# **Subtract Mixed Numbers**

### Focus on...

After this lesson, you will be able to...

- subtract mixed numbers with like and unlike denominators
- solve problems involving the subtraction of mixed numbers
- check that your answers are reasonable using estimation



After Lucy worked on her art project, she had  $2\frac{3}{4}$  jars of paint left. Later, she used  $1\frac{1}{4}$  jars of paint to finish her painting. How much paint is left now?

## Discuss the Math

### How do you subtract mixed numbers?

#### **Example 1: Subtract Mixed Numbers With Like Denominators**

Subtract. Write the answer in lowest terms.  $2\frac{3}{4} - 1\frac{1}{4}$ 

#### Solution

Method 1: Use Fraction Strips

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

There are now  $1\frac{2}{4}$  fraction strips. Write the answer in lowest terms.  $1\frac{2}{4} = 1\frac{1}{2}$ Method 2: Use a Subtraction Statement Strategies Subtract the whole numbers. Problem 2 - 1 = 1Subtract the fractions. You can use diagrams.  $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$  $2\frac{3}{4} - 1\frac{1}{4} = 1\frac{2}{4} \circ \circ \circ \circ \circ \circ \circ$ 2 - 1 = 1Write the answer in lowest terms. ÷2  $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$  $1\frac{2}{4} = 1\frac{1}{2}$ Check:  $2\frac{3}{4} - 1\frac{1}{4} \approx 3 - 1$ 3 - 1 = 2 $1\frac{1}{2}$  is close to the estimate of 2. The answer is reasonable. Show You Know Subtract. Write each answer in lowest terms.

a)  $2\frac{2}{3} - 1\frac{1}{3}$  b)  $3\frac{7}{8} - 1\frac{3}{8}$  c)  $4\frac{3}{4} - \frac{1}{4}$ 

**Solve a Simpler** Refer to page xvii.

#### **Example 2: Subtract Mixed Numbers With Unlike Denominators**

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

#### Solution

Method 1: Use Fraction Strips



To subtract  $\frac{3}{8}$  and  $\frac{1}{2}$ , you need to use parts that are the same size.



You cannot subtract  $\frac{4}{8}$  from  $\frac{3}{8}$ . Take 1 whole strip from  $3\frac{3}{8}$  and make it the equivalent fraction  $\frac{8}{8}$ .



Method 2: Use a Subtraction Statement and Regroup

Use multiples to determine a common denominator.

Multiples of 2 are 2, 4, 6, 8, ...

Multiples of 8 are $(8,)16, \dots$ 

Use 8 as a common denominator.

$$3\frac{3}{8} - 1\frac{1}{2} = 3\frac{3}{8} - 1\frac{4}{8}$$
  
You cannot subtract  $\frac{4}{8}$  from  $\frac{3}{8}$ . You need to regroup.



#### Method 3: Use a Subtraction Statement and Improper Fractions

Determine a common denominator.



Check: 
$$\mathbf{M}^{\blacksquare}\mathbf{E}$$
  
 $3\frac{3}{8} - 1\frac{1}{2} \approx 3\frac{1}{2} - 1\frac{1}{2}$   
 $3\frac{1}{2} - 1\frac{1}{2} = 2$ 

 $1\frac{7}{8}$  is a little less than the estimate of 2. The answer is reasonable.

#### Show You Know

Subtract. Write each answer in lowest terms.

a) 
$$3\frac{3}{8} - 1\frac{1}{2}$$
 b)  $4\frac{1}{4} - 3\frac{2}{5}$  c)  $4\frac{1}{4} - \frac{7}{8}$ 

#### Did You Know?

Chinese fractions do not have a fraction bar. A symbol is used that represents the words "part of" or "parts of."  $\frac{1}{2}$  is written or spoken as "1 part of 2."

### Key Ideas

- When subtracting mixed numbers with like denominators, you can
  - subtract the whole numbers
  - subtract the fractions
- When subtracting mixed numbers with unlike denominators, you can determine a common denominator for the fractions
  - subtract the whole numbers
  - subtract the fractions
- Sometimes, mixed numbers need to be regrouped or changed to improper fractions before subtracting.

 Regroup
 Change to Improper Fractions

  $4\frac{3}{8} - 1\frac{5}{8} = 3\frac{11}{8} - 1\frac{5}{8}$   $4\frac{3}{8} - 1\frac{5}{8} = \frac{35}{8} - \frac{13}{8}$ 
 $= 2\frac{6}{8}$   $= \frac{22}{8}$ 
 $= 2\frac{3}{4}$   $= 2\frac{6}{8}$ 
 $= 2\frac{3}{4}$   $= 2\frac{3}{4}$ 

• To check your answer, compare to an estimate.

#### **Communicate the Ideas**

- 1. After Jack's party,  $2\frac{3}{4}$  bottles of pop were left. The next day, Jack's family drank  $2\frac{1}{4}$  bottles. How much pop is left now? Discuss with a partner how you would solve this problem.
- **2.** a) What do you need to do before you can calculate  $2\frac{1}{6} 1\frac{5}{12}$ ?
  - **b**) Determine the answer to  $2\frac{1}{6} 1\frac{5}{12}$ .
  - c) Use estimation to check your answer. What method did you use?
  - d) With a partner, compare how you calculated the answer to  $2\frac{1}{6} 1\frac{5}{12}$ . Then compare the method you used to check your answer.

#### Practise

# For help with #3 to #6, refer to Example 1 on pages 252–253.

**3.** For each set of fraction strips, write the subtraction statement.



**4.** Write a subtraction statement to represent each diagram.



**5.** Subtract. Write your answers in lowest terms. Check your answers using estimation.

a) $1\frac{2}{5} - 1\frac{1}{5}$	b) $6\frac{7}{8} - 5\frac{5}{8}$
c) $3\frac{1}{4} - 1\frac{1}{4}$	d) $3\frac{1}{12} - 1\frac{7}{12}$
<b>e)</b> $2\frac{1}{6} - \frac{5}{6}$	f) $4 - 1\frac{1}{7}$

**6.** Determine the difference. Write your answers in lowest terms.

a) 
$$4\frac{5}{9} - 3\frac{1}{9}$$
  
b)  $2\frac{1}{3} - 2\frac{1}{3}$   
c)  $5\frac{2}{5} - 1\frac{4}{5}$   
d)  $4\frac{3}{10} - 2\frac{9}{10}$   
e)  $5 - 4\frac{7}{12}$   
f)  $3\frac{5}{8} - 2\frac{7}{8}$ 

# For help with #7 to #10, refer to Example 2 on pages 254–255.

**7.** Write a subtraction statement for each set of fraction strips.



**8.** For each diagram, write a subtraction statement.



**9.** Subtract. Write your answers in lowest terms. Check your answers using estimation.

a) 
$$6\frac{7}{10} - 3\frac{2}{5}$$
  
b)  $4\frac{1}{2} - \frac{1}{5}$   
c)  $7\frac{7}{15} - 3\frac{1}{6}$   
d)  $5\frac{5}{9} - 2\frac{2}{3}$   
e)  $1\frac{4}{5} - 1\frac{2}{3}$   
f)  $2\frac{3}{14} - \frac{6}{7}$ 

**10.** Determine the difference. Write your answers in lowest terms.





- **11.** Karen goes to swimming practice for  $1\frac{1}{3}$  h each day. In the morning she has  $\frac{2}{3}$  h of practice. How many hours of practice does she have in the afternoon?
- 12. A large Thermos<sup>™</sup> has enough water to fill 9<sup>3</sup>/<sub>4</sub> water bottles for a team of soccer players. Halfway through practice, the players drink 4<sup>1</sup>/<sub>2</sub> bottles of water. How much water is left for the rest of the practice?



- **13.** It takes Ria  $3\frac{3}{4}$  h to complete the marathon. The race started  $1\frac{1}{2}$  h ago.
  - a) How much longer will Ria be running?
  - **b**) Check your answer using estimation.
- 14. A pie recipe calls for  $3\frac{1}{2}$  packages of Saskatoon berries. Julia has  $1\frac{1}{3}$  packages. How much more does she need? Include diagrams with your answer.

- **15.** Mark and Lin race to see who can collect the most hockey cards. Mark has collected  $5\frac{1}{3}$  sets. Lin has collected  $4\frac{3}{4}$  sets. Who has collected more sets? How much more?
- **16.** Alex has just completed  $2\frac{3}{4}$  h of a babysitting course. He must complete
  - $13\frac{1}{2}$  h to get his certificate.
  - a) How many more hours does he need?
  - **b**) Check your answer using estimation.
- **17.** For gym class Ben ran  $1\frac{5}{12}$  laps. Mei ran  $\frac{18}{12}$  laps. Who ran farther and by how much?
- **18.** You can subtract a mixed number and an improper fraction. Determine each difference.

a) 
$$3\frac{3}{4} - \frac{3}{2}$$
 b)  $2\frac{7}{10} - \frac{6}{5}$  c)  $5\frac{1}{3} - \frac{7}{4}$ 

**19.**  $1\frac{3}{4}$  trays of dinner rolls are for sale in the bakery window. A customer comes and buys  $\frac{5}{6}$  of a tray. How much is left? Include diagrams with your answer.

### Extend

- **20.** Daniel spends  $9\frac{1}{2}$  h sleeping. He spends
  - $6\frac{1}{4}$  h at school.
  - a) How much more time does he spend sleeping than at school?
  - **b)** How much time does he spend at school and sleeping altogether?
  - **c)** How much time is left in the day to do other things?

- **21.** Diana is allowed to use the computer for 3 h each weekend. She used it for  $\frac{1}{2}$  h on Saturday morning,  $1\frac{1}{4}$  h on Saturday night, and  $\frac{3}{4}$  h on Sunday morning.
  - a) For how much time can Diana use the computer on Sunday night?
  - **b)** Show how you would check your answer using estimation.
- 22. Bella uses 4.1 pieces of construction paper
  - to make an art project. Shelly uses  $3\frac{1}{4}$

pieces. For each of the following questions, calculate your answer using only fractions. Then calculate using only decimals. Compare the answers.

- a) How much more paper does Bella use?
- **b)** How much paper do Bella and Shelly use in total?
- 23. There are 12 golf balls in a package. The Takeda family has  $2\frac{2}{3}$  packages. Cindy takes  $\frac{1}{2}$  package, her dad takes 1 package, and her brother takes 4 golf balls.
  - a) What fraction of a package is left?
  - **b)** How many golf balls is this?



# MATH LINK

The Babylonian system of numbers was based on 60, not 10.

Babylonian fractions were expressed as numbers out of 60, e.g.,  $\frac{2}{60}$ ,  $\frac{3}{60}$ ,  $\frac{5}{60}$ ,  $\frac{12}{60}$ .

Many things we use today come from the Babylonian times. Our clock is based on the number 60.

The time can be written as a fraction out of 60 min. For example, 9:10 a.m. =  $9\frac{10}{60}$ 

For a) to e) write your answers as fractions.

- a) Write each time as a fraction out of 60. 8:10 p.m. 9:20 a.m. 7:48 a.m. 12:12 p.m.
- b) The time now is 2:15 p.m. What was the time 1 h and 12 min ago?
- c) The time now is 4:30 p.m. What will be the time 2 h and 36 min from now?
- d) Amanda studied for  $\frac{1}{3}$  of an hour. She started studying at 9:15 a.m. At what time did she finish studying?
- e) How much time passed between 1:07 p.m. and 3:42 p.m.? between 5:45 p.m. and 9:20 p.m.?
- f) Sam started reading the newspaper at 9:45 a.m. and finished reading it in  $\frac{7}{12}$  h. Mila took  $\frac{1}{4}$  h more to read the paper than Sam did. She started at 10:30 a.m. At what time did she finish reading the paper?

