they have left to ski?



Use the graphic organizer to help you solve the problem.

**Read the Problem**

**What do I need to find?**

I need to find the distance

\_\_\_\_\_.

**What information do I need to use?**

I need to use the distance

\_\_\_\_\_

and the total distance

\_\_\_\_\_.

**How will I use the information?**

I can work backward by starting

with the \_\_\_\_\_

and \_\_\_\_\_ each distance they have already skied to find amount they have left.

**Solve the Problem**

Addition and subtraction are inverse operations. By working backward and using the same numbers, one operation undoes the other.

- Write an equation.

miles skied yesterday	+	miles skied today	+	miles they need to ski	=	total distance
↓		↓		↓		↓
_____	+	_____	+	m	=	4

- Then work backward to find  $m$ .

_____	-	_____	-	_____	=	m
				_____	=	m

So, the family has \_\_\_\_\_ miles left to ski.

- **Explain** how you know your answer is reasonable. \_\_\_\_\_

\_\_\_\_\_

## Try Another Problem

As part of their study of Native American basket weaving, Lia's class is making wicker baskets. Lia starts with a strip of wicker 36 inches long. From the strip, she first cuts one piece but does not know its length, and then cuts a piece that is  $6\frac{1}{2}$  inches long. The piece left is  $7\frac{3}{4}$  inches long. What is the length of the first piece she cut from the strip?



### Read the Problem

**What do I need to find?**

**What information do I need to use?**

**How will I use the information?**

### Solve the Problem

So, the length of the first piece cut was \_\_\_\_\_ inches.

**Math Talk**

**MATHEMATICAL PRACTICES**

What other strategy could you use to solve the problem?

Name \_\_\_\_\_

## Share and Show



1. Caitlin has  $4\frac{3}{4}$  pounds of clay. She uses  $1\frac{1}{10}$  pounds to make a cup, and another 2 pounds to make a jar. How many pounds are left?

First, write an equation to model the problem.

\_\_\_\_\_

Next, work backwards and rewrite the equation to find  $x$ .

\_\_\_\_\_

Solve.

\_\_\_\_\_

So, \_\_\_\_\_ pounds of clay remain.

2. **H.O.T.** What if Caitlin had used more than 2 pounds of clay to make a jar? Would the amount remaining have been more or less than your answer to Exercise 1?

\_\_\_\_\_

3. A pet store donated 50 pounds of food for adult dogs, puppies, and cats to an animal shelter.  $19\frac{3}{4}$  pounds was adult dog food and  $18\frac{7}{8}$  pounds was puppy food. How many pounds of cat food did the pet store donate?

\_\_\_\_\_

4. Thelma spent  $\frac{1}{6}$  of her weekly allowance on dog toys,  $\frac{1}{4}$  on a dog collar, and  $\frac{1}{3}$  on dog food. What fraction of her weekly allowance is left?

\_\_\_\_\_

### UNLOCK the Problem

Tips

- ✓ Plan your solution by deciding on the steps you will use.
- ✓ Check your exact answer by comparing it with your estimate.
- ✓ Check your answer for reasonableness.

### SHOW YOUR WORK

# On Your Own . . . . .

## Choose a STRATEGY

- Act It Out
- Draw a Diagram
- Make a Table
- Solve a Simpler Problem
- Work Backward
- Guess, Check, and Revise

5. Martin is making a model of a Native American canoe. He has  $5\frac{1}{2}$  feet of wood. He uses  $2\frac{3}{4}$  feet for the hull and  $1\frac{1}{4}$  feet for the paddles and struts. How much wood does he have left?

---

6. **H.O.T.** **What if** Martin makes a hull and two sets of paddles and struts? How much wood does he have left?

---

7. Beth's summer vacation lasted 87 days. At the beginning of her vacation, she spent 3 weeks at soccer camp, 5 days at her grandmother's house, and 13 days visiting Glacier National Park with her parents. How many vacation days remained?

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8. **Write Math** You can buy 2 DVDs for the same price you would pay for 3 CDs selling for \$13.20 apiece. **Explain** how you could find the price of 1 DVD.

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9. **Test Prep** During the 9 hours between 8 A.M. and 5 P.M., Bret spent  $5\frac{3}{4}$  hours in class and  $1\frac{1}{2}$  hours at band practice. How much time did he spend on other activities?

- (A)  $\frac{3}{4}$  hour
- (B)  $1\frac{1}{4}$  hours
- (C)  $1\frac{1}{2}$  hours
- (D)  $1\frac{3}{4}$  hours

**SHOW YOUR WORK**

Name \_\_\_\_\_

## Use Properties of Addition

**Essential Question** How can properties help you add fractions with unlike denominators?

**CONNECT** You can use properties of addition to help you add fractions with unlike denominators.

Commutative Property:  $\frac{1}{2} + \frac{3}{5} = \frac{3}{5} + \frac{1}{2}$

Associative Property:  $\left(\frac{2}{9} + \frac{1}{8}\right) + \frac{3}{8} = \frac{2}{9} + \left(\frac{1}{8} + \frac{3}{8}\right)$

### Remember

Parentheses ( ) tell which operation to do first.

## UNLOCK the Problem REAL WORLD

Jane and her family are driving to Big Lagoon State Park. On the first day, they travel  $\frac{1}{3}$  of the total distance. On the second day, they travel  $\frac{1}{3}$  of the total distance in the morning and then  $\frac{1}{6}$  of the total distance in the afternoon. How much of the total distance has Jane's family driven by the end of the second day?

**Use the Associative Property.**

Day 1 + Day 2

$$\frac{1}{3} + \left(\frac{1}{3} + \frac{1}{6}\right) = \left(\square + \square\right) + \square$$

$$= \square + \square$$

$$= \square + \square$$

$$= \square$$

So, Jane's family has driven \_\_\_\_\_ of the total distance by the end of the second day.



Write the number sentence to represent the problem. Use the Associative Property to group fractions with like denominators together.

Use mental math to add the fractions with like denominators.

Write equivalent fractions with like denominators. Then add.

### Math Talk

**MATHEMATICAL PRACTICES**

**Explain** why grouping the fractions differently makes it easier to find the sum.



**Example** Add.  $(2\frac{5}{8} + 1\frac{2}{3}) + 1\frac{1}{8}$

Use the Commutative Property and the Associative Property.

$$\begin{aligned}
 \left(2\frac{5}{8} + 1\frac{2}{3}\right) + 1\frac{1}{8} &= \left(\square + \square\right) + \square \\
 &= \square + \left(\square + \square\right) \\
 &= \square + \square \\
 &= \square + \square \\
 &= \square = \square
 \end{aligned}$$

Use the Commutative Property to put fractions with like denominators next to each other.

Use the Associative Property to group fractions with like denominators together.

Use mental math to add the fractions with like denominators.

Write equivalent fractions with like denominators. Then add.

Rename and simplify.

**Try This!** Use properties to solve. Show each step and name the property used.

**A**  $5\frac{1}{4} + \left(\frac{3}{4} + 1\frac{5}{12}\right)$

**B**  $\left(\frac{1}{5} + \frac{3}{10}\right) + \frac{2}{5}$

Name \_\_\_\_\_

## Share and Show

Use the properties and mental math to solve. Write your answer in simplest form.

1.  $(2\frac{5}{8} + \frac{5}{6}) + 1\frac{1}{8}$

2.  $\frac{5}{12} + (\frac{5}{12} + \frac{3}{4})$

3.  $(3\frac{1}{4} + 2\frac{5}{6}) + 1\frac{3}{4}$

### Math Talk

#### MATHEMATICAL PRACTICES

**Explain** how solving

Exercise 3 is different from solving Exercise 1.

## On Your Own .....

Use the properties and mental math to solve. Write your answer in simplest form.

4.  $(\frac{2}{7} + \frac{1}{3}) + \frac{2}{3}$

5.  $(\frac{1}{5} + \frac{1}{2}) + \frac{2}{5}$

6.  $(\frac{1}{6} + \frac{3}{7}) + \frac{2}{7}$

7.  $(2\frac{5}{12} + 4\frac{1}{4}) + \frac{1}{4}$

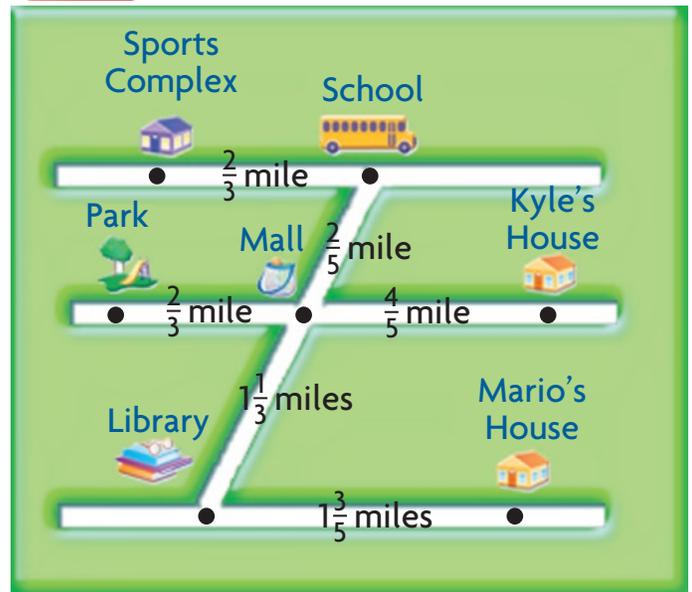
8.  $1\frac{1}{8} + (5\frac{1}{2} + 2\frac{3}{8})$

9.  $\frac{5}{9} + (\frac{1}{9} + \frac{4}{5})$

# Problem Solving **REAL WORLD**

Use the map to solve 10–12.

10. In the morning, Julie rides her bike from the sports complex to the school. In the afternoon, she rides from the school to the mall, and then to Kyle's house. How far does Julie ride her bike?
- 
11. On one afternoon, Mario walks from his house to the library. That evening, Mario walks from the library to the mall, and then to Kyle's house. **Describe** how you can use the properties to find how far Mario walks.
- 
- 
- 
- 



**SHOW YOUR WORK**

12. **H.O.T.** **Pose a Problem** Write and solve a new problem that uses the distances between four locations.
- 
- 
- 
- 

13. **Test Prep** Which property or properties does the problem below use?
- $$\frac{1}{9} + \left(\frac{4}{9} + \frac{1}{6}\right) = \left(\frac{1}{9} + \frac{4}{9}\right) + \frac{1}{6}$$
- (A) Commutative Property  
 (B) Associative Property  
 (C) Commutative Property and Associative Property  
 (D) Distributive Property



# Chapter Review/Test

## ► Vocabulary

Choose the best term from the box.

1. A \_\_\_\_\_ is a number that is a common multiple of two or more denominators. (p. 255)

Vocabulary
common denominator
common multiple

## ► Concepts and Skills

Use a common denominator to write an equivalent fraction for each fraction.

2.  $\frac{2}{5}, \frac{1}{8}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

3.  $\frac{3}{4}, \frac{1}{2}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

4.  $\frac{2}{3}, \frac{1}{6}$  common denominator: \_\_\_\_\_  
\_\_\_\_\_

Find the sum or difference. Write your answer in simplest form

5.  $\frac{5}{6} + \frac{7}{8}$

6.  $2\frac{2}{3} - 1\frac{2}{5}$

7.  $7\frac{3}{4} + 3\frac{7}{20}$

Estimate. Then find the difference and write it in simplest form.

8. Estimate: \_\_\_\_\_  
 $1\frac{2}{5} - \frac{2}{3}$

9. Estimate: \_\_\_\_\_  
 $7 - \frac{3}{7}$

10. Estimate: \_\_\_\_\_  
 $5\frac{1}{9} - 3\frac{5}{6}$

Use the properties and mental math to solve. Write your answer in simplest form.

11.  $(\frac{3}{8} + \frac{2}{3}) + \frac{1}{3}$

12.  $1\frac{4}{5} + (2\frac{3}{20} + \frac{3}{5})$

13.  $3\frac{5}{9} + (1\frac{7}{9} + 2\frac{5}{12})$

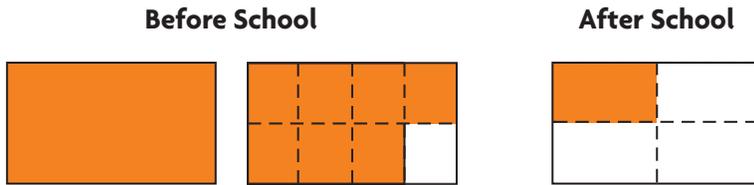
Fill in the bubble completely to show your answer.

14. Ursula mixed  $3\frac{1}{8}$  cups of dry ingredients with  $1\frac{2}{5}$  cups of liquid ingredients. Which answer represents the best estimate of the total amount of ingredients Ursula mixed?
- (A) about 4 cups  
(B) about  $4\frac{1}{2}$  cups  
(C) about 5 cups  
(D) about  $5\frac{1}{2}$  cups
15. Samuel walks in the Labor Day parade. He walks  $3\frac{1}{4}$  miles along the parade route and  $2\frac{5}{6}$  miles home. How many miles does Samuel walk?
- (A)  $\frac{5}{10}$  mile  
(B)  $5\frac{1}{12}$  miles  
(C)  $5\frac{11}{12}$  miles  
(D)  $6\frac{1}{12}$  miles
16. A gardener has a container with  $6\frac{1}{5}$  ounces of liquid plant fertilizer. On Sunday, the gardener uses  $2\frac{1}{2}$  ounces on a flower garden. How many ounces of liquid plant fertilizer are left?
- (A)  $3\frac{7}{10}$  ounces  
(B)  $5\frac{7}{10}$  ounces  
(C)  $6\frac{7}{10}$  ounces  
(D)  $8\frac{7}{10}$  ounces
17. Aaron is practicing for a triathlon. On Sunday, he bikes  $12\frac{5}{8}$  miles and swims  $5\frac{2}{3}$  miles. On Monday, he runs  $6\frac{3}{8}$  miles. How many total miles does Aaron cover on the two days?
- (A)  $23\frac{1}{6}$  miles  
(B)  $24\frac{7}{12}$  miles  
(C)  $24\frac{2}{3}$  miles  
(D)  $25\frac{7}{12}$  miles

Name \_\_\_\_\_

Fill in the bubble completely to show your answer.

18. Mrs. Friedmon baked a walnut cake for her class. The pictures below show how much cake she brought to school and how much she had left at the end of the day.



Which fraction represents the difference between the amounts of cake Mrs. Friedmon had before school and after school?

- (A)  $\frac{5}{8}$
- (B)  $1\frac{1}{2}$
- (C)  $1\frac{5}{8}$
- (D)  $2\frac{1}{2}$
19. Cody is designing a pattern for a wood floor. The length of the pieces of wood are  $1\frac{1}{2}$  inches,  $1\frac{13}{16}$  inches, and  $2\frac{1}{8}$  inches. What is the length of the 5th piece of wood if the pattern continues?
- (A)  $2\frac{7}{16}$  inches
- (B)  $2\frac{3}{4}$  inches
- (C)  $3\frac{1}{2}$  inches
- (D) 4 inches
20. Julie spends  $\frac{3}{4}$  hour studying on Monday and  $\frac{1}{6}$  hour studying on Tuesday. How many hours does Julie study on those two days?
- (A)  $\frac{1}{3}$  hour                      (C)  $\frac{5}{6}$  hour
- (B)  $\frac{2}{5}$  hour                      (D)  $\frac{11}{12}$  hour

## ► Constructed Response

21. A class uses  $8\frac{5}{6}$  sheets of white paper and  $3\frac{1}{12}$  sheets of red paper for a project. How much more white paper is used than red paper? Show your work using words, pictures, or numbers. **Explain** how you know your answer is reasonable.

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## ► Performance Task

22. For a family gathering, Marcos uses the recipe below to make a lemon-lime punch.

**Lemon-Lime Punch**

$\frac{1}{4}$  gallon lime juice

$\frac{2}{3}$  gallon lemon juice

$1\frac{1}{4}$  gallons carbonated water

- A** How would you decide the size of a container you need for one batch of the Lemon-Lime Punch?

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- B** If Marcos needs to make two batches of the recipe, how much of each ingredient will he need? How many gallons of punch will he have? Show your math solution and explain your thinking when you solve both questions.

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- C** Marcos had  $1\frac{1}{3}$  gallons of punch left over. He poured all of it into several containers for family members to take home. Use fractional parts of a gallon to suggest a way he could have shared the punch in three different-sized containers.

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