CHAPTER 6

Fraction Operations

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### Add and Subtract Fractions

To add fractions with the same denominators, add the numerators.

\[
\frac{2}{5} + \frac{2}{5} = \frac{4}{5}
\]

To subtract fractions with different denominators, use a common denominator.

\[
\frac{1}{2} - \frac{1}{6} = \frac{1}{2} - \frac{1}{6} = \frac{3}{6} - \frac{1}{6} = \frac{2}{6} = \frac{1}{3}
\]

Write the answer in lowest terms.

### 1. Add or subtract. Write your answers in lowest terms.

a) \[\frac{1}{6} + \frac{1}{6} = \frac{2}{6} \]

\[
\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}
\]

b) \[\frac{4}{5} - \frac{3}{10} = \frac{5}{10}
\]

\[
\frac{4}{5} - \frac{3}{10} = \frac{8}{10} - \frac{3}{10} = \frac{5}{10} = \frac{1}{2}
\]
Name: _____________________________ Date: ______________

Add and Subtract Mixed Numbers

mixed number
• includes a whole number and a proper fraction \( \left( \text{e.g., } 1\frac{1}{2}, 2\frac{3}{5} \right) \)

improper fraction
• a fraction in which the numerator is greater than the denominator \( \left( \text{e.g., } \frac{10}{8} \right) \)

To subtract or add mixed numbers:

Use Regrouping:

\[
4\frac{1}{2} + 2\frac{1}{4} = 4\frac{2}{4} + 2\frac{1}{4} = (4 + 2) + \left(\frac{2}{4} + \frac{1}{4}\right) = 6\frac{3}{4}
\]

Use Improper Fractions:

\[
\frac{18}{4} - \frac{11}{4} = \frac{7}{4} = 1\frac{3}{4}
\]

2. Add or subtract. Write your answers in lowest terms.

a) Use regrouping.

\[
3\frac{1}{2} - 1\frac{2}{5} = 3\frac{5}{10} - 1\frac{4}{10} = (3 - 1) + \left(\frac{5}{10} - \frac{4}{10}\right) = 2\frac{1}{10}
\]

b) Use improper fractions.

\[
1\frac{1}{2} + 2\frac{1}{3} = 1\frac{3}{6} + 2\frac{2}{6} = \frac{9}{6} + \frac{14}{6} = \frac{23}{6} = 3\frac{5}{6}
\]
Canada’s Ecozones

Canada has many ecozones of different sizes. The boundaries between ecozones depend on geography, climate, animals, plants, and human activities.

a) The Pacific marine ecozone covers $\frac{1}{10}$ of Canada’s coastline. The Northwest Atlantic ecozone covers $\frac{1}{5}$ of Canada’s coastline. Use a common denominator to find the sum of the 2 ecozones.

Common denominator for $\frac{1}{10}$ and $\frac{1}{5}$:

$$\frac{1}{10} + \frac{1}{5} = \frac{1}{10} + \frac{1 \times 2}{5 \times 2}$$

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

b) About $\frac{1}{2}$ of the Prairies ecozone area is in Saskatchewan, and about $\frac{1}{3}$ of the area is in Alberta. What fraction of the area is in Manitoba?

Add the areas in Alberta and Saskatchewan. Show your work.

Use your answer above to find the area that covers Manitoba.

Let 1 represent the whole part of the ecozone.

Think $1 = \frac{6}{6}$.
6.1 Warm Up

1. Write each fraction.
   a) [Image of fraction strips]
      [Image of fraction strips]
      improper fraction: [Image of fraction strips]
      mixed number: [Image of fraction strips]
   b) [Image of fraction strips]
      [Image of fraction strips]

2. Draw fraction strips to solve.
   a) \( \frac{1}{3} + \frac{1}{3} \)
   b) \( \frac{1}{8} + \frac{1}{2} \)

3. Solve. Write your answers in lowest terms.
   a) \( \frac{1}{12} + \frac{2}{3} \)
   b) \( \frac{3}{5} - \frac{1}{2} \)

   a) \( 2 \times 4 = \) _____________
   b) \( 4 \times 5 = \) _____________
   c) \( 3 \times 2 = \) _____________
   d) \( 5 \times 3 = \) _____________
   e) \( 3 \times 3 = \) _____________
   f) \( 6 \times 5 = \) _____________
6.1 Multiplying a Fraction and a Whole Number

Working Example 1: Multiply Using a Model

**proper fraction**
- a fraction in which the denominator is greater than the numerator (e.g., \( \frac{5}{8} \))

Find \( 3 \times \frac{5}{6} \) using fraction strips. Write the product in lowest terms.

**Solution**

\[
3 \times \frac{5}{6} = \frac{5}{6} + \frac{5}{6} + \frac{5}{6}
\]

Count the shaded parts of the strips:

\[
\frac{5}{6} + \frac{5}{6} + \frac{5}{6} = \frac{15}{6}
\]

Write the answer in lowest terms.

\[
\frac{15}{6} = \frac{2 \times 5}{2 \times 3} = \frac{5}{2}
\]

So, \( 3 \times \frac{5}{6} = \frac{5}{2} \).

---

**Show You Know**

Draw fraction strips to find the product. Write the answer in lowest terms.

\[
2 \times \frac{5}{6}
\]

\[
\frac{10}{6} = \frac{2 \times 5}{2 \times 3} = \frac{5}{3}
\]

\[
\div 3
\]

\[
\frac{5}{3} = \frac{1 \times 5}{1 \times 3} = \frac{5}{3}
\]
Working Example 2: Multiply Using a Diagram

Find $3 \times \frac{2}{5}$. Write the product in lowest terms.

Solution

$$3 \times \frac{2}{5} = \frac{2}{5} + \frac{2}{5} + \frac{2}{5}$$

Model the fractions using a number line.
The denominator is 5.
So, you need 5 equal parts between each whole number.

$$\frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{6}{5}$$

So, $3 \times \frac{2}{5} = \frac{6}{5}$.

Show You Know

Draw a diagram to find each product.

a) $2 \times \frac{2}{3}$

b) $3 \times \frac{3}{4}$
Working Example 3: Apply Multiplication With Fractions

A spider has 8 legs.
An ant has $\frac{3}{4}$ as many legs as a spider.
How many legs does an ant have?

Solution

An ant has $\frac{3}{4}$ of the number of legs of a spider.

Use repeated addition on the number line to show $8 \times \frac{3}{4}$.

The answer is ____________.

So, $8 \times \frac{3}{4} =$ ____________.

An ant has ____________ legs.

Show You Know

Jenelle is making a recipe that needs 6 cups of flour.
She wants to make $\frac{2}{3}$ of the recipe.
How many cups will she need to use?

Write a multiplication statement: $6 \times \frac{2}{3}$

Model the multiplication on the number line.

Jenelle needs ____________ cups of flour.
Communicate the Ideas

1. The diagram models $3 \times \frac{6}{5}$.

   \[
   \begin{array}{c}
   \frac{6}{5} \quad + \quad \frac{6}{5} \quad + \quad \frac{6}{5} \\
   \hline
   \frac{18}{5}
   \end{array}
   \]

   a) The diagram represents

   \[
   \begin{array}{c}
   \frac{6}{5} \quad + \quad \frac{6}{5} \quad + \quad \frac{6}{5} \\
   \hline
   \frac{18}{5}
   \end{array}
   \]

   b) Use the number line to model the same equation.

   c) Circle the model you like to use. FRACTION STRIPS or NUMBER LINE.
   Give 1 reason for your answer.

Check Your Understanding

Practise

2. Write the multiplication statement that each diagram shows.

   a) \[
   \begin{array}{c}
   1 \quad 1 \quad 1 \quad 1 \quad 1 \\
   \hline
   5 \quad 5 \quad 5 \quad 5 \quad 5
   \end{array}
   \]
   \[
   \begin{array}{c}
   + \quad 1 \quad 1 \quad 1 \quad 1 \\
   \hline
   5 \quad 5 \quad 5 \quad 5 \quad 5
   \end{array}
   \]
   \[
   + \quad 1 \quad 1 \quad 1 \quad 1 \\
   \hline
   5 \quad 5 \quad 5 \quad 5 \quad 5
   \end{array}
   \]
   \[
   \frac{18}{5}
   \]

   b) \[
   \begin{array}{c}
   \frac{6}{5} \quad + \quad \frac{6}{5} \quad + \quad \frac{6}{5} \\
   \hline
   \frac{18}{5}
   \end{array}
   \]

   \[
   \begin{array}{c}
   \frac{18}{5}
   \end{array}
   \]
3. Write the multiplication statement that each number line shows.

a) 

b) 

4. Write the multiplication statement that each model shows.

a) 

b) 

5. Draw a diagram to find each product.

a) \(4 \times \frac{1}{2}\)

b) \(3 \times \frac{7}{10}\)

6. The width of a Canadian flag is \(\frac{1}{2}\) of its length. The length of the flag is 4 m long.

What is the width of the flag?

\[4 \times \frac{1}{2} = \]

Sentence: ___________________________
7. A minibus has room for 12 people. The bus is \( \frac{3}{4} \) full. How many people are on the minibus?

\[
\underline{11.25} \times \frac{3}{4} = \underline{8.4375}
\]

Sentence: ________________________________________________

8. a) Write a word problem for \( \frac{1}{4} \times 8 \).

b) Show how to solve your problem.

_________________________________

_________________________________

_________________________________

_________________________________

_________________________________

_________________________________

_______________________________

MATH LINK

One quarter of Canada’s 20 ecozones are marine ecozones. They include parts of the oceans. The rest of Canada’s ecozones are terrestrial ecozones (land, rivers, lakes, and wetlands).

a) How many marine ecozones does Canada have?

One quarter = \[ \frac{1}{4} \] Number of ecozones = 20

\[
20 \times \frac{1}{4} = \frac{20}{4} = 5
\]

Canada has \( \underline{5} \) marine ecozones.

b) How many terrestrial ecozones does Canada have?

Number of ecozones = 20 Marine ecozones = \( \underline{5} \)

\[
20 - \text{marine ecozones} = \text{terrestrial ecozones}
\]

\[ 20 - 5 = 15 \]

Canada has \( \underline{15} \) terrestrial ecozones.
6.2 Warm Up

1. Write the multiplication statement for each diagram.
   a) \[ \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \times \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} = \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \]
   b) \[ \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} + \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} + \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} + \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} = \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \times \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} = \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \]
   c) \[ \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} + \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} = \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \times \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} = \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \]
   d) \[ \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \times \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} = \begin{array}{c}
   \hline
   \hline
   \hline
   \hline
   \end{array} \]

2. Draw a diagram to solve.
   a) \[ 4 \times \frac{3}{8} \]
   b) \[ 7 \times \frac{1}{2} \]

3. Divide.
   a) \[ 15 \div 5 = \] 
   b) \[ 30 \div 6 = \]
   c) \[ 40 \div 2 = \]
   d) \[ 6 \div 3 = \]
   e) \[ 12 \div 4 = \]
   f) \[ 21 \div 7 = \]
6.2 Dividing a Fraction by a Whole Number

Working Example 1: Divide Using a Model

Find $\frac{1}{4} \div 3$.

**Solution**

Use a fraction strip to show $\frac{1}{4}$:

![Fraction strip showing \( \frac{1}{4} \)]

The fraction strip shows that $\frac{1}{4}$ is equal to $\frac{3}{12}$.

Each of the 3 equal parts of $\frac{1}{4}$ is $\frac{1}{12}$:

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

**Show You Know**

Use fraction strips to find the answer.

$\frac{3}{4} \div 3$

Shade the fraction strip to show $\frac{3}{4}$:

![Fraction strip showing \( \frac{3}{4} \)]

Divide each $\frac{1}{4}$ into 3 equal parts.

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

Each of the 3 equal parts of $\frac{3}{4}$ is $\frac{1}{12}$ or $\frac{1}{4}$.

$\frac{3}{4} \div 3 = \frac{1}{12}$ or $\frac{1}{4}$. 
**Working Example 2: Divide Using Diagrams**

Find $\frac{2}{3} \div 4$. Write your answer in lowest terms.

**Solution**

Draw and label a number line that shows thirds.

To model division by 4, divide each third into ____________ equal parts.

There are 12 parts in the whole, so each part is $\frac{1}{12}$.

Use brackets to divide $\frac{2}{3}$ into 4 equal parts.

Each of the 4 parts is $\frac{1}{12}$ or $\frac{1}{6}$.

So, $\frac{2}{3} \div 4 = \frac{6}{12}$.

---

**Show You Know**

Use a number line to find each quotient. Write your answers in lowest terms.

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

- Label the number line to show $\frac{1}{2}$.
- Divide each half into 5 equal parts to show division by 5.

There are ____________ parts in the whole, so each part is ____________.

- Use brackets to divide $\frac{1}{2}$ into 5 equal parts. Each of the 5 parts is ____________.

So, $\frac{1}{2} \div 5 = \frac{6}{12}$. 

---

Name: ________________________________  Date: ______________
Working Example 3: Apply Division With Fractions

Mustafa used $\frac{3}{4}$ of a jar of sauce on 6 servings of pasta.
He used the same amount of sauce on each serving.
What fraction of the jar of sauce did he use on each serving?

Solution

Find $\frac{3}{4} \div 6$.
Label the number line to show quarters.
To show division by 6, divide each quarter into 6 parts.
There are 24 parts in the whole, so each part is $\frac{24}{24}$.
Use brackets to divide $\frac{3}{4}$ into 6 equal parts.
Each of the 6 parts is $\frac{24}{24}$.
So, $\frac{3}{4} \div 6 = \frac{24}{24}$.

Write in lowest terms.

Mustafa used $\frac{8}{8}$ of a jar of sauce on each serving.
Show You Know

Four students equally shared \( \frac{1}{2} \) of a cake. What fraction of the cake did each student eat?

Find \( \frac{1}{2} \div \)_________.

- Label the number line to show halves.
- Divide each half into ___________ equal parts to show the division.
- There are ___________ parts in the whole. Each part is ___________.
- Use brackets to divide \( \frac{1}{2} \) into ___________ equal parts.

So, \( \frac{1}{2} \div \)_________ = ___________.

Communicate the Ideas

1. a) Model \( \frac{1}{2} \div 2 \) using fraction strips or a number line.

\[ \frac{1}{2} \div 2 = \]

b) What did you use to solve the question? Circle FRACTION STRIPS or NUMBER LINE. Give 1 reason your choice.
2. Find the quotient using fraction strips.

   a) \( \frac{1}{4} \div 2 \)

   - Divide the strip into quarters.
   - Shade \( \frac{1}{4} \).
   - Divide each quarter into 2 equal parts.

   There are ________ parts in the whole.

   Each part is \( \frac{8}{8} \). So, \( \frac{1}{4} \div 2 = \frac{8}{8} \)

   b) \( \frac{1}{3} \div 3 \)

   - Label the number line to show fifths.
   - Divide each fifth into 2 equal parts.

   There are ________ parts in the whole, so each part is \( \frac{1}{8} \).

   - Use brackets to divide \( \frac{3}{5} \) into 2 equal parts.

   Each part is ________.

   So, \( \frac{3}{5} \div 2 = \frac{1}{8} \).

3. Find each quotient using a number line.

   a) \( \frac{3}{5} \div 2 \)

   - Label the number line to show fifths.
   - Divide each fifth into 2 equal parts.

   Each part is ________.

   So, \( \frac{3}{5} \div 2 = \frac{1}{8} \).

   b) \( \frac{1}{2} \div 4 \)

   So, \( \frac{1}{2} \div 4 = \frac{1}{8} \).
Apply

4. Two different fish curries, dhopa and molee curry, are made with coconut.
   
   a) You need \( \frac{1}{2} \) of a coconut to make 2 servings of dhopa. What fraction of a coconut is in each serving?
      
      \( \frac{1}{2} \div 2 = ? \)
      
      Draw a fraction strip to solve.
      
      \[ \frac{1}{2} \div 2 = \]

   b) You need \( \frac{1}{2} \) coconut to make 4 servings of molee. What fraction of a coconut is in each serving?
      
      \( \frac{1}{2} \div \underline{} = ? \)
      
      Draw a number line to solve.
      
      \[ \frac{1}{2} \div \underline{} = \]

5. A container of orange juice is \( \frac{2}{3} \) full. Four students share the juice equally. What fraction of the full container does each student get?

   \[ \underline{} \div \underline{} = \underline{} \]

   Sentence: ______________________________________

Math Link

The Montane Cordillera and Boreal Cordillera ecozones have almost equal areas.

Together, the 2 ecozones equal about \( \frac{1}{10} \) of the area of Canada.

What fraction of the area of Canada does each of these ecozones cover?

\[ \frac{1}{10} \div 2 = \]

Sentence: ______________________________________
6.3 Warm Up

1. Draw diagrams to solve.

   a) \( \frac{1}{6} \div 3 \)
   b) \( \frac{3}{4} \div 2 \)
   c) \( 5 \times \frac{2}{5} \)
   d) \( 6 \times \frac{1}{3} \)

2. Decide whether each fraction is closer to 0, \( \frac{1}{2} \), or 1. Use the number line to help you.

   a) \( \frac{3}{5} \)
   b) \( \frac{2}{3} \)
   c) \( \frac{7}{8} \)
   d) \( \frac{1}{6} \)

   \( \frac{3}{5} \) is closer to \( \underline{_________} \).
   \( \frac{2}{3} \) is closer to \( \underline{_________} \).
   \( \frac{7}{8} \) is closer to \( \underline{_________} \).
   \( \frac{1}{6} \) is closer to \( \underline{_________} \).

3. Multiply.

   a) \( 4 \times 2 = \underline{_________} \)
   b) \( 5 \times 3 = \underline{_________} \)
   c) \( 12 \times 2 = \underline{_________} \)
   d) \( 7 \times 6 = \underline{_________} \)
6.3 Multiplying Proper Fractions

Working Example 1: Multiply Using Paper Folding

Find \( \frac{1}{2} \times \frac{3}{5} \).

**Solution**

Fold a rectangular piece of paper into fifths along its length.

Open the paper and shade \( \frac{3}{5} \) of it.

Fold the paper in half across its width.

Open the paper and draw slanted lines on half of it.

Count the rectangles. There are ____________ equal rectangles.

How many are shaded and have slanted lines? ____________

\[
\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}
\]

**Show You Know**

Find each product using paper folding.

a) \( \frac{1}{4} \times \frac{1}{2} \)

- Fold paper into quarters along its length.
- Shade \( \frac{1}{4} \).
- Fold paper in half across its width.
  - Draw a line to show the fold.
  - Draw slanted lines on half of it.

There are ____________ equal rectangles.

- How many are shaded and have slanted lines? ____________

\[
\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}
\]

b) \( \frac{2}{3} \times \frac{2}{3} \)

- Fold paper into quarters along its length.
- Shade \( \frac{2}{3} \).
- Fold paper in half across its width.
  - Draw a line to show the fold.
  - Draw slanted lines on half of it.

There are ____________ equal rectangles.

- How many are shaded and have slanted lines? ____________

\[
\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}
\]
Working Example 2: Multiply Using Diagrams

Find \( \frac{2}{3} \times \frac{1}{2} \). Write the product in lowest terms.

**Solution**

Draw a rectangle.
Draw lines to divide its length into thirds.
Draw a line to divide the width of the rectangle in half.

\[
\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} \text{ of the rectangle is grey and has slanted lines.}
\]

So, \( \frac{2}{3} \times \frac{1}{2} = \frac{1}{3} \).

**Show You Know**

Find each product using diagrams. Write your answers in lowest terms.

<table>
<thead>
<tr>
<th>a) Find ( \frac{1}{2} \times \frac{1}{2} ).</th>
<th>b) Find ( \frac{1}{3} \times \frac{3}{4} ).</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Divide the length in half.</td>
<td>☐ Write in lowest terms.</td>
</tr>
<tr>
<td>☐ Shade ( \frac{1}{2} ).</td>
<td></td>
</tr>
<tr>
<td>☐ Divide the width in half.</td>
<td></td>
</tr>
<tr>
<td>☐ Draw slanted lines on the top half.</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{1}{2} \times \frac{1}{2} = \frac{\text{number of shaded parts with lines}}{\text{total number of parts}}
\]

\[
= \frac{1}{2}
\]
Working Example 3: Multiply Using a Rule

Estimate and calculate $\frac{8}{15} \times \frac{5}{6}$.

**Solution**

**Estimate:**

Is $\frac{8}{15}$ closer to 0, $\frac{1}{2}$, or 1?

$\frac{8}{15} \approx \frac{1}{2}$

Is $\frac{5}{6}$ closer to 0, $\frac{1}{2}$, or 1?

$\frac{5}{6} \approx 1$

**Calculate:**

$\frac{8}{15} \times \frac{5}{6}$

$= \frac{8 \times 5}{15 \times 6}$

$= \frac{90}{90}$

Write in lowest terms.

$= 2$

Plot on a number line.

The answer is reasonable because it is close to the estimate of $\frac{2}{1}$.

An estimate is *reasonable* if it is close to the actual answer.
Estimate and calculate. Write your answers in lowest terms.

\[
\frac{3}{5} \times \frac{2}{9}
\]

**Estimate:**

Is \(\frac{3}{5}\) closer to 0, \(\frac{1}{2}\), or 1?

\[
\frac{3}{5} \approx \boxed{\quad \quad \quad \quad}
\]

Is \(\frac{2}{9}\) closer to 0, \(\frac{1}{2}\), or 1?

\[
\frac{2}{9} \approx \boxed{\quad \quad \quad \quad}
\]

\[
\frac{3}{5} \times \frac{2}{9} \approx \boxed{\quad \quad \quad \quad} \times \boxed{\quad \quad \quad \quad}
\]

\[
\approx \boxed{\quad \quad \quad \quad}
\]

**Calculate:**

\[
\frac{3}{5} \times \frac{2}{9}
\]

\[
= \boxed{\quad \quad \quad \quad} \times \boxed{\quad \quad \quad \quad}
\]

\[
= \boxed{\quad \quad \quad \quad}
\]

Write in lowest terms.

\[
= \boxed{\quad \quad \quad \quad}
\]

**Communicate the Ideas**

1. Brendan calculated \(\frac{3}{5} \times \frac{2}{5} = \frac{6}{5}\). Brendan made a mistake.

   a) What mistake did he make?

   _______________________________________________________

   b) Find the correct answer.

   _______________________________________________________
Check Your Understanding

Practise

2. Find the products by drawing diagrams.

a) \( \frac{5}{6} \times \frac{1}{2} \)

\[ \begin{array}{c}
\text{Divide the length in sixths.} \\
\text{Shade } \frac{5}{6} . \\
\text{Divide the width in half.} \\
\text{Draw slanted lines on the top half.} \\
\end{array} \]

\[ \frac{5}{6} \times \frac{1}{2} = \frac{\text{number of shaded parts with lines}}{\text{total number of parts}} \]

b) \( \frac{3}{4} \times \frac{5}{6} \)

\[ \begin{array}{c}
\text{Divide the length in sixths.} \\
\text{Shade } \frac{5}{6} . \\
\text{Divide the width in half.} \\
\text{Draw slanted lines on the top half.} \\
\end{array} \]

3. Estimate and calculate \( \frac{3}{8} \times \frac{2}{3} \). Write your answers in lowest terms.

Estimate:

\[ \frac{3}{8} \approx \frac{2}{3} \]

Calculate:

\[ \frac{3}{8} \times \frac{2}{3} = \frac{6}{24} = \frac{1}{4} \]

Write in lowest terms.
4. Calculate. Write your answers in lowest terms.

   a) \(\frac{3}{4} \times \frac{3}{4}\)
   
   b) \(\frac{5}{6} \times \frac{3}{8}\)

5. Tamar had \(\frac{1}{2}\) of an apple pie in her fridge. She ate \(\frac{1}{4}\) of it.

   What fraction of the whole pie did she eat?

   \[
   \frac{1}{2} \times \frac{1}{4} \quad \text{Sentence: } \quad \frac{1}{8}
   \]

6. About \(\frac{1}{20}\) of the people in the world live in Canada or the United States.

   Of the people who live in Canada or the United States, about \(\frac{1}{10}\) live in Canada.

   What fraction of people in the world live in Canada? Show your work.

   \[
   \frac{1}{20} \times \frac{1}{10} \quad \text{Sentence: } \quad \frac{1}{200}
   \]
7. Marius spends $\frac{1}{3}$ of his time sleeping.

While he is asleep, he dreams for $\frac{1}{4}$ of the time.

a) What fraction of the time is Marius dreaming?

b) How many hours a day is Marius dreaming? Show your work.

Fraction from part a) $\times$ number of hours

MATH LINK

British Columbia is about $\frac{1}{10}$ of the area of Canada.

The Pacific Maritime ecozone covers about $\frac{1}{5}$ of British Columbia.

What fraction of the area of Canada does the Pacific Maritime ecozone cover? Show your work.

Sentence:
6.4 Warm Up

1. Change the improper fraction to a mixed fraction.

   a) \( \frac{5}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{2}{2} + \frac{1}{2} = 2 \frac{1}{2} \)

   b) \( \frac{4}{3} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1 \frac{1}{3} \)

   c) \( \frac{5}{3} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1 \frac{2}{3} \)

   d) \( \frac{6}{4} = \frac{3}{4} + \frac{3}{4} = 1 \frac{1}{2} \)

2. Change the mixed number to an improper fraction.

   a) \( 2 \frac{2}{3} = \frac{3}{3} + \frac{3}{3} + \frac{2}{3} = \frac{8}{3} \)

   b) \( 1 \frac{1}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{4}{2} = 2 \)

   c) \( 1 \frac{3}{4} = \frac{4}{4} + \frac{3}{4} = \frac{7}{4} \)

   d) \( 3 \frac{1}{4} = \frac{3}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{5}{4} \)
6.4 Multiplying Improper Fractions and Mixed Numbers

Working Example 1: Multiply Mixed Numbers Using a Model

Find \( \frac{1}{2} \times 1\frac{3}{4} \).

Solution

Draw a rectangle. Draw lines to separate each mixed fraction into a whole number and a proper fraction. Show the area of each part in the diagram.

Calculate the area of each part.

\[
2 \times 1 = \underline{\phantom{000}}
\]

\[
2 \times \frac{3}{4} = \underline{\phantom{000}}
\]

\[
\frac{1}{2} \times 1 = \underline{\phantom{000}}
\]

\[
\frac{1}{2} \times \frac{3}{4} = \underline{\phantom{000}}
\]

Add the areas together: \( 2 + \frac{1}{2} + \frac{1}{2} + \frac{3}{8} \)

\[
= (2 + 1) + \left( \frac{1}{2} + \frac{1}{2} + \frac{3}{8} \right)
\]

\[
= \underline{\phantom{000}} + \frac{4}{8} + \frac{4}{8} + \frac{3}{8}
\]

\[
= 3 + \underline{\phantom{000}}
\]

\[
= 3 + 1\frac{3}{8}
\]

\[
= 4\frac{3}{8}
\]

So, \( \frac{1}{2} \times 1\frac{3}{4} = 4\frac{3}{8} \).
Find each product using a model.

a) \( \frac{11}{2} \times \frac{1}{3} \)

- Label the outer edges of the diagram.
- Label the inside of the diagram.
- Calculate the area of each part.

\[ 1 \times 1 = \]

\[ 1 \times \frac{1}{2} = \]

\[ 1 \times \frac{1}{3} = \]

\[ \frac{1}{2} \times \frac{1}{3} = \]

- Add all the areas together.

b) \( 2 \frac{1}{4} \times 1 \frac{1}{4} \)

- Label the outer edges of the diagram.
- Label the inside of the diagram.
- Calculate the area of each part.

\[ 2 \times 1 = \]

\[ 2 \times \frac{1}{4} = \]

\[ 1 \times \frac{1}{4} = \]

\[ \frac{1}{4} \times \frac{1}{4} = \]

- Add all the areas together.
Working Example 2: Multiply Mixed Numbers Using a Rule

Estimate and calculate $\frac{4\frac{1}{2}}{2} \times 2\frac{1}{3}$. Write the product in lowest terms.

**Solution**

**Estimate:**

Round each mixed number to the closest whole number.

$4\frac{1}{2} \approx 5$

$2\frac{1}{3} \approx \underline{2}$

$5 \times 2 = \underline{10}$

So, $4\frac{1}{2} \times 2\frac{1}{3} \approx \underline{10}$.

**Calculate:**

Write the mixed numbers as improper fractions.

$4\frac{1}{2} = \frac{2}{2} + \frac{2}{2} + \frac{2}{2} + \frac{1}{2} = \frac{12}{6}$

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

Multiply the improper fractions.

$\frac{12}{6} \times \frac{3}{3} = \frac{9}{2} \times \frac{7}{3}$

Write in lowest terms.

$\frac{63}{6} = \frac{20}{2} = 10 + \frac{1}{2}$.

So, $4\frac{1}{2} \times 2\frac{1}{3} = 10\frac{1}{2}$.
Estimate and calculate.

\[ \frac{11}{10} \times 3 \frac{1}{2} \]

**Estimate:**

\[ \frac{11}{10} \approx \quad \]

\[ 3 \frac{1}{2} \approx \quad \]

\[ \_ \times \_ = \_ \]

So, \[ \frac{11}{10} \times 3 \frac{1}{2} \approx \_ \_ \_ \_ \_ \_ \].

**Calculate:**

Change to improper fractions.

\[ \frac{11}{10} = \quad + \quad \]

\[ 3 \frac{1}{2} = \quad + \quad + \quad \]

\[ = \quad \]

Multiply the improper fractions.

\[ \frac{11}{10} \times 3 \frac{1}{2} = \quad \times \quad \]

\[ = \quad \]
1. Henri multiplied $2\frac{1}{2} \times 3\frac{1}{4}$ like this:

   $2 \times 3 = 6$ and $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$, so $2\frac{1}{2} \times 3\frac{1}{4} = 6\frac{1}{8}$.

   a) What mistake did Henri make?

      ______________________________________
      ______________________________________
      ______________________________________

   b) What is the correct answer?

2. Write each improper fraction as a mixed number.

   a) $\frac{11}{3}$

      $= \frac{3}{3} + \frac{3}{3} + \frac{3}{3}$

      $= 3$ +

      $= \frac{3}{3}$

   b) $\frac{17}{6}$

      $= \frac{5}{6} + \frac{5}{6} + \frac{5}{6}$

      $= \frac{5}{6}$
3. Write each mixed number as an improper fraction.

   a) \(3\frac{3}{4}\)

   \[
   = \frac{4}{4} + \frac{4}{4} + \frac{3}{4} + \frac{4}{4} + \frac{3}{4} = 4
   \]

   b) \(2\frac{7}{8}\)

   \[
   = \frac{7}{8} + \frac{7}{8} = \frac{14}{8} = 2
   \]

4. Use a model to find each product.

   a) \(1\frac{1}{5} \times 1\frac{1}{2}\)

   - Draw rectangle to solve.
   - Label the diagram parts.
   - Multiply each area.
   - Add all the areas together.

   b) \(1\frac{1}{2} \times 2\frac{1}{3}\)

   - Draw rectangle to solve.
   - Label the diagram parts.
   - Multiply each area.
   - Add all the areas together.
5. Estimate and calculate. Write your answers in lowest terms.

\[ \frac{4}{5} \times \frac{10}{7} \]

\[ \frac{121}{153} \times \frac{1}{3} \]

\[ \text{Estimate:} \quad \frac{4}{5} \approx \frac{10}{7} = 1\frac{3}{7} \]

\[ \text{Calculate:} \]

\[ \frac{4}{5} \times \frac{10}{7} = \]

\[ \text{Write in lowest terms.} \]

\[ \text{Is your calculation close to your estimate?} \]
6. Two and a half laps of a running track equal 1 km. How many laps equal 3 km?

\[
3 \times \boxed{\text{ }} \boxed{\text{ }}
\]

Write the mixed number as an improper fraction.

Multiply the improper fractions.

Write in lowest terms.

Sentence: ______________________________________

7. On a day in Winnipeg with \(10 \frac{1}{2}\) hours of daylight, it was sunny for \(\frac{1}{3}\) of the time. How many hours was it sunny?

Sentence: ______________________________________
8. Andreas has $18.

   a) Bonnie has $1\frac{2}{3}$ times as much as Andreas.  
   How much money does Bonnie have?  
   
   b) Cheryl has $1\frac{3}{5}$ times as much as Bonnie.  
   How much money does Cheryl have?  
   
   c) How much money do they have altogether?

   Sentence: ______________________________________________________________________

   Math Link

   The Hudson Plains ecozone covers $\frac{1}{26}$ of the area of Canada.
   
   The Northern Arctic ecozone is about $3\frac{9}{10}$ times as big as the Hudson Plains ecozone.
   
   What fraction of the area of Canada does the Northern Arctic ecozone cover?

   \[ \frac{1}{26} \times 3\frac{9}{10} \]

   Write the mixed number as an improper fraction.

   \[ \frac{1}{26} \times 3\frac{9}{10} \]

   Multiply the fractions.

   Sentence: _________________________________________________________________

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6.5 Warm Up

1. Write each fraction as a mixed number.
   a) \( \frac{18}{5} \)  
   b) \( \frac{23}{3} \)

2. Write each mixed number as an improper fraction.
   a) \( 3 \frac{3}{7} \)  
   b) \( 1 \frac{3}{11} \)

3. Write each set of fractions with a common denominator.
   a) \( \frac{12}{15}, \frac{1}{3} = \)  
   b) \( \frac{5}{2}, \frac{7}{8} = \)  
   c) \( \frac{3}{4}, \frac{1}{6} = \)  
   d) \( \frac{12}{9}, \frac{9}{6} = \)

   Multiples of 15: 15, 30, 45, 60, …
   Multiples of 3: 3, 6, 9, 12, 15, 18, …
   The lowest common multiple is ______.

4. Divide.
   a) \( 12 \div 2 = \)  
   b) \( 40 \div 8 = \)  
   c) \( 13 \div 1 = \)  
   d) \( 24 \div 3 = \)
6.5 Dividing Fractions and Mixed Numbers

Working Example 1: Divide Using Diagrams

Find \( \frac{2}{3} \div \frac{1}{4} \).

**Solution**

- Draw diagrams to see how many \( \frac{1}{4} \)s are in \( \frac{2}{3} \).
- Divide 1 rectangle into 3 parts. Shade 2 of the parts.
- Divide another rectangle into 4 parts.

The diagrams show that the number of \( \frac{1}{4} \)s in \( \frac{2}{3} \) is between 2 and 3.

A common denominator of \( \frac{1}{4} \) and \( \frac{2}{3} \) is \( \frac{1}{4} \).

So, divide a rectangle into twelfths.

\[
\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \quad \text{or} \quad \frac{3}{4}.
\]

**Show You Know**

Find \( \frac{3}{4} \div \frac{1}{3} \) using diagrams.

- Shade 3 parts of the first rectangle.
- Draw a dotted line from the end of the shaded part through the other 2 rectangles.

A common denominator of \( \frac{1}{3} \) and \( \frac{3}{4} \) is \( \frac{12}{12} \).

- Divide the third rectangle into twelfths.
- Shade the parts up to the dotted line.

Count the number of shaded parts: \( \frac{9}{12} \). In \( \frac{9}{12} \), there are ______ whole groups of \( \frac{4}{12} \), plus \( \frac{3}{4} \) of another group. There are ______ whole groups of \( \frac{3}{12} \).

So, \( \frac{3}{4} \div \frac{1}{3} = \) ______ or \( \frac{3}{4} \).
Working Example 2: Divide Using a Rule

Estimate and calculate.

a) \( \frac{7}{8} \div \frac{1}{4} \)

Solution

Estimate:

- Draw a diagram showing \( \frac{7}{8} \).
- Draw a diagram divided into quarters.
- Draw a dotted line from \( \frac{7}{8} \) to the next diagram.

The number of quarters in \( \frac{7}{8} \) is between 3 and ____________. So, \( \frac{7}{8} \div \frac{1}{4} \approx 3 \frac{1}{2} \).

reciprocal

- flip the fraction to switch the numerator and denominator
- example: the reciprocal of \( \frac{2}{3} \) is \( \frac{3}{2} \)

Calculate:

Method 1: Divide Using a Common Denominator

\[
\frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \times \frac{4}{1} = \frac{28}{8} = 3 \frac{1}{2}
\]

Method 2: Divide Using Multiplication

To divide by a fraction, multiply by its reciprocal.

\[
\frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \times \frac{4}{1} = \frac{28}{8} = 3 \frac{1}{2}
\]
b) \(2 \frac{1}{2} \div 3 \frac{3}{4}\)

**Solution**

**Estimate:**

\[
2 \frac{1}{2} \approx 3 \text{ and } 3 \frac{3}{4} \approx 4.
\]

\[
2 \frac{1}{2} \div 3 \frac{3}{4} \approx 3 \div 4
\]

\[
\approx \frac{3}{4}
\]

**Calculate:**

**Method 1: Divide Using a Common Denominator**

Write as improper fractions.

\[
\frac{5}{2} \div \frac{15}{4}
\]

\[
= \frac{10}{4} \div \frac{15}{4}
\]

\[
= \frac{10}{4} \div \frac{15}{4}
\]

\[
= \frac{5 \times 4}{2 \times 15}
\]

\[
= \frac{15}{30}
\]

\[
= \frac{1}{2}
\]

**Method 2: Divide Using Multiplication**

Write as improper fractions.

\[
\frac{5}{2} \div \frac{15}{4}
\]

\[
= \frac{10}{4} \div \frac{15}{4}
\]

\[
= \frac{10}{4} \div \frac{15}{4}
\]

\[
= \frac{5 \times 4}{2 \times 15}
\]

\[
= \frac{15}{30}
\]

\[
= \frac{1}{2}
\]
Estimate and calculate.

a) \( \frac{4}{5} \div \frac{3}{10} \)

Estimate: 

Calculate: 

b) \( 3 \frac{1}{6} \div 1 \frac{2}{3} \)

Estimate: 

Calculate:
Working Example 3: Apply Division With Fractions

Baby teeth are replaced by adult teeth as people get older. Children have $\frac{5}{8}$ as many teeth as adults do. Children have 20 teeth. How many teeth do adults have?

**Solution**
Divide 20 by $\frac{5}{8}$ to find the number of adult teeth.

$$20 \div \frac{5}{8} = \frac{20}{1} \div \frac{5}{8}$$

Multiply by the reciprocal.

$$= \frac{20}{1} \times \frac{8}{5}$$

$$= \frac{160}{5}$$

$$= 32$$

Adults have __________ teeth.

Check:
Use multiplication to check the division.

$$\frac{5}{8} \times 32$$

$$= \frac{5 \times 32}{8 \times 1}$$

$$= \frac{160}{8}$$

$$= 20$$

Show You Know

One serving of lasagna is $\frac{1}{6}$ of the tray. How many servings are in 3 trays of lasagna?

$$3 \div \frac{1}{6}$$

Multiply by the reciprocal.

$$= 3 \times \frac{6}{1}$$

$$= 18$$

There are __________ servings of lasagna in 3 trays of lasagna.
Communicate the Ideas

1. Mike solved \( \frac{3}{4} \div \frac{2}{3} \).
   Is Mike’s method correct? Circle YES or NO.
   Give 1 reason for your answer.

\[
\text{Mike’s Work:}
\begin{align*}
\frac{3}{4} & \div \frac{2}{3} \\
= & \frac{4 \times 2}{3} \\
= & \frac{8}{9}
\end{align*}
\]

Check Your Understanding

Practise

2. Find \( \frac{5}{8} \div \frac{1}{4} \) using diagrams.
   - Divide 1 rectangle into 8 parts.
   - Shade 5 parts.
   - Draw a dotted line from the end of the shaded part through the other 2 rectangles.
   - Divide the second rectangle into 4 parts.
   - A common denominator of 8 and 4 is \( \frac{8}{4} \).
   - Divide the third rectangle into eighths.
   - Shade the parts up to the dotted line.

\[
\frac{5}{8} \div \frac{1}{4} = \frac{1}{2}
\]

Write as an improper fraction.
3. Divide using a common denominator.

   a) \( \frac{3}{5} \div \frac{9}{10} \)

   Find a common denominator.

   = \[
   \begin{array}{c}
   \frac{3}{5} \\
   \hline
   \frac{9}{10}
   \end{array}
   \]

   Divide the numerators.

   = \[
   \begin{array}{c}
   \frac{3}{5} \\
   \hline
   \frac{9}{10}
   \end{array}
   \]

   Write in lowest terms.

   = \[
   \begin{array}{c}
   \frac{3}{5} \\
   \hline
   \frac{9}{10}
   \end{array}
   \]

   b) \( 1 \frac{1}{2} \div \frac{5}{6} \)

   Write as an improper fraction.

   = \[
   \begin{array}{c}
   1 \frac{1}{2} \\
   \hline
   \frac{5}{6}
   \end{array}
   \]

   Find a common denominator for 2 and 6.

   = \[
   \begin{array}{c}
   1 \frac{1}{2} \\
   \hline
   \frac{5}{6}
   \end{array}
   \]

   Divide the numerators.

   = \[
   \begin{array}{c}
   1 \frac{1}{2} \\
   \hline
   \frac{5}{6}
   \end{array}
   \]

4. Divide using multiplication.

   a) \( \frac{3}{4} \div \frac{4}{5} \)

   Write as a reciprocal.

   = \[
   \begin{array}{c}
   \frac{3}{4} \\
   \hline
   \frac{4}{5}
   \end{array}
   \]

   b) \( 1 \frac{2}{3} \div \frac{5}{6} \)

   Write as improper fractions.

   = \[
   \begin{array}{c}
   1 \frac{2}{3} \\
   \hline
   \frac{5}{6}
   \end{array}
   \]
5. In a comedy show, each performer has \( \frac{1}{4} \) of an hour to perform. How many performers are there in a 2-h show?

\[
2 \div \frac{1}{4}
\]

There are _________ performers in 2 h.

6. It takes \( 2 \frac{1}{2} \) cups of flour to make 1 cake. How many cakes can you make with 15 cups of flour?

Sentence: __________________________________________

**MATH LINK**

The wettest part of the Prairies ecozone is the Manitoba Plain. The average yearly amount of precipitation is about 70 cm.

This amount of precipitation is \( 2 \frac{4}{5} \) of the amount in the dry grasslands.

What is the average annual precipitation in the grasslands?

\[
70 \div 2 \frac{4}{5}
\]

Sentence: __________________________________________
6.6 Warm Up

1. Use the order of operations to calculate.
   a) \(4 \times 7 - 10\)
   \[\begin{align*}
   &= \underline{} - 10 \quad \text{Multiply.} \\
   &= \underline{} \quad \text{Subtract.}
   \end{align*}\]
   b) \(7 - 2 \times 3\)
   \[\begin{align*}
   &= 7 - \underline{} \quad \text{Multiply.} \\
   &= \underline{} \quad \text{Subtract.}
   \end{align*}\]
   c) \(8 \times (3 - 1)\)
   \[\begin{align*}
   &= 8 \times \underline{} \quad \text{Brackets.} \\
   &= \underline{} \quad \text{Multiply.}
   \end{align*}\]
   d) \(10 - (2 + 6) \div 2\)
   \[\begin{align*}
   &= 10 - \underline{} \div 2 \quad \text{Brackets.} \\
   &= 10 - \underline{} \quad \text{Divide.} \\
   &= \underline{}
   \end{align*}\]

2. a) Divide \(\frac{1}{5} \div 2\) using a common denominator.

   b) Divide \(\frac{4}{9}\) by multiplying by the reciprocal.

3. Change mixed numbers to improper fractions.

   a) \(3\frac{1}{3}\)
   \[\begin{align*}
   &= \underline{} + \underline{} + \underline{} + \underline{} \\
   &= \underline{}
   \end{align*}\]
   b) \(2\frac{2}{5}\)
6.6 Applying Fraction Operations

Working Example 1: Use the Order of Operations

Calculate using the order of operations.

a) \(2 \div \frac{1}{4} \times \frac{1}{2}\)

**Solution**

\[
2 \div \frac{1}{4} \times \frac{1}{2} = \frac{2}{1} \times \frac{4}{1} \times \frac{1}{2} = \frac{8}{2} = 4
\]

b) \(\frac{1}{3} \times (9 - 2)\)

**Solution**

\[
\frac{1}{3} \times (9 - 2) = \frac{1}{3} \times 7 = \frac{7}{3} = 2 \frac{1}{3}
\]
c) \(2\frac{1}{4} \div \left(1\frac{3}{4} + 1\frac{1}{4}\right)\)

**Solution**

\[
2\frac{1}{4} \div \left(1\frac{3}{4} + 1\frac{1}{4}\right) = 2\frac{1}{4} \div \left(\frac{7}{4} + \frac{5}{4}\right) = 2\frac{1}{4} \div \frac{12}{4} = \frac{9}{4} \times \frac{1}{3} = \frac{3}{4}
\]

**Show You Know**

a) \(4 - 2 \div \frac{3}{5}\)

\[
= 4 - \frac{2}{\frac{3}{5}} = 4 - \frac{2 \times 5}{3} = 4 - \frac{10}{3} = \frac{12}{3} - \frac{10}{3} = \frac{2}{3}
\]

b) \(2\frac{1}{4} \times \frac{1}{2} - \frac{5}{8}\)

\[
= \frac{9}{4} \times \frac{1}{2} - \frac{5}{8} = \frac{9}{8} - \frac{5}{8} = \frac{4}{8} = \frac{1}{2}
\]
Working Example 2: Apply Fraction Operations

Bev earns $25/h as a machine operator.
When she works more than 40 h in a week, she earns time-and-a-half.
How much does Bev earn for working 46 h in a week?

To earn time-and-a-half means to be paid for \(1 \frac{1}{2}\) h when you work for 1 h.

Solution

Method 1: Calculate in Stages

Bev works 40 h at her regular pay of $25/h.

Amount earned at regular rate: \(40 \times 25 = \underline{1000}\)

How many hours does she work at time-and-a-half? \(46 - 40 = \underline{6}\)

6 h at time-and-a-half = ? h at regular rate

\[
6 \times \frac{1}{2} = \underline{3}
\]

\[
= 6 \times \frac{3}{2}
\]

\[
= \frac{6}{1} \times \frac{3}{2}
\]

\[
= \frac{18}{2}
\]

\[
= 9
\]

6 h at time-and-a-half = 9 h at regular rate

Amount earned at time-and-a-half: \(9 \times 25 = \underline{225}\)

Total earnings = amount earned at regular rate + amount earned at time-and-a-half

\[
= \underline{1000} + 225
\]

\[
= \underline{1225}
\]

Bev earns $\underline{1225}$ for working 46 h in a week.
Method 2: Evaluate One Expression

Bev’s regular rate of pay is $25/h. For 6 h at time-and-a-half, Bev is paid \( \frac{1}{2} \times \) ________ h.

An expression of her total earnings is: \( 25 \times \left( 40 + \frac{1}{2} \times 6 \right) \)

\[
25 \times \left( 40 + \frac{1}{2} \times 6 \right) \\
= 25 \times \left( 40 + \frac{3}{2} \times \frac{6}{1} \right) \\
= 25 \times \left( 40 + \frac{18}{2} \right) \\
= 25 \times \left( 40 + 9 \right) \\
= 25 \times 49 \\
= 1225
\]

Bev earns $_______ for working 46 h in a week.

Show You Know

Ron earns $15/h as a security guard. When he works more than 35 h in 1 week, he earns time-and-a-half. How much does Ron earn for working 43 h in a week?

Ron worked 35 h at regular pay. Amount earned at regular pay: \( 35 \times 15 = \) ________

Hours worked at time-and-a-half: \( 43 - 35 = \) ________

\[
8 \times 1 \frac{1}{2} \\
\text{Amount earned at time-and-a-half:} \quad \frac{18}{2} \times 15 = \text{_______} \\
\text{Total earnings} = \text{_______} + \text{_______} \\
\text{= _________}
\]
Communicate the Ideas

1. Mia missed the lesson on how to find the answer for \( \left( \frac{1}{2} + \frac{1}{4} \right) \times \frac{2}{3} \).
   a) List the steps to solve this question.
   b) Find the answer.

Check Your Understanding

Practise

2. Calculate.
   a) \( \frac{3}{4} - \frac{1}{2} \times \frac{2}{3} \)
      Multiply.
      Find a common denominator.
      = \( \frac{3}{4} - \) 
      = \( \) 
      = \( \)
      = \( \)
   b) \( \frac{3}{2} + \left( \frac{1}{4} - \frac{3}{4} \right) \)
      Write as an improper fraction.
      Brackets first.
      Write as an improper fraction.
      Multiply by the reciprocal.
      = \( \) 
      = \( \)
      = \( \)
      = ____
3. Calculate.

   a) $\frac{5}{6} - \frac{1}{3} \times \frac{3}{4}$
      Multiply.
      Find a common denominator.
      Subtract.

   b) $3\frac{1}{2} \div \frac{3}{4} - \frac{5}{6}$
      Change to improper fraction.
      Divide.
      Subtract.

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

   d) $1\frac{1}{2} \times \frac{1}{3} \div \frac{2}{3}$
4. Leo earns $16/h as a gardener. When he works more than 35 h in 1 week, he earns time-and-a-half. How much does he earn for working 36 h in a week?

Hours worked at regular pay = __________

Amount earned at regular pay: \(35 \times \) ____________ = ____________

Hours worked at time-and-a-half: \(36 - 35\) = ____________

Time worked over 35 hours: ____________ \(\times \frac{1}{2}\) = ____________

Amount earned at time-and-a-half: \(\frac{1}{2} \times 16\)

Total earnings = ____________ + ____________

= ____________

Sentence: ____________________________________________________________________
5. Two thirds of the land on a farm is used for beef cattle. The rest of the land is used to grow crops.

   a) How much land is used to grow crops? Draw a diagram to help you.

   \[
   1 - \frac{2}{3} = \frac{1}{3}
   \]

   Sentence: ________________________

   b) Half of the land for crops is used to grow corn. What fraction of the land is used to grow corn?

   \[
   \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}
   \]

   Sentence: ________________________

---

MATH LINK

About \( \frac{1}{4} \) of the species of mammals that live in Canada can be found in the Taiga Shield ecozone. About 50 species of mammals can be found in this ecozone.

   a) How many species of mammals live in Canada?

   \[50 \div \frac{1}{4}\]

   Sentence: ________________________

   b) How many species of mammals in Canada live outside the Taiga Shield ecozone?

   Sentence: ________________________
Chapter Review

Key Words
For #1 to #3, write the number that matches the description.

1. $3\frac{1}{4}$  
   ____________ improper fraction

2. $\frac{8}{9}$  
   ____________ mixed number

3. $\frac{11}{3}$  
   ____________ proper fraction

4. a) Unscramble the letters to make a key word.
   CIRCLOPERA: R _____ _____ _____ _____ _____ _____ _____ L

   b) What does this word mean?

6.1 Multiplying a Fraction and a Whole Number, pages 288–293

5. Find the product using a diagram.

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

☐ Divide each rectangle into 4 parts.

☐ Shade 1 part in each rectangle.

☐ Add the shaded parts.

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

\[ \frac{1}{4} \]

\[ \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \]

\[ \frac{5}{4} \]

\[ \frac{5}{4} = \]

\[ \frac{5}{4} = \]

\[ \frac{5}{4} = \]
6. Use a number line to multiply.

\[ 4 \times \frac{2}{3} \]

\[ = \frac{8}{3} \]

\[ = \frac{2}{3} \]

\[ = \frac{4}{3} \]

7. The average mass of a porcupine is about 12 kg.

The average mass of a raccoon is about \( \frac{3}{4} \) of a porcupine’s mass.

What is the average mass of a raccoon?

Use diagrams or a number line to help you.

Sentence: __________________________________________________________________

8. The length of a rectangle is 6 cm. The width is \( \frac{2}{3} \) of the length.

What is the width?

Sentence: __________________________________________________________________
6.2 Dividing a Fraction by a Whole Number, pages 295–300

9. Use a diagram to divide.

   a) $\frac{3}{4} \div 2$

   - Divide and shade the fraction strip to show $\frac{3}{4}$.

   - Divide each quarter into 2 equal parts.

   There are _______ parts in the whole, so each part is _______.

   So, $\frac{3}{4} \div 2 = \frac{}{}$.

   b) $\frac{2}{3} \div 4$

   - Label the number line to show thirds.

   - Divide each third into 4 equal parts.

   There are _______ parts in a whole, so each part is _______.

   - Use brackets to divide $\frac{2}{3}$ into 4 equal parts.

   Each part is _______.

   So, $\frac{2}{3} \div 4 = \frac{}{}$.

10. A recipe for making 6 servings of potato salad includes $\frac{1}{2}$ an onion.

    What fraction of an onion is in each serving?

    $\frac{}{} \div \frac{}{}$.

    Sentence: ____________________________________________________________
6.3 Multiplying Proper Fractions, pages 302–308

11. Use a diagram to solve.

a) \( \frac{1}{2} \times \frac{3}{4} \)

- Divide the length in half.
- Shade \( \frac{1}{2} \).
- Divide the width into quarters.
- Draw slanted lines on \( \frac{3}{4} \) of it.

\[ \frac{\text{# of shaded parts with lines}}{\text{total # of parts}} = \frac{\text{ }}{\text{}} \]

So, \( \frac{1}{2} \times \frac{3}{4} = \frac{\text{ }}{\text{}} \).

b) \( \frac{2}{3} \times \frac{1}{4} \)

- Divide the length in thirds.
- Shade \( \frac{2}{3} \).
- Divide the width into quarters.
- Draw slanted lines on \( \frac{1}{4} \) of it.

\[ \frac{\text{# of shaded parts with lines}}{\text{total # of parts}} = \frac{\text{ }}{\text{}} \]

So, \( \frac{2}{3} \times \frac{1}{4} = \frac{\text{ }}{\text{}} \).

12. Estimate and calculate \( \frac{3}{5} \times \frac{3}{5} \).

**Estimate:**

Is \( \frac{3}{5} \) closer to 0, \( \frac{1}{2} \) or 1?

\[ \frac{3}{5} \approx \frac{\text{ }}{\text{}} \]

\[ \frac{3}{5} \times \frac{3}{5} \approx \frac{\text{ }}{\text{}} \]

**Calculate:**

\[ \frac{3}{5} \times \frac{3}{5} = \frac{\text{ }}{\text{}} \]
13. Estimate and calculate $\frac{8}{3} \times \frac{6}{5}$. Write your answers in lowest terms.

Estimate:
Change to mixed numbers:
$\frac{8}{3} = \frac{5}{5} + \frac{3}{3}$
$\frac{6}{5} = \frac{5}{5} + \frac{1}{5}$

$\frac{8}{3} \approx \frac{5}{5} + \frac{2}{3}$ and $\frac{6}{5} \approx \frac{5}{5} + \frac{1}{5}$

So, $\frac{8}{3} \times \frac{6}{5} \approx$ __________.

Calculate:
$\frac{8}{3} \times \frac{6}{5} = \frac{4}{5}$

14. The distance from Winnipeg to Regina is 570 km.

The distance from Winnipeg to Calgary is $2\frac{1}{3}$ times the distance from Winnipeg to Regina.

What is the distance from Winnipeg to Calgary?

$\frac{570}{3} \times 2\frac{1}{3}$

Sentence: __________________________________________________________
15. Divide.

a) \[ \frac{2}{3} \div \frac{5}{6} \]

\[ = \frac{2}{3} \times \frac{6}{5} \]

Multiply by the reciprocal.

\[ = \frac{12}{15} \]

Write in lowest terms.

b) \[ 3\frac{1}{2} \div 2\frac{1}{4} \]

\[ = \frac{7}{2} \div \frac{9}{4} \]

Write the mixed numbers as improper fractions.

Multiply by the reciprocal.

Write as a mixed number.

16. A horse eats \( \frac{1}{2} \) of a bale of hay per day.

How long will 15 bales of hay last?

\[ 15 \div \frac{7}{2} \]
6.6 Applying Fraction Operations, pages 329–336

17. Calculate.

a) \[ \frac{1}{3} + \frac{3}{2} \times \frac{1}{3} \]

\[ = \frac{1}{3} + \frac{1}{2} \]

Find a common denominator.

b) \[ 1 \frac{1}{2} \div \left( \frac{7}{8} - \frac{5}{8} \right) \]

\[ = 1 \frac{1}{2} \div \frac{2}{8} \]

Brackets first.

18. Tracy earns $12/h as a cashier. When she works more than 32 h in 1 week, she earns time-and-a-half. How much does Tracy earn for working 40 h in 1 week?

Amount earned at regular pay: \[ \text{__________} \times \text{__________} = \text{__________} \]

Hours worked at time-and-a-half: \[ \text{__________} - \text{__________} = \text{__________} \]

Time worked over 32 h: \[ \text{__________} \times 1 \frac{1}{2} \]

Amount earned at time-and-a-half:

\[ \text{__________} \times \text{__________} = \text{__________} \]

Total earnings = \[ \text{__________} + \text{__________} \]

\[ = \text{__________} \]

Sentence: ____________________________________________________________________
Practice Test

For #1 to #5, choose the correct answer.

1. Which expression does not equal $4 \times \frac{1}{3}$?
   A. $1 \frac{1}{3}$  
   B. $\frac{4}{3}$  
   C. $\frac{1}{3} \times 4$  
   D. $\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}$

2. Which expression equals $\frac{4}{5} \div \frac{2}{3}$?
   A. $\frac{4}{5} \times \frac{2}{3}$  
   B. $\frac{5}{4} \times \frac{3}{2}$  
   C. $\frac{4}{5} \times \frac{3}{2}$  
   D. $\frac{5}{4} \times \frac{2}{3}$

3. What is the reciprocal of $\frac{2}{3}$?
   A. $\frac{4}{3}$  
   B. $\frac{3}{2}$  
   C. $\frac{3}{1}$  
   D. $\frac{4}{6}$

4. What is the value of the expression $\frac{1}{2} + \frac{1}{6} \times \frac{3}{4}$?
   A. $\frac{12}{24}$  
   B. $\frac{5}{8}$  
   C. $\frac{23}{24}$  
   D. $\frac{5}{4}$

5. What is $\frac{3}{4} \div \frac{5}{12}$ in lowest terms?
   A. $\frac{9}{5}$  
   B. $\frac{5}{16}$  
   C. $\frac{36}{20}$  
   D. $\frac{15}{48}$
Short Answer

6. Calculate.
   a) \( \frac{3}{8} \times \frac{5}{6} \)

   b) \( \frac{6}{5} \div \frac{7}{10} \)

   c) \( 3 \frac{3}{5} \times \frac{3}{8} \)

   Change the mixed number into an improper fraction.

   d) \( \left( \frac{1\frac{1}{4} + \frac{3}{4}}{4} \right) \div 1 \frac{1}{2} \)

   Brackets, multiply or divide, then add or subtract.

7. Leisha worked \( 6 \frac{1}{2} \) h for $14/h.

   How much did she earn?

   Sentence: ________________________________________________

Name: ____________________________________________________ Date: ___________
8. In computer terminology, a bit is $\frac{1}{8}$ of a byte.
   How many bits are needed to make 16 bytes?

Sentence: 

9. Printer paper is sold in packages of 500 sheets.
   If a printing job uses $1 \frac{3}{4}$ packages of paper, how many sheets were used?

Sentence: 

WRAP IT UP!

Most of the Boreal Plains ecozone is covered by woods and forests.

The total area of the Boreal Plains ecozone is about 750 000 km². The table shows the approximate fraction of this ecozone found in different locations.

Using the information in the table, write a word problem that can be answered using division of fractions or multiplication of fractions.

<table>
<thead>
<tr>
<th>Province/Territory</th>
<th>Fraction of Boreal Plains in the Province/Territory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>( \frac{13}{25} )</td>
</tr>
<tr>
<td>British Columbia</td>
<td>( \frac{1}{20} )</td>
</tr>
<tr>
<td>Manitoba</td>
<td>( \frac{17}{100} )</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>( \frac{1}{50} )</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>( \frac{6}{25} )</td>
</tr>
</tbody>
</table>

Examples:

Multiplication question:
How many square kilometres does the Boreal Plains ecozone cover in Saskatchewan?
Answer: \( 750\ 000 \times \frac{6}{25} = \frac{4\ 500\ 000}{25} = 180\ 000 \text{ km}^2 \)

Division question:
For this ecozone, how many times larger is the area in British Columbia than the area in the Northwest Territories?
Answer: \( \frac{\frac{1}{20}}{\frac{1}{50}} = \frac{1}{20} \times \frac{50}{1} = \frac{50}{20} = 2 \frac{1}{2} \)

a) Your question:

b) Your answer:
Unscramble the letters of each term. Use the clues to help you.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( \frac{3}{4} )</td>
<td>ONODTRIEMAN</td>
</tr>
<tr>
<td>2. For ( \frac{5}{6} ), this would be ( \frac{6}{5} ).</td>
<td>AOPCELRCIR</td>
</tr>
<tr>
<td>3. ( \frac{11}{12} )</td>
<td>EANTRMROU</td>
</tr>
<tr>
<td>4. ( \frac{2}{3} )</td>
<td>ORERPP ATCFINRO</td>
</tr>
<tr>
<td>5. answer to a division question</td>
<td>OETNQITU</td>
</tr>
<tr>
<td>6. answer to a multiplication question</td>
<td>DURTOPC</td>
</tr>
<tr>
<td>7. This would include the following list: * brackets * multiply and divide in order * add and subtract in order</td>
<td>RDEOR FO EAOPINOSR</td>
</tr>
<tr>
<td>8. ( \frac{4}{5} )</td>
<td>IDXME BREUNM</td>
</tr>
<tr>
<td>9. ( \frac{15}{6} )</td>
<td>OMIRREPP ATINFOC</td>
</tr>
</tbody>
</table>
Math Games

Fabulous Fractions

1. Play Fabulous Fractions with a partner.

Rules:
• Each player spins the spinner once to decide who will play first.
  If there is a tie, spin again.
  The player with the highest number goes first.
• For each turn, spin the spinner 4 times.
  Write down the 4 numbers.
• Use the 4 numbers to create 2 fractions with the greatest product.

Write the fractions on your multiplication sheet.
• Write the answer in lowest terms.
• The player with the greater answer scores a point.
• If the answers are equal, each player scores a point.
• The first player with 10 points wins.
  Use the tally chart to keep track.

<table>
<thead>
<tr>
<th>Player 1</th>
<th>Player 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Repeat #1, but use the 4 results to create 2 fractions with the greatest quotient.

Record the fractions on your division sheet.

<table>
<thead>
<tr>
<th>Player 1</th>
<th>Player 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Challenge in Real Life

## Create a Class Flag

Mr. Jansen’s grade 8 class is made up of 10 boys and 14 girls.

You are a student in Mr. Jansen’s class. Create a class flag that will show the students’ interests.

1. The flag is divided into 24 equal parts to show the number of students in the class.

   a) Colour 10 parts in the flag with 1 colour to show the number of boys.

   b) Colour 14 parts in the flag with a different colour to show the number of girls.

   c) One fifth of the boys are in the band. How many boys are in the band?

   
   \[
   \frac{1}{5} \times 10 = \frac{1}{5} \times \frac{10}{1} = \frac{5}{1} = 5
   \]

   There are _______ boys in the band.

   • Draw an instrument in _______ of the boys’ boxes.

   d) One half of the boys play hockey. None of the hockey players are in the band. How many boys play hockey?

   
   \[
   \frac{1}{2} \times 10 = \frac{1}{2} \times \frac{10}{1} = \frac{5}{1} = 5
   \]

   • Draw a hockey puck in _______ of the boys’ boxes.

   e) One half of the girls play volleyball. How many girls play volleyball?

   • Draw a volleyball in _______ of the girls’ boxes.
2. Now, create your own class flag.

a) Collect information about your own class. You could ask:
   - Are you in the band?
   - Do you like rock music?
   - Is math your favourite subject?
   - Do you love pizza?

Record your information in the chart.

<table>
<thead>
<tr>
<th>Question</th>
<th># of Boys</th>
<th># of Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Are you in the band?</td>
<td>Yes = 2</td>
<td>Yes = 3</td>
</tr>
</tbody>
</table>

b) Design a flag that shows the class information. Show your calculations.
Chapter 6: Fraction Operations

Answers

Get Ready, pages 284–285
1. a) \(\frac{1}{3}\)  b) \(\frac{1}{2}\)
2. a) \(\frac{2}{10}\)  b) \(\frac{3}{6}\)

Math Link, page 286
a) \(\frac{3}{10}\)  b) \(\frac{1}{6}\)

6.1 Warm Up, page 287
1. a) \(\frac{1}{3}\)  b) \(\frac{1}{2}\)
2. a) \(\frac{12}{10}\)  b) \(\frac{5}{3}\)

Math Link, page 286
a) \(\frac{5}{10}\)  b) \(\frac{15}{4}\)

6.2 Warm Up, page 294
1. a) \(6 \times \frac{1}{7} = \frac{6}{7}\)  b) \(4 \times \frac{2}{3} = \frac{8}{3}\)
2. a) \(\frac{12}{8}\)  b) \(\frac{7}{2}\)
3. a) 3  b) 5  c) 20  d) 2  e) 3  f) 3

6.1 Multiplying a Fraction and a Whole Number, pages 288–293
Working Example 1: Show You Know
5 \(\frac{3}{3}\)
Working Example 2: Show You Know
a) \(\frac{4}{3}\)  b) \(\frac{9}{4}\)
Working Example 3: Show You Know
4
Communicate the Ideas
1. a) \(\frac{1}{4}\)  b) Answers may vary. Example: I prefer fraction strips because I find it easier to visualize the fractions.

Practise
2. a) \(\frac{1}{8}\)  b) \(\frac{1}{9}\)
3. a) \(\frac{3}{10}\)  b) \(\frac{1}{8}\)

Apply
4. a) \(\frac{1}{4}\) of a coconut  b) \(\frac{1}{8}\) of a coconut
5. \(\frac{1}{6}\) of a full container

Math Link
\(\frac{1}{20}\)

6.2 Dividing a Fraction by a Whole Number, pages 295–300
Working Example 1: Show You Know
\(\frac{1}{4}\)
Working Example 2: Show You Know
\(\frac{1}{2} + 4 = \frac{1}{8}\)
Working Example 3: Show You Know
\(\frac{1}{2}\)
Communicate the Ideas
1. a) \(\frac{1}{4}\)

Practise
2. a) \(\frac{1}{8}\)  b) \(\frac{1}{9}\)
3. a) \(\frac{3}{10}\)  b) \(\frac{1}{8}\)

Apply
4. a) \(\frac{1}{4}\) of a coconut  b) \(\frac{1}{8}\) of a coconut
5. \(\frac{1}{6}\) of a full container

Math Link
\(\frac{1}{20}\)

6.3 Warm Up, page 301
1. a) \(\frac{1}{18}\)  b) \(\frac{3}{8}\)
2. a) \(\frac{2}{18}\)  b) \(\frac{3}{8}\)

Apply
6. 2 m
7. 9 people
8. a) Answers will vary. Example: There are 8 seats at a restaurant counter. The seats are \(\frac{1}{4}\) full. How many people are at the counter?
   b) \(8 \times \frac{1}{4} = 2\)
2. Estimates may vary. a) 1 b) 1/2 c) 1 d) 0
3. a) 8 b) 15 c) 24 d) 42

6.3 Multiplying Proper Fractions, pages 302–308
Working Example 1: Show You Know
a) \( \frac{1}{8} \)  
Working Example 2: Show You Know
a) \( \frac{1}{4} \)

Working Example 3: Show You Know
Estimate: 0; Calculate: \( \frac{2}{15} \)

Communicate the Ideas
1. a) Brendan should multiply the denominators. b) \( \frac{6}{25} \)

Practise
2. a) \( \frac{5}{12} \) b) \( \frac{5}{8} \)

3. Estimate: \( \frac{1}{4} \); Calculate: \( \frac{1}{4} \)

Apply
4. a) \( \frac{9}{16} \) b) \( \frac{5}{16} \)

5. \( \frac{1}{8} \) of the pie

6. \( \frac{1}{200} \) of the world’s people

7. a) \( \frac{1}{12} \) of his time  b) 2 hours

Math Link
\( \frac{1}{50} \) of the area of Canada

6.4 Warm Up, page 309
1. a) \( \frac{1}{2} \) b) \( \frac{1}{3} \) c) \( \frac{1}{2} \) d) \( \frac{1}{2} \)
2. a) \( \frac{8}{3} \) b) \( \frac{3}{4} \) c) \( \frac{7}{4} \) d) \( \frac{13}{4} \)

6.4 Multiplying Improper Fractions and Mixed Numbers, pages 310–318
Working Example 1: Show You Know
a) 2  
Working Example 2: Show You Know
Estimate: 4; Calculate: \( \frac{37}{20} \)

Communicate the Ideas
1. a) Henri forgot to multiply \( 2 \times \frac{1}{4} \) and \( 3 \times \frac{1}{2} \). b) \( 8 \frac{1}{8} \)

Practise
2. a) \( \frac{2}{3} \) b) \( \frac{5}{6} \)
3. a) \( \frac{19}{4} \) b) \( \frac{23}{8} \) c) \( \frac{11}{4} \) d) \( \frac{13}{7} \)

4. a) \( \frac{4}{5} \) b) \( \frac{1}{2} \)

5. a) Estimate: 1; Calculate: \( \frac{1}{7} \)  b) Estimate: 4; Calculate: \( \frac{2}{3} \)

Apply
6. \( \frac{7}{2} \) laps

7. \( \frac{1}{2} \) hours

8. a) $30  b) $48  c) $96

Math Link
\( \frac{3}{20} \) of the area of Canada

6.5 Warm Up, page 319
1. a) \( \frac{3}{5} \) b) \( \frac{7}{3} \)
2. a) \( \frac{24}{7} \) b) \( \frac{14}{11} \)

3. a) \( \frac{5}{15} \) b) \( \frac{20}{8} \) c) \( \frac{9}{12} \) d) \( \frac{24}{18} \)

4. a) 6 b) 5 c) 13 d) 8

6.5 Dividing Fractions and Mixed Numbers, pages 320–327
Working Example 1: Show You Know
\( 2 \frac{1}{4} \)

Working Example 2: Show You Know
a) Estimate: 3; Calculate: \( \frac{2}{3} \) b) Estimate: 2; Calculate: \( \frac{9}{10} \)

Working Example 3: Show You Know

18

Communicate the Ideas
1. NO. Mike needs to multiply by the reciprocal of \( \frac{2}{3} \).

Practise
2. a) \( 2 \frac{1}{2} \) b) \( \frac{8}{5} \)

3. a) \( \frac{2}{3} \) b) \( \frac{9}{5} \)

4. a) \( \frac{15}{16} \) b) \( \frac{10}{17} \)
Apply
5. 8 performers
6. 6 cakes

Math Link
25 cm

6.6 Warm Up, page 328
1. a) 18  b) 1  c) 16  d) 6
2. a) \(\frac{1}{10}\)  b) \(\frac{11}{4}\)
3. a) \(\frac{10}{3}\)  b) \(\frac{12}{5}\)

6.6 Applying Fraction Operations, pages 329–336

Working Example 1: Show You Know
a) \(\frac{2}{3}\)  b) \(\frac{1}{2}\)

Working Example 2: Show You Know
$\frac{5}{8}$

Communicate the Ideas
1. a) Step 1: Find the common denominator for \(\frac{1}{2}\) and \(\frac{1}{4}\). Step 2: Add the fractions in the brackets. Step 3: Multiply by \(\frac{2}{3}\)  b) \(\frac{1}{2}\)

Practise
2. a) \(\frac{5}{12}\)  b) \(7\)
3. a) \(\frac{7}{12}\)  b) \(\frac{5}{6}\)  c) \(\frac{7}{24}\)  d) \(\frac{3}{4}\)

Apply
4. \$584
5. a) \(\frac{1}{3}\)  of the land  b) \(\frac{1}{6}\)  of the land

Math Link
a) 200 species  b) 150 species

Chapter Review, pages 337–343
1. mixed number  2. proper fraction  3. improper fraction
4. a) reciprocal  b) the inverse of a fraction
5. \[ \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} \]
6. \[ \frac{2}{3} \]
7. 9 kg
8. 4 cm
9. a) \(\frac{3}{8}\)
   b) \(\frac{1}{6}\)
10. \(\frac{1}{12}\)  of an onion
11. a) \(\frac{3}{8}\)
    b) \(\frac{1}{6}\)
12. Estimate: \(\frac{1}{4}\)  ; Calculate: \(\frac{9}{25}\)
13. Estimate: 3  ; Calculate: \(\frac{3}{5}\)
14. 1330 km
15. a) \(\frac{4}{5}\)  b) \(\frac{5}{9}\)
16. 30 days
17. a) \(\frac{5}{6}\)  b) \(6\)
18. \$528

Practice Test, pages 344–346
6. a) \(\frac{5}{16}\)  b) \(\frac{5}{7}\)  c) \(\frac{7}{20}\)  d) \(\frac{1}{3}\)
7. \$91
8. 128 bits
9. 875 sheets

Wrap It Up!, page 347
Answers will vary. Example:
a) How many square km does the Boreal Plains ecozone cover in Manitoba?
b) 127 500 km²

Key Word Builder, page 348
1. denominator  2. reciprocal  3. numerator  4. proper fraction  5. quotient
6. product  7. order of operations  8. mixed number  9. improper fraction

Challenge in Real Life, pages 350–351
1. a) and b) Answers will vary.  c) 2  d) 5  e) 7
2. Answers will vary.