Lesson 11

Finding Common Denominators

Problem Solving:

Graphs With Two Lines

Finding Common Denominators

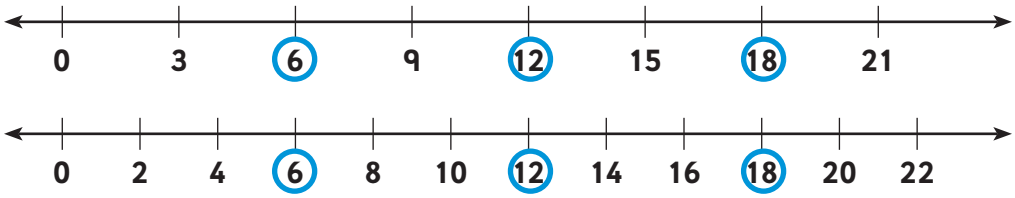
Vocabulary
common multiple

How do we find common denominators?

We have used fraction bars to find common denominators. A faster way is to find **common multiples** for each denominator. A common multiple is a number that is a multiple of two or more numbers. We can use several methods to find a common denominator.

Use a Number Line

A number line shows the common multiples for different numbers. The common multiples for 3 and 2 are circled.



We see that 6, 12, and 18 are common multiples of 3 and 2. We could find many more common multiples if we kept counting. We could use any one of them as common denominators.

Count by Multiples

Another way to find common denominators is to count by multiples for each number in our head.

3s	3	(6)	9	(12)	15	(18)	21		
2s	2	4	(6)	8	10	(12)	14	16	(18)

We see that 6, 12, and 18 are common multiples of 3 and 2.

Use Basic Facts

Multiplying both denominators by each other gives us a common multiple.

3 · 2 = 6

A common multiple of 3 and 2 is 6.

We must find a common multiple to make fractions that have the same denominators.

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

Steps for Making Common Denominators to Add Fractions

STEP 1

Find a common denominator.

We know that 12 is a common multiple of both 2 and 3. We need to multiply each fraction by a fraction equal to 1 to make both denominators 12.

We know that $3 \cdot 4 = 12$, and $2 \cdot 6 = 12$.

The fractions we use are $\frac{4}{4}$ and $\frac{6}{6}$.

$$\frac{1}{3} \cdot \frac{4}{4} = \frac{4}{12}$$

$$\frac{1}{2} \cdot \frac{6}{6} = \frac{6}{12}$$

STEP 2

Solve the problem.

$$\frac{4}{12} + \frac{6}{12} = \frac{10}{12}$$

We use the same steps when we subtract fractions with unlike denominators.

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

Steps for Making Common Denominators to Subtract Fractions

STEP 1

Find a common denominator.

We know that 12 is a common multiple of both 2 and 3. So we need to multiply each fraction by a fraction equal to 1 to make both denominators 12.

We know that $3 \cdot 4 = 12$, and $2 \cdot 6 = 12$.

The fractions we use are $\frac{4}{4}$ and $\frac{6}{6}$.

$$\frac{2}{3} \cdot \frac{4}{4} = \frac{8}{12}$$

$$\frac{1}{2} \cdot \frac{6}{6} = \frac{6}{12}$$

STEP 2

Solve the problem.

$$\frac{8}{12} - \frac{6}{12} = \frac{2}{12}$$

Let's see how this works with other fractions.

Example 1

Add $\frac{1}{4}$ and $\frac{2}{6}$.

We need to find the common denominator. We know if we count up by multiples, we can find a number that both 4 and 6 can go into.

The first number we come to that is a multiple of both 4 and 6 is 12.

We know that 4 goes into 12 three times, so we will multiply $\frac{1}{4}$ by $\frac{3}{3}$.

We also know that 6 goes into 12 two times, so we will multiply $\frac{2}{6}$ by $\frac{2}{2}$.

$\frac{1}{4} \cdot \frac{3}{3} = \frac{3}{12}$ $\quad$ $\frac{2}{6} \cdot \frac{2}{2} = \frac{4}{12}$

The answer is $\frac{3}{12} + \frac{4}{12} = \frac{7}{12}$.

Example 2

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

We need to find the common denominator. We know if we count up by multiples, we can find a number that both 7 and 3 go into. The first number we come to that is a multiple of both 7 and 3 is 21.

We know that 7 goes into 21 three times, so we will multiply $\frac{6}{7}$ by $\frac{3}{3}$.

We also know that 3 goes into 21 seven times, so we will multiply $\frac{2}{3}$ by $\frac{7}{7}$.

$\frac{6}{7} \cdot \frac{3}{3} = \frac{18}{21}$ $\quad$ $\frac{2}{3} \cdot \frac{7}{7} = \frac{14}{21}$

The answer is $\frac{18}{21} - \frac{14}{21} = \frac{4}{21}$.

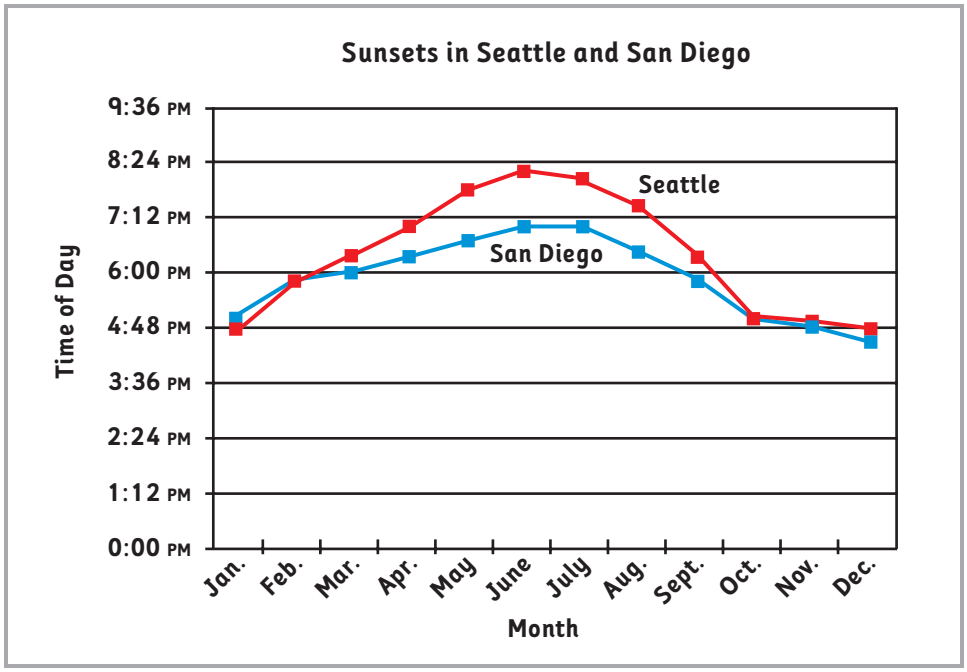
Apply Skills
Turn to ***Interactive Text***, page 30.

Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

Problem Solving: Graphs With Two Lines

When do we use a graph with two lines?

We compare sets of data by using a line graph with more than one line. Such line graphs show how two or more sets of data change over time. The graph below shows what time the sun sets in two different cities over a one-year period.



We see from the graph that in summer the sun sets later in Seattle than in San Diego. We also see that the sun sets a little bit later in San Diego than in Seattle during January.

Speaking of Math

Here's how we can explain our thinking when we choose to use a multiple-line graph.

- *"I can compare sets of data."*
- *"I can show how two or more sets of data change over time."*
- *"I can compare similar data sets over the same time period."*

Problem-Solving Activity
Turn to ***Interactive Text***, page 31.

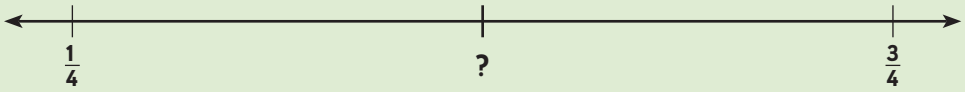
mBook Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

Homework

Activity 1

Select the fraction that goes in the location shown on the number line.

Model



Is this fraction $\frac{1}{3}$, $\frac{1}{2}$, or $\frac{2}{3}$?

1.

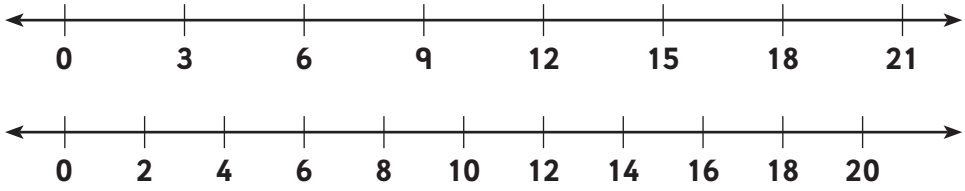
Is this fraction $\frac{2}{3}$, $\frac{2}{4}$, or $\frac{1}{4}$?

2.

Is this fraction $\frac{3}{4}$, $\frac{3}{2}$, or $\frac{1}{3}$?

Activity 2

Look at the number lines to help you solve the problems.



1. $\frac{1}{3} + \frac{2}{4}$ **2.** $\frac{2}{3} - \frac{1}{4}$ **3.** $\frac{3}{4} + \frac{1}{3}$ **4.** $\frac{3}{4} - \frac{2}{3}$ **5.** $\frac{2}{3} + \frac{3}{4}$ **6.** $\frac{1}{3} + \frac{1}{4}$

Activity 3

Tell which of the problems can be solved without finding a common denominator. Write the letter.

(a) $\frac{1}{3} + \frac{1}{4}$ **(b)** $\frac{1}{2} + \frac{1}{2}$ **(c)** $\frac{2}{3} + \frac{1}{3}$ **(d)** $\frac{3}{5} + \frac{2}{5}$

Activity 4 • Distributed Practice

Solve.

1.
$$\begin{array}{r} 500 \\ +\ 800 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 7{,}012 \\ -\ 2{,}995 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 68 \\ \times\ 79 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 708 \\ \times\ \ 2 \\ \hline \end{array}$$

5. $8\overline{)597}$