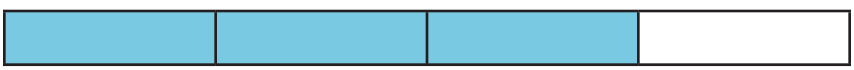
Lesson 9 | Adding and Subtracting Fractions

Problem Solving: Making a Line Graph

Adding and Subtracting Fractions

How do we add and subtract fractions with like denominators?

This fraction bar represents the fraction $\frac{3}{4}$.



$\frac{3}{4}$

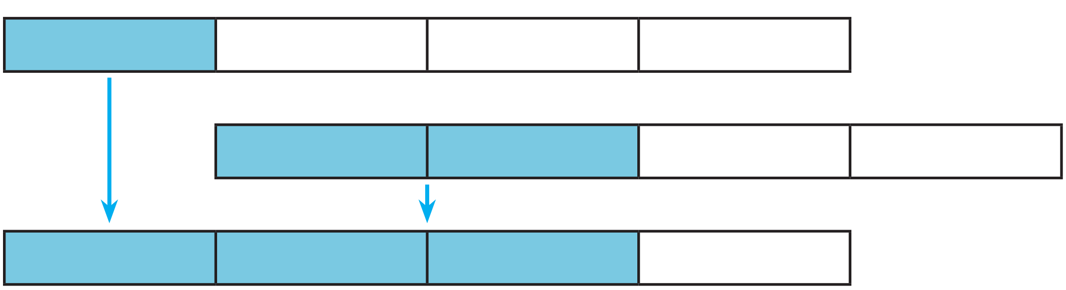
We identify the *denominator* by counting the total fractional parts. There are 4 total parts. We identify the *numerator* by counting the shaded parts. There are 3 shaded parts.

Adding Fractions With Like Denominators

We can use this idea of counting fractional parts to add fractions with the same denominator. After all, we are just counting out more of the same fractional part—thirds, fourths, fifths, tenths, and so on.

$$\frac{1}{4} + \frac{2}{4}$$

First, we look to see if both fractions have the same denominator. Both fractions are fourths, so we are counting the same fractional part—fourths.



$$\begin{array}{r} \frac{1}{4} \\ + \frac{2}{4} \\ \hline \frac{3}{4} \end{array}$$

$$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

Remember, we can add these fractions because the denominators are the same.

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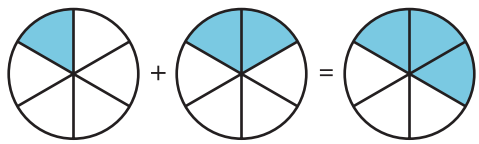
When the denominators are the same, we know the fair shares are the same. Let's look at some examples using different pictures.

Example 1

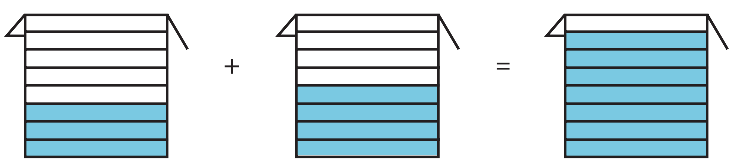
Add the following fractions.

$\frac{1}{6} + \frac{2}{6}$



The answer is $\frac{3}{6}$.

$\frac{3}{8} + \frac{4}{8}$



The answer is $\frac{7}{8}$.

POWER CONCEPT

When we add or subtract fractions, the denominators have to be the same.

Subtracting Fractions With Like Denominators

We also must have the same denominator when we subtract fractions. The fair shares have to be the same. The need for fair shares is easier to see with subtraction because we take away the fractional part.

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

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

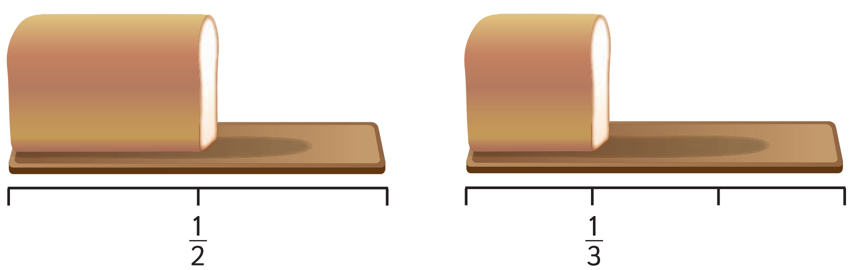
The answer is $\frac{3}{5}$.

How do we add and subtract fractions with unlike denominators?

Below is a fable about two peasants and a king. It helps us think about the problem of adding and subtracting fractions. It also shows us why the denominators have to be the same. If they are not the same, we have to find equivalent fractions.

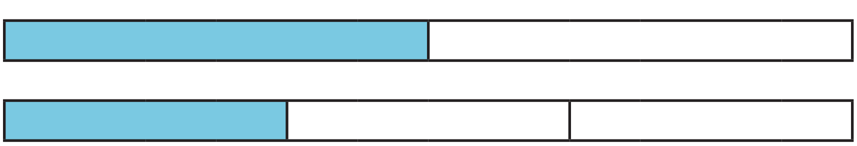
Hundreds of years ago, people didn't always use money to buy the things they needed. They would trade work for food or a place to live. One day a king was giving out bread to the peasants who had done some work for him. Two peasants came to get their bread. Peasant George got $\frac{1}{3}$ of a loaf of bread, and Peasant Dane got $\frac{1}{2}$ of a loaf of bread. George asked the king, "Why did I get less bread?" The king said, "If you tell me exactly how much less bread you were given, I will give you the same amount as your friend." This was a big problem for George, because he had to figure out exactly what the difference was between $\frac{1}{2}$ and $\frac{1}{3}$.

Exactly how much smaller is George's loaf than Dane's?



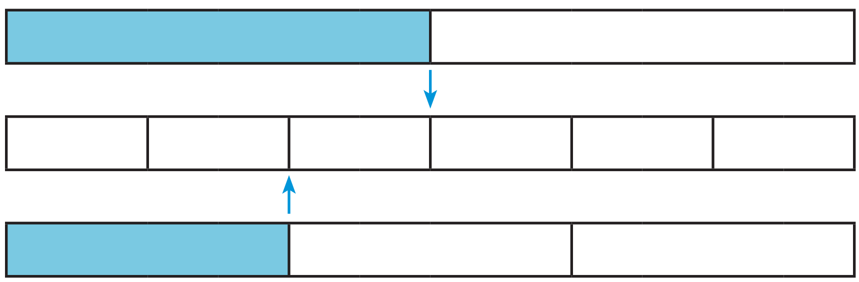
This illustration shows us the problem when we try to find the difference between $\frac{1}{2}$ and $\frac{1}{3}$ using fraction bars. We can see the difference, but we do not know exactly what it is. The difference is not a fair share of either of the fraction bars.

What is the difference between $\frac{1}{2}$ and $\frac{1}{3}$?



To solve this problem, we need to change the denominators for both fractions.

We need to change $\frac{1}{2}$ and $\frac{1}{3}$ so that they have the same denominator. We can do this using fraction bars. We use the fraction bar for sixths because 6 is the least common multiple for both 2 and 3. We can make equivalent fractions that meet at $\frac{1}{2}$ and $\frac{1}{3}$.



The fraction bar for sixths lines up with the fraction bars for halves and thirds. We can find an equivalent fraction for both $\frac{1}{2}$ and $\frac{1}{3}$ on the fraction bar for sixths.

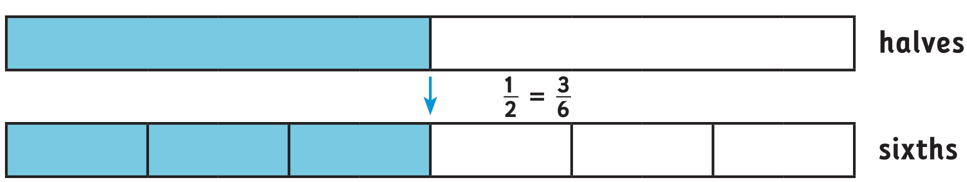
Example 1 shows that we can change $\frac{1}{2}$ into $\frac{3}{6}$ and $\frac{1}{3}$ into $\frac{2}{6}$.

Example 1

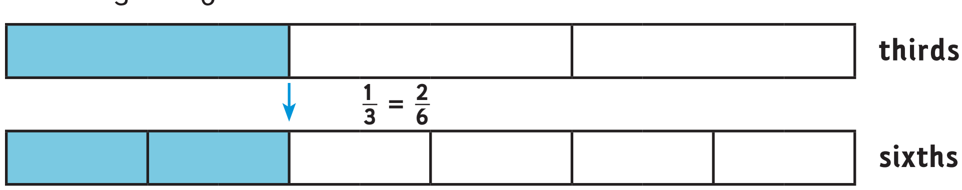
Find an equivalent fraction for both $\frac{1}{2}$ and $\frac{1}{3}$.

Using another fraction bar is one way to find denominators that are the same.

Change $\frac{1}{2}$ into $\frac{3}{6}$ using fraction bars.



Change $\frac{1}{3}$ into $\frac{2}{6}$ using fraction bars.



Now we can rewrite the problem: $\frac{3}{6} - \frac{2}{6} = \frac{1}{6}$. George received $\frac{1}{6}$ less bread than Dane.

Apply Skills
Turn to ***Interactive Text***, page 25.

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

Lesson 9

Problem Solving: Making a Line Graph

How do we make a line graph?

We have looked at what a line graph is. Now we will look at how to use a line graph. A line graph is a good graph to use to record the data from the following story.

A science class wants to measure the height of the bounce a ball makes when it is dropped from 20 feet. Each time a ball bounces, the height of the bounce gets smaller until the ball stops bouncing. The students drop a golf ball onto a concrete floor and keep track of how high the ball bounces for 10 bounces.

Now that we have a table of data, we can take this information and make a line graph. Remember that a line graph compares two sets of data.

Bounce	Height (in feet)
1	16
2	12
3	10
4	7
5	6
6	5
7	4
8	3
9	2
10	1

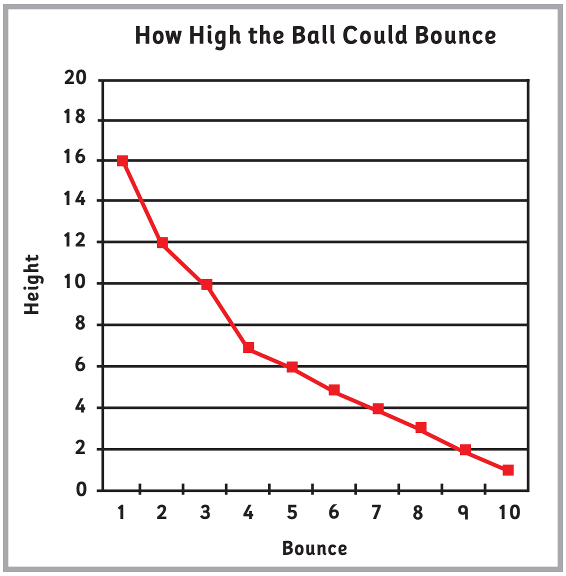
Steps for Making a Line Graph

STEP 1
Draw the axes. Label the horizontal axis (the line at the bottom) "Bounce." Mark off the points on this axis from 0 to 10 because there are 10 bounces to record.

STEP 2
Label the vertical axis (the line on the left) "Height." Mark off the points on this axis from 0 to 20 because the height of the biggest bounce was close to 20.

STEP 3
We also need to write a title for the graph: "How High the Ball Could Bounce."

STEP 4
Now we record the data. Start with the first bounce. Locate the height, and plot a point. Continue with the second point, and so on.



Problem-Solving Activity
Turn to *Interactive Text*, page 26.

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

Homework

Activity 1

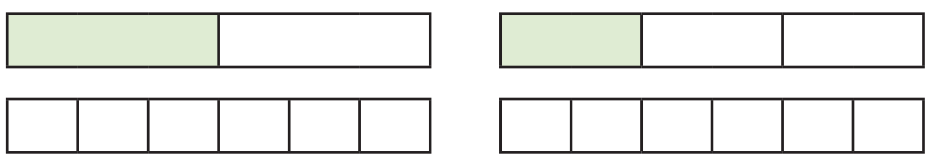
Solve the problems involving fractions with like denominators.

1. $\frac{1}{3} + \frac{1}{3}$
2. $\frac{3}{5} + \frac{1}{5}$
3. $\frac{4}{5} - \frac{2}{5}$
4. $\frac{2}{3} - \frac{1}{3}$
5. $\frac{3}{9} + \frac{2}{9}$
6. $\frac{7}{8} - \frac{6}{8}$

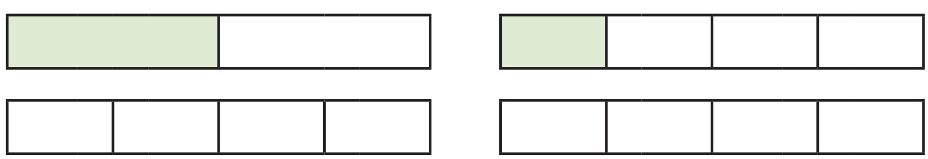
Activity 2

Use the fraction bars to help you solve the problems with unlike denominators.

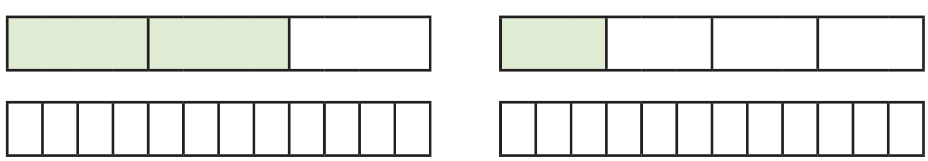
1. $\frac{1}{2} + \frac{1}{3}$



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



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



Activity 3 • Distributed Practice

Solve.

1. $\begin{array}{r} 1{,}200 \\ -\ \ 800 \\ \hline \end{array}$
2. $\begin{array}{r} 6{,}701 \\ +\ 2{,}199 \\ \hline \end{array}$
3. $\begin{array}{r} 895 \\ \times\ \ 9 \\ \hline \end{array}$
4. $\begin{array}{r} 37 \\ \times\ 46 \\ \hline \end{array}$
5. $9\overline{)841}$