Percents

You can show a percent by shading squares on a hundred grid. This grid shows 53% because 53 squares are shaded.

1. What percent does each hundred grid show?
   a) [Grid A]
   b) [Grid B]

   ________%   ________%

2. Shade the hundred grids to show each percent.
   a) 3% (shade 3 squares)
   b) 87%

Fractions, Decimals, and Percents

This diagram shows the fraction \( \frac{3}{4} \).

To change a fraction to a decimal, divide the numerator by the denominator.

\[
\text{numerator} \rightarrow \frac{3}{4} = 3 \div 4 = 0.75
\]

To change a decimal to a percent, multiply by 100 and write a percent symbol.

\[
0.75 \times 100 = 75\%
\]
3. Write each diagram as a fraction, a decimal, and a percent.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>Fraction</th>
<th>Decimal</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Repeating Decimals

A repeating decimal has 1 or more digits that repeat over and over without ending.

\[
\frac{2}{3} = 2 ÷ 3 = 0.666666… \text{ or } 0.\overline{6}
\]

Use a bar to show the repeating part:

To write a repeating decimal as a percent, multiply by 100 and write a percent symbol.

\[
0.\overline{6} = 0.666666… \times 100 = 66.6\%
\]

\[
0.\overline{36} = 0.363636… \times 100 = 36.\overline{36}\%
\]

4. Write the repeating decimal using bar notation.

a) \(0.\overline{333333} = \boxed{\underline{\text{___________}}}\)

b) \(0.\overline{272727} = \boxed{\underline{\text{___________}}}\)

Estimating Percents

To estimate the percent of a number, use percents you know, such as 50%, 25%, 10%, or 1%.

52% of 80 is about 50% of 80. This is the same as half of 80, which is 40.

• 50% means divide by 2.
• 10% means divide by 10.
• 25% means divide by 4.
• 1% means divide by 100.

\[
80 ÷ 2 = 40
\]

5. Estimate each percent.

a) 48% of 102

48% is close to \boxed{\underline{\text{___________}}}%.

\boxed{\underline{\text{___________}}}% of 102 is the same as half of 102, which is \boxed{\underline{\text{___________}}}.

b) 24% of 80

24% is close to \boxed{\underline{\text{___________}}}%.

\boxed{\underline{\text{___________}}}% of 80 is the same as 80 divided by 4, which is \boxed{\underline{\text{___________}}}.
MATH LINK

Water Conservation

Conserving water is a key step to saving the world’s supply of fresh water.

THE DAILY NEWS

Rainforest Town Suffers Water Shortages

Residents and businesses in Tofino, a small seaside town on Vancouver Island, have been asked to restrict their water use. This popular resort town attracts 15,000 to 20,000 visitors a day during the summer, doubling water consumption rates. The old water reservoir is not large enough to deal with such demands. Rather than shut down the popular resort, residents have been asked to restrict their water usage, including no watering of gardens and lawns, or washing of sidewalks, driveways, and vehicles. Ironically, this seaside town is one of the wettest places in Canada, receiving more than three metres of precipitation each year. Most of the rain falls during the winter, however.

a) Why does Tofino use double the amount of water in the summer?

b) What are 2 examples of water restrictions in the article?

restrict
• to limit the use of something

•

•

c) You usually shower for 20 min. What percent of water would you save by showering for 1 min less? Write your answer as a decimal and a percent.

\[
\frac{1 \text{ min}}{20 \text{ min}} = \frac{1}{20} = \frac{1}{20} \times 100\% = 5\%
\]

Sentence:
4.1 Warm Up

1. Write each fraction as a percent.
   a) \( \frac{2}{100} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \% \\
   b) \( \frac{50}{100} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \% \\
   c) \( \frac{98}{100} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \% \\
   d) \( \frac{21}{100} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \% \\

2. Show each fraction on a hundred grid.
   a) \( \frac{12}{100} \)
   b) \( \frac{57}{100} \)

3. Change each percent to a fraction out of 100. Then, show each percent on a hundred grid.
   a) \( 25\% = \frac{25}{100} \)
   b) \( 7\% = \frac{7}{100} \)
   c) \( 87\% = \frac{87}{100} \)
   d) \( 95\% = \frac{95}{100} \)

4. Write each fraction as a decimal.
   a) \( \frac{1}{2} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \)
   b) \( \frac{1}{4} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \)
   c) \( \frac{7}{10} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \)
   d) \( \frac{3}{4} = \underline{\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ } \)

5. Shade the diagram to show each fraction.
   a) \( \frac{1}{4} \)
   b) \( \frac{3}{8} \)
4.1 Representing Percents

Working Example 1: Determine the Percent Represented on a Grid

One completely shaded grid shows 100%. What percent does each diagram show?

a) Grid 1 Grid 2

Solution

Grid 1 has ________ squares shaded. Grid 2 has ________ squares shaded.

In total, ________ squares are shaded, so the diagram shows 135%.

This is a combined percent.

combined percent

- when individual percents are added together
- example: 100% + 25% = 125%

b) 

Solution

Only part of 1 square of the grid is shaded. This percent is between 0% and 1%.

This is a fractional percent.

fractional percent

- a percent that shows part of 1 percent
- examples: $\frac{1}{2}$%, 0.42%, $7\frac{3}{8}$%, 4.5%

You can zoom in to see the shaded parts of the 1 square.

Since 1 square is 1%, then part of that square is either a fraction or a decimal percent.

The shading shows $\frac{7}{10}$ or 0.7 of 1% of the whole diagram.

So, $0.7 \times 1\% = 0.7\%$

The diagram shows $\frac{7}{10}$ % or 0.7%.
What percent does each diagram show?

a) __________ shaded squares  __________ shaded squares  __________ shaded squares

Total shaded squares = __________% 

b) __________ of 1% = 0. __________ × 1%

= __________%

The shaded part of the whole diagram represents __________ % or __________%.

c) The shaded part of the diagram represents __________ % or __________%. 

______%.
Working Example 2: Represent Percents on a Grid

Show each percent on the grid.

a) A glass of orange juice has 120% of the recommended daily amount of Vitamin C.

Solution

To show 120%, you need 2 grids.

The first grid shows 100%. Shade __________ squares.

The second grid shows 20%. Shade __________ squares.

b) Canada has 0.5% of the world’s population.

Solution

0.5% is a fractional percent.
It is between 0% and 1%.
Use 1 grid with an enlarged square.

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

Shade \(\frac{1}{2}\) of the enlarged square.

c) A credit card company charges an interest rate of \(18\frac{1}{4}\%\) on unpaid balances.

Solution

\(18\frac{1}{4}\%\) is a fractional percent. It is between 1% and 100%.
Use __________ grid with an enlarged square.

Show You Know

Show each percent on a grid.

a) 180%  

b) \(12\frac{1}{2}\%\)  

\[
12\frac{1}{2} = \frac{25}{2} = \frac{25\times5}{2\times5} = \frac{125}{10} = \frac{62.5}{5}
\]

Divide this square into ________ parts and shade 6 parts.

c) 0.6%  

\[
0.6 = \frac{3}{5}\]

Divide this square into ________ parts and shade 6 parts.
Communicate the Ideas

1. Use hundred grids to show each percent.
   a) a percent between 0% and 1%
   
   
   ___________%
   b) a percent between 1% and 100%
   
   
   ___________%
   c) a percent greater than 200%
   
   
   ___________%

Check Your Understanding

Practise

2. What percent does each diagram show?
   a) Total shaded squares = ___________%
   
   ___________ shaded squares
   ___________ shaded squares

   b) Total shaded squares = ___________ %
   Shaded part = ___________%
   
   1 shaded grid = 100%
   
   ___________ shaded squares
   ___________ shaded squares

   c) Total shaded squares = ___________%
   
   ___________ shaded squares
   ___________ shaded squares
   ___________ shaded squares
3. Show each percent on a grid.
   a) 125% 
      
   b) \( \frac{7}{8} \) 
      
4. Show each percent on a grid.
   a) The mass of a Singapura cat is about 0.1% of the mass of a Siberian tiger.
      
5. Show 10\( \frac{1}{2} \)% on a grid.
   
6. Write 1 example from your life outside of school where you might find a percent greater than 100%.
7. A glass of milk has 25% of the recommended daily amount of calcium. How many glasses of milk would you need to drink to get 100% of the recommended calcium? Use a hundred grid to show your answer.

Sentence: ____________________________________________

### MATH LINK

Use hundred grids to show each percent.

- **97.5% of Earth’s Water is Salt Water**
- **2.5% of Earth’s Water is Fresh Water**
- **$\frac{3}{10}$ % of Fresh Water is Found in Lakes and Rivers**
- **0.4% of Fresh Water Found in Earth’s Atmosphere**
4.2 Warm Up

1. Change each fraction to a decimal.
   a) \( \frac{2}{10} = \) ____________
   b) \( \frac{15}{20} = \) ____________
   c) \( \frac{75}{100} = \) ____________
   d) \( \frac{3}{5} = \) ____________

2. Change each decimal to a percent.
   a) 0.12 = ____________%
   b) 0.45 = ____________%
   c) 0.6 = ____________
   d) 3.14 = ____________

3. Write each percent as a fraction of 100.
   a) 30% = \( \frac{\text{numerator}}{100} \)
   b) 9% = \( \frac{\text{numerator}}{100} \)

4. Use equivalent fractions to find the missing number.
   a) \( \frac{2}{25} \times \_\_\_\_\_ = \frac{\_\_\_\_\_}{100} \)
   b) \( \frac{14}{20} \times \_\_\_\_\_ = \frac{\_\_\_\_\_}{100} \)

5. In what place is the last digit? Use the place value chart to help you.

<table>
<thead>
<tr>
<th>Tens</th>
<th>Ones</th>
<th>.</th>
<th>Tenths</th>
<th>Hundredths</th>
<th>Thousandths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>.</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
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<td></td>
</tr>
</tbody>
</table>

   a) 0.35 ______________________
   b) 0.7 ______________________
   c) 0.002 _____________________
   d) 45.891 ____________________
4.2 Fractions, Decimals, and Percents

Working Example 1: Convert Fractions to Decimals and Percents

Change each fraction to a decimal and a percent.

a) \( \frac{1}{20} \)

Solution

Method 1: Use a Hundred Grid

Percent means out of 100. So, \( \frac{1}{20} = \frac{x}{100} \).

For every 20 squares, shade 1 square.

Then count the number of shaded squares in total.

\( \frac{1}{20} \) squares are shaded.

This is \( \frac{1}{100} \), which is \( \frac{1}{100} \% \) or 0.05.

Method 2: Divide

To find a decimal, divide the numerator by the denominator.

\( 1 \div 20 = \frac{1}{20} \)

To change the decimal to a percent, multiply by 100.

\( \frac{1}{20} \times 100 = \frac{5}{20} \% \)

Method 3: Make an Equivalent Fraction

Make an equivalent fraction out of 100.

\( \frac{1}{20} = \frac{5}{20} \) or 0.05.
b) \( \frac{71}{200} \)

**Solution**

*Method 1: Divide*

To find a decimal, divide the numerator by the denominator.

\[
\frac{71}{200} = \frac{71 \div 200}{200} = \frac{71}{200}
\]

To change the decimal to a percent, multiply by 100.

\[
\frac{71}{200} \times 100 = \frac{71 \times 100}{200} = \frac{7100}{200} = \frac{355}{100} = 35.5\%
\]

So, \( \frac{71}{200} = 35.5\% \) or 0.355.

*Method 2: Make an Equivalent Fraction*

Make an equivalent fraction out of 100.

\[
\frac{71}{200} = \frac{71 \div 2}{200 \div 2} = \frac{35.5}{100} = 35.5\%
\]

c) \( \frac{5}{4} \)

**Solution**

*Method 1: Divide*

To find a decimal, divide the numerator by the denominator.

\[
\frac{5}{4} = \frac{5 \div 4}{4} = \frac{1.25}{4}
\]

To change the decimal to a percent, multiply by 100.

\[
\frac{1.25}{4} \times 100 = \frac{125}{4} = 31.25\%
\]

*Method 2: Use Mixed Numbers*

\[
\frac{5}{4} = \frac{4 + 1}{4} = 1 + \frac{1}{4}
\]

One whole is 100%, and you know that \( \frac{1}{4} \) is 25%.

\[
100\% + 25\% = 125\%
\]

So, \( \frac{5}{4} \) is 125%.
### Show You Know

Change each fraction to a decimal and a percent.

<table>
<thead>
<tr>
<th></th>
<th>Decimal</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a)</strong></td>
<td>(\frac{171}{300})</td>
<td>(\frac{171}{300} \div 3 = \frac{171}{100}) or (\frac{171}{300} \div 3 = %)</td>
</tr>
<tr>
<td><strong>b)</strong></td>
<td>(\frac{3}{40})</td>
<td>(\frac{3}{40} \times 2.5 = %)</td>
</tr>
<tr>
<td><strong>c)</strong></td>
<td>(\frac{12}{10})</td>
<td>(\frac{10}{10} + \frac{2}{10} = % + %) or (\frac{10}{10} + \frac{2}{10} = %)</td>
</tr>
</tbody>
</table>
Working Example 2: Convert Decimals to Percents and Fractions

Change each decimal to a percent and a fraction.

a) 3.26

Solution

Shade 3 full hundred grids plus 26 squares.

\[
3.26 = \frac{326}{100} = 326\%
\]

Use place values to show 3.26 as a fraction.

The 6 is in the hundredth place, so the fraction is \(\frac{26}{100}\).

\[
\frac{26}{100} = \frac{50}{50} = \frac{8}{8}
\]

So, 3.26 is 326% or \(\frac{8}{8}\).

b) 0.125

Solution

Multiply by 100 to write 0.125 as a percent: 0.125 \(\times 100 = \frac{125}{1000}\).

The 5 is in the thousandth place, so the fraction is \(\frac{125}{1000}\).

Write in lowest terms:

\[
\frac{125}{1000} = \frac{200}{200} = \frac{40}{40} = \frac{8}{8}
\]

So, 0.125 is 12.5% or \(\frac{8}{8}\).
Change each decimal to a percent and a fraction. Write the fraction in lowest terms.

a) 0.56

Percent: ___________

Fraction: \[
\frac{\text{\phantom{0}0\phantom{0}}}{100} \rightarrow \frac{\text{\phantom{0}0\phantom{0}}}{50}
\]

So, 0.56 is ______ % or \( \frac{\phantom{1}2}{\phantom{1}5} \).

b) 3.98

Percent: ___________

Fraction: \[
\frac{\text{\phantom{0}3\phantom{0}}}{100} \rightarrow \frac{\text{\phantom{0}3\phantom{0}}}{50}
\]

So, 3.98 is ______ % or \( \frac{\phantom{1}8}{\phantom{1}5} \).
Working Example 3: Convert Percents to Fractions and Decimals

Change each percent to a fraction in lowest terms and a decimal.

a) 160%

Solution

Write the percent as a fraction out of 100.

\[
\begin{align*}
\frac{160}{100} & \quad \div 10 \quad \div 2 \\
10 & \quad \quad 5
\end{align*}
\]

To find the decimal, divide the numerator by the denominator.

\[0.16 = \frac{160}{100} \div \frac{10}{2} = \frac{80}{10} = 8\]

So, 160% = \[\frac{8}{5}\] or 1.__________.

b) 0.35%

Solution

Divide by 100 to find the decimal: \[0.35 \div 100 = \frac{35}{100}\]

The 5 is in the ten thousandths place, so \[0.0035 = \frac{35}{10000}\].

\[
\begin{align*}
\frac{0.35}{100} & \quad \times 100 \quad \div 5 \\
\frac{35}{10000} & \quad 10000 \quad \quad \end{align*}
\]

So, 0.35% = \[\frac{35}{10000}\] or 0.__________.
c) \(8 \frac{1}{2}\%\)

**Solution**

Write \(8 \frac{1}{2}\%\) as \(8\% + \frac{1}{2}\%\).

To find the decimal, write each percent as a decimal.

\[
8\% = \frac{8}{100} \quad \frac{1}{2} = 0.5
\]

\[
= 8 \div 100 \quad \text{So, } \frac{1}{2}\% = 0.5\%
\]

\[
= \frac{0.5}{100}
\]

\[
= 0.5 \div 100
\]

\[
= \frac{0.5}{100}
\]

\[8 \frac{1}{2}\% \text{ as a decimal is } \frac{0.5}{100} + 0.005 = \frac{85}{1000}
\]

Use the decimal to make the fraction: the 5 is in the thousandths place, so \(0.085 = \frac{85}{1000}\).

Write the fraction in lowest terms.

\[
\frac{85}{1000} \div 5
\]

\[
\frac{85}{1000} = \frac{17}{200}
\]

\[
\div 5
\]

So, \(8 \frac{1}{2}\% = \frac{17}{200}\) or 0.085.
### Change each percent to a decimal and a fraction.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) 750%</strong></td>
<td><img src="https://via.placeholder.com/150" alt="Diagram" /></td>
</tr>
</tbody>
</table>

\[
\begin{align*}
750\% &= \frac{750}{100} \\
\frac{750}{100} &= 7.50 \\ 
\frac{7.50}{10} &= 0.75 \\
\frac{0.75}{5} &= 0.15
\end{align*}
\]

| **b) 0.3%** | ![Diagram](https://via.placeholder.com/150) |

\[
\begin{align*}
0.3\% &= \frac{0.3}{100} \\
\frac{0.3}{100} &= 0.003 \\
\frac{0.003}{10} &= 0.0003 \\
\frac{0.0003}{5} &= 0.00006
\end{align*}
\]

| **c) 15\frac{1}{4}%** | ![Diagram](https://via.placeholder.com/150) |

\[
\begin{align*}
15\frac{1}{4}\% &= \frac{15\frac{1}{4}}{100} \\
\frac{15\frac{1}{4}}{100} &= \frac{61}{400} \\
\frac{61}{400} &= 0.1525 \\
\frac{0.1525}{25} &= 0.0061 \\
0.0061 &= 0.0061 \% \\
0.0061 &= \frac{61}{10000} \\
\frac{61}{10000} &= 0.0061 \%
\end{align*}
\]

Use the decimal to make the fraction.
Working Example 4: Determine a Percent

The north magnetic pole is moving across the Canadian Arctic. It used to travel at an average speed of 10 km/year. It now travels at 50 km/year.

**north magnetic pole**
- the location on Earth’s surface where the magnetic field points straight downward
- located near the North Pole

a) What percent is the current speed of the original speed?

**Solution**

The current speed is _______ km/year.

The original speed is _______ km/year.

Divide to find what percent the current speed is of the original speed.

\[
\frac{\text{current speed}}{\text{original speed}} = \text{decimal}
\]

One whole means 100%, so 5 means _______%

The current speed is _______% of the original speed.

b) The circumference of Earth is about 40 000 km. At 50 km/year, what percent of Earth’s circumference will the pole move in 1 year?

\[
\frac{\text{distance pole moves in 1 year}}{\text{Earth’s circumference}} = \text{decimal} \quad \left(\frac{50}{40 000}\right)
\]

= _______%

Multiply the decimal by 100.

At 50 km/year, the North Pole will move across 0.125% of Earth’s circumference in 1 year.
Suppose that the speed at which the north magnetic pole is moving changed to 75 km/year.

a) What percent is 75 km/year of the original speed? The original speed was 10 km/year.

\[
\begin{align*}
\text{current speed} & \quad \text{original speed} \\
\hline
\text{current speed} & \quad \text{original speed} \\
\hline
= \quad & \quad \text{decimal} \\
= \quad & \quad \text{percent} \\
\end{align*}
\]

Sentence: _____________________

_____________________________

b) At 75 km/year, what percent of 40 000 km would the pole move in 1 year?

\[
\begin{align*}
\frac{40 000}{\text{current speed}} & = \text{decimal} \\
= \text{percent} \\
\end{align*}
\]

Sentence: _____________________

_____________________________

Communicate the Ideas

1. Kaitlyn and Jordan are converting 0.003 to a percent.

Kaitlyn says: 0.003 = 3%  
Jordan says: 0.003 = 0.3%

Who is correct? Circle KAITLYN or JORDAN. Show how you know.


2. Do \( \frac{60}{25} \) and 2.4 have the same value? Circle YES or NO.

Give 1 reason for your answer.

_____________________________________________

____________________________

_____________________________________________

____________________________
3. Write each fraction as a decimal and a percent.

<table>
<thead>
<tr>
<th></th>
<th>Decimal</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) (\frac{22}{200})</td>
<td>(\frac{22}{200} \div 2)</td>
<td>(\frac{22}{100} = \frac{\boxed{______}}{\boxed{______}})</td>
</tr>
<tr>
<td>b) (\frac{51}{30})</td>
<td>(\frac{51}{30} \div 2)</td>
<td>(\frac{51}{60} = \frac{\boxed{______}}{\boxed{______}})</td>
</tr>
</tbody>
</table>

4. Write each decimal as a percent and a fraction. Write the fraction in lowest terms.

<table>
<thead>
<tr>
<th></th>
<th>Percent</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 0.56</td>
<td>(0.56 \times 100 = \boxed{______}%)</td>
<td>(\boxed{______} \div \boxed{______} = \boxed{______})</td>
</tr>
<tr>
<td>b) 1.5</td>
<td>(1.5 \times 100 = \boxed{______}%)</td>
<td>(\frac{______}{100} = \boxed{______})</td>
</tr>
</tbody>
</table>

5. Write each percent as a decimal and a fraction. Write the fraction in lowest terms.

<table>
<thead>
<tr>
<th></th>
<th>Decimal</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 0.6%</td>
<td>(\frac{0.6}{100} = \boxed{______} \div \boxed{______})</td>
<td>(\boxed{______} \div \boxed{______} = \boxed{______})</td>
</tr>
<tr>
<td>b) 248%</td>
<td>(\boxed{______} \div \boxed{______})</td>
<td>(\boxed{______} \div \boxed{______} = \boxed{______})</td>
</tr>
</tbody>
</table>
6. Write the percent as a decimal and a fraction. Write the fraction in lowest terms.

<table>
<thead>
<tr>
<th>Percent</th>
<th>Decimal</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>5\frac{8}{10}%</td>
<td>$5% = \frac{5}{100}$</td>
<td>$\frac{5}{100} \div 100 = \frac{5}{100}$</td>
</tr>
<tr>
<td>$8% = \frac{8}{100}$</td>
<td>$\frac{8}{100} \div 100 = \frac{8}{100}$</td>
<td>$5\frac{8}{10}% = \frac{5}{100} + \frac{8}{10}$</td>
</tr>
</tbody>
</table>

7. Write the shaded part of each diagram as a fraction, a decimal, and a percent.

a) Fraction: \(\frac{\text{number of shaded squares}}{\text{total number of squares}}\)

Decimal: \(\frac{\text{number of shaded squares}}{\text{total number of squares}}\) = 

Percent: \(\times 100 = \%\)

b) Fraction:

Decimal:

Percent:
8. A miner found 12 g of gold in a 2500-g sample of ore.
What percent of the sample is gold?

\[
\frac{\text{grams of gold}}{\text{grams of ore}} = \underline{\ \ \ \ \ \ } \\
= \underline{\ \ \ \ \ \ } \leftarrow \text{decimal}
\]

\[
= \underline{\ \ \ \ \ \ } \% \quad \text{Multiply by 100 to find the percent.}
\]

Sentence: ____________________________

9. A snack has 0.9 g of fat.
If you ate a total of 40 g of fat during the day, what percent of fat is the snack?

\[
\frac{0.9}{40} = \underline{\ \ \ \ \ \ } \leftarrow \text{decimal}
\]

\[
= \underline{\ \ \ \ \ \ } \leftarrow \text{percent}
\]

Sentence: ____________________________________

10. Several years ago, Claire bought a comic book for $10.
The comic’s value now is $200.
What percent is the value now of the price several years ago?

\[
\frac{\text{value now}}{\text{original price}} = \underline{\ \ \ \ \ \ } \\
= \underline{\ \ \ \ \ \ } \leftarrow \text{decimal}
\]

\[
= \underline{\ \ \ \ \ \ } \leftarrow \text{percent}
\]

_____________________________________________
**MATH LINK**

Change the percents in the circle graph to decimals and fractions. Write your fractions in lowest terms.

<table>
<thead>
<tr>
<th>Earth’s Fresh Water</th>
<th>Percent</th>
<th>Decimal</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glaciers</td>
<td>68.9%</td>
<td>$68.9 \div 100$</td>
<td>$\frac{689}{1000}$</td>
</tr>
<tr>
<td>Groundwater</td>
<td>30.8%</td>
<td>$30.8 \div 100$</td>
<td>$\frac{308}{1000}$</td>
</tr>
<tr>
<td>Lakes and rivers</td>
<td>0.3%</td>
<td>$0.3 \div 100$</td>
<td>$\frac{3}{1000}$</td>
</tr>
</tbody>
</table>
4.3 Warm Up

1. Complete the factors for each number.
   a) \[ \begin{array}{c}
   \underline{200} \\
   2 \times \underline{\phantom{00}} \\
   \underline{200} \\
   5 \times \underline{\phantom{00}} \\
   \underline{200} \\
   10 \times \underline{\phantom{00}} \\
   \underline{200} \\
   50 \times \underline{\phantom{00}} \\
   \end{array} \]
   b) \[ \begin{array}{c}
   \underline{150} \\
   3 \times \underline{\phantom{00}} \\
   \underline{150} \\
   5 \times \underline{\phantom{00}} \\
   \underline{150} \\
   10 \times \underline{\phantom{00}} \\
   \underline{150} \\
   50 \times \underline{\phantom{00}} \\
   \end{array} \]

2. Change each percent to a decimal. \[ \text{Divide by 100.} \]
   a) \(55\% = \underline{\phantom{00}}\)  
b) \(200\% = \underline{\phantom{00}}\)  
c) \(140\% = \underline{\phantom{00}}\)  
d) \(6\% = \underline{\phantom{00}}\)  

3. Divide.
   a) \(1.5 \div 100 = \underline{\phantom{00}}\)  
b) \(0.55 \div 100 = \underline{\phantom{00}}\)  
c) \(20.35 \div 100 = \underline{\phantom{00}}\)  
d) \(3.75 \div 100 = \underline{\phantom{00}}\)

4. Write each percent as a decimal.
   a) \(\frac{1}{4}\% = \underline{\phantom{00}}\)  
   \[= 0.\underline{\phantom{00}}\%\]  
   \[= 0.\underline{\phantom{00}}\div 100\]  
   \[= 0.\underline{\phantom{00}}\]  
   b) \(\frac{1}{2}\% = \underline{\phantom{00}}\)  
   \[= 0.\underline{\phantom{00}}\%\]  
   \[= 0.\underline{\phantom{00}}\div 100\]  
   \[= 0.\underline{\phantom{00}}\]  
   c) \(\frac{3}{4}\% = \underline{\phantom{00}}\)  
   d) \(\frac{3}{5}\% = \underline{\phantom{00}}\)

5. Fill in the blanks.
   a) Half of 60 is \underline{\phantom{00}}
   b) Double 25 is \underline{\phantom{00}}
   c) \(1000 \div 10 = \underline{\phantom{00}}\)
   d) \(10000 \div 10 = \underline{\phantom{00}}\)
4.3 Percent of a Number

**Working Example 1: Use Mental Math to Find the Percent of a Number**

Use mental math to find each percent.

a) 150% of $5

*Solution*

a) $150\% = 100\% + 50\%$.

100% of 5 = 5 50% of 5 = ______________

So, 150% of $5$ is ______________ + ______________ = ______________.

b) 0.1% of $1000$

*Solution*

Divide by 10s until you get to 0.1%.

100% of 1000 = 1000

10% of 1000 = ______________

1% of 1000 = ______________

0.1% of 1000 = ______________

So, 0.1% of $1000$ is $____________$.

c) $1\frac{1}{2}\%$ of $200$

*Solution*

Divide by 10s until you get to 1%:

100% of 200 = ______________

10% of 200 = ______________

1% of 200 = ______________

$1\frac{1}{2}\% = 1\% + \frac{1}{2}\%$. If 1% is 2, then $\frac{1}{2}\%$ is half of 2.

$2 + ______________ = ______________$

So, $1\frac{1}{2}\%$ of $200$ is ______________.
Use mental math to find each percent.

a) 350% of $10

350% = 100% + 100% + __________% + __________%

100% of $10 is __________

50% of $10 is 10 ÷ 2 = __________

So, 350% of $10 is _________ + _________ + _________ + _________ = ________.

b) 0.1% of $5000

100% of 5000 is __________

10% of 5000 is __________

1% of 5000 is __________

0.1% of 5000 is __________

So, 0.1% of $5000 is __________.

c) $2\frac{1}{10}$% of $2000

100% of $2000 is __________

10% of $2000 is __________

1% of $2000 is __________

2% of $2000 is __________ Think: 1% + 1% = 2%.

$\frac{1}{10}$% of $2000$ is __________ Think: $\frac{1}{10}$ is 1% divided by 10.

So, $2\frac{1}{10}$% of $2000$ is __________.
Working Example 2: Calculate the Percent of a Number

a) A survey showed $\frac{1}{4}$% of 800 students use inline skates to get to school.
   How many students skate to school?

Solution

Find $\frac{1}{4}$% of 800.
Change the fractional percent to a decimal.
$\frac{1}{4}$ % = $1 \div 4$

= 0._________%

To write the percent as a decimal, divide by 100.
0.25% = 0.25 ÷ 100

= __________

0.0025 × 800 = ___________  

So, ___________ students use inline skates to get to school.

b) $30\frac{3}{4}$% of 400 students surveyed said they own a cell phone.
   How many students own a cell phone?

Solution

Find $30\frac{3}{4}$% of 400.
$\frac{3}{4}$ % = $3 \div 4$

= 0._________%

So $30\frac{3}{4}$% = 30.75%.
To write the percent as a decimal, divide by 100.
30.75 ÷ ____________ = ____________

To find the number of students, multiply by 400.

___________ × 400 = ____________  

So, ____________ of the 400 students own a cell phone.
c) You have $40.12 in a savings plan. At the end of 1 year, you will have 120% of what you started with. How much money will you have at the end of 1 year?

**Solution**

Find 120% of $40.12.
To change to a decimal, divide by 100: $120 \div 100 = \underline{\hspace{2cm}}$

Now, multiply by $40.12.
\[ \text{1.2 of } 40.12 = 1.2 \times 40.12 \]

\[ = \underline{\hspace{2cm}} \]

You will have $\underline{\hspace{2cm}}$ in your savings plan at the end of 1 year.

**Show You Know**

Find the percent of each number.

a) 160% of $53.27

\[ 160\% = \underline{\hspace{2cm}} \div 100 \]
\[ = \underline{\hspace{2cm}} \quad \leftarrow \text{decimal} \]

\[ 160\% \text{ of } 53.27 \]
\[ \underline{\hspace{2cm}} \times 53.27 = \underline{\hspace{2cm}} \]

b) \( \frac{3}{4} \) % of 135

\[ \frac{3}{4} \% = \frac{3}{4} \]
\[ = 0.\underline{\hspace{2cm}}\% \]
\[ = \underline{\hspace{2cm}}\% \div 100 \]
\[ = \underline{\hspace{2cm}} \quad \leftarrow \text{decimal} \]

\[ \frac{3}{4} \% \text{ of } 135 \]
\[ \underline{\hspace{2cm}} \times 135 = \underline{\hspace{2cm}} \]

c) \( \frac{57}{10} \) % of 500

\[ \frac{57}{10} \% = 55.\underline{\hspace{2cm}}\% \]
\[ = 55.\underline{\hspace{2cm}}\% \div 100 \]
\[ = \underline{\hspace{2cm}} \]

\[ \frac{57}{10} \% \text{ of } 500 \]
\[ \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \]

d) \( 1 \frac{1}{4} \) % of 60

\[ 1 \frac{1}{4} \% = 1.25\% \]
\[ = 1.25\% \div 100 \]
\[ = \underline{\hspace{2cm}} \]

\[ 1 \frac{1}{4} \% \text{ of } 60 \]
\[ \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \]
Communicate the Ideas

1. Write steps to show how to find 300% of 40 using mental math.
   
   **Step 1:**
   
   **Step 2:**

2. One of your classmates missed class. Describe how to find 6% of 120.
   
   **Step 1:** Write the percent as a fraction.
   
   **Step 2:** Change the ______________ to a _______________.
   
   **Step 3:** Multiply the ______________ by ________________.
   
   The answer is ____________.

Check Your Understanding

Practise

3. Use mental math to find each answer.
   
   a) 300% of 2000
   
   300% = 100% + 100% + ______________
   
   100% of 2000 is ______________
   
   300% of 2000 = ______________ + ______________ + ______________
   
   = ______________

   b) 0.1% of 40
   
   100% of 40 is ______________
   
   10% of 40 is ______________
   
   ______________% of 40 is ______________
   
   0.1% of 40 is ______________
4. Find the answer using mental math.
   a) 10% of 60

   b) 250% of 400
      
      \[
      250\% = 100\% + \_ + \_
      \]
      
      \[
      100\% \text{ of } 400 = \_ \quad 50\% \text{ of } 400 = \_
      \]
      
      \[
      \_ + \_ + \_ = \_
      \]
      
      250% of 400 is \_

Apply

5. The school sold 200 tickets for a draw.
   a) What is your chance of winning if you have 1 ticket? Write your answer as a percent.
      
      Sentence: \__________________________________________________________________________

   b) How many tickets would you need to buy to have a 2.5% chance of winning?
      
      \[
      2.5\% = 2.5 \div 100 \quad 2.5\% \text{ of } 200
      \]
      
      \[
      = \_ \quad \_ \times \_ = \_
      \]
      
      Sentence: \__________________________________________________________________________

6. Mount Logan in Yukon Territory is 159% as high as Mount Columbia in Alberta.
   If Mount Columbia is 3747 m, how high is Mount Logan?

   Find 159% of 3747 m.
      
      Sentence: \__________________________________________________________________________
7. When water freezes, its volume increases by about 10%.
   If you have 750 mL of water, how much will you have after it freezes?
   Find 10% of 750 mL.

   Add: 10% increase + 750 mL

   Sentence: ________________________________________________________________

8. The original price of a jacket was $84.00.
   The store manager reduced the price by 25%.
   By how much was the price reduced?

   Sentence: ________________________________________________________________

**MATH LINK**

Water conservation is very important to protect local supplies of fresh water.
Fresh water includes lakes, ponds, rivers, and streams.

a) List 3 ways that your home, school, or community could reduce the amount of water used.

1. ________________________________________________________________

2. ________________________________________________________________

3. ________________________________________________________________

b) Write a math problem about saving water by using 1 of your answers to part a).
   Then answer your problem.

   **Example:** If you usually shower for 10 min, what percent of water would you save by
   showering for 1 min less?

   \[
   \begin{align*}
   \text{1 min} & \quad \text{10 min} \\
   = 1 \div 10 & \\
   = 0.1 & \quad \text{To change to a percent, multiply by 100.}
   \end{align*}
   \]

   = 10%
4.4 Warm Up

1. To find the total cost of an item, add the price of the item plus the taxes.

\[
\text{Price} + \text{Tax} = \text{Total Cost}
\]

a) \$10.99 + \$1.32 = ____________

b) \$5.98 + \$0.78 = ____________

c) \$79.50 + \$7.95 = ____________

d) \$129.99 + \$16.90 = ____________

2. Find the percent of each number.

a) 12% of 84

\[0.12 \times 84 = \text{__________}\]

c) 20% of 250

d) 100% of 425

3. Subtract the decimals.

a) \$110.00 – \$12.50 = ____________

b) \$65.00 – \$25.00 = ____________

c) \$18.50 – \$5.75 = ____________

d) \$125.25 – \$35.85 = ____________

4. Write each percent as a decimal.

a) 12% = ____________%

b) 5% = ____________

c) 7% = ____________

d) 10% = ____________

e) 112% = ____________

f) 325% = ____________

5. Write each fraction as a percent.

a) \[\frac{19}{20} = \text{__________} \leftarrow \text{decimal} \rightarrow \]

\[= \text{__________} \times \text{__________} = \text{__________}\%\]
4.4 Combining Percents

Working Example 1: Combined Percents

Suppose GST is 5% and PST is 7%.
Calculate the total tax and total cost of a $250 sound system.

Solution

There are 3 ways to find the total tax and cost.

Method 1: Calculate the Taxes Separately

GST is 5%: Change the percent to a decimal.

\[ 5\% = 0.\overline{05} \]

To find the GST, multiply by the price.

\[ 0.05 \times 250 = \underline{12.50} \]

The GST is $\underline{12.50}.$

PST is 7%: Change the percent to a decimal.

\[ 7\% = \underline{0.07} \]

To find the PST, multiply by the price.

\[ \underline{0.07} \times 250 = \underline{17.50} \]

The PST is $\underline{17.50}.$

Total tax = GST + PST

\[ = \underline{12.50} + \underline{17.50} \]

\[ = \underline{30.00} \]

Total cost = cost of item + total tax

\[ = \$250 + \underline{30.00} \]

\[ = \underline{280.00} \]

The total cost of the sound system is $\underline{280.00}.$

PST means provincial sales tax. PST varies by province.
GST means goods and services tax. GST is the same across Canada.
Method 2: Combine the Tax Percents First

GST is 5% and PST is 7%.
The combined tax is 5% + 7% = 12%.

Change the percent to a decimal.

\[12\% = \frac{12}{100} \]

To find the total tax, multiply by the price.

\[0.12 \times 250 = \] $250

Total cost = cost of item + total tax

\[= 250 + \] $250

= $500

The total cost of the sound system is

$500.

Method 3: Combine the Cost and Tax Percents

The cost of the item is 100%.
The PST is 7%.
The GST is 5%.
Total of the percents = 100% + 7% + 5%

Change the percent to a decimal.

\[112\% = \frac{112}{100} \]

To find the total cost, multiply by the price.

\[1.12 \times 250 = \] $250

The total cost of the sound system is

$500.

A backpack costs $35.

a) Find the total cost of the backpack if GST is 5% and PST is 6%.

The total cost of the backpack is $[ ]

b) Use a different method to check your work.

The total cost of the backpack is $[ ].
Working Example 2: Percent of a Percent

Keifer wants to buy a goalie mask that costs $200. At Sports R Us, there is a 10% discount, and an additional 10% off the sale price. Sports Galore offers a 20% discount on all items. Which store has the best price? Show your work.

Solution

**Sports R Us:**
The first discount is 10% of $200.

\[
\text{Discount} = 0.1 \times 200 = 0.1 \times 200 = 20
\]

\[
\text{Sale price} = \text{price} - \text{discount} = 200 - 20 = 180
\]

The second discount is 10% of the sale price.

\[
\text{Second discount} = \text{decimal} \times \text{sale price} = 0.1 \times 180 = 18
\]

\[
\text{Final sale price} = \text{sale price} - \text{second discount} = 180 - 18 = 162
\]

The final sale price at Sports R Us is $162.

**Sports Galore:**
The discount is 20% of $200.

\[
20\% = \frac{20}{100} = 0.2
\]

\[
\text{Decimal} \times \text{price} = \text{discount} = 0.2 \times 200 = 40
\]

\[
\text{Price} - \text{discount} = \text{sale price} = 200 - 40 = 160
\]

The final sale price at Sports Galore is $160.

The sports store that has the best buy is **Sports Galore** because the sale price is $160.
An item costs $100. Which store has the better price?

Store A: 50% off

Store B: 25% off, then an additional 25% off the sale price

**Store A:**

50% of 100

\[
50\% = 50 \div 100
\]

\[
\text{Discount} = \text{decimal} \times \text{price}
\]

\[
= \frac{1}{2} \times 100
\]

\[
= 50
\]

Sale price = price – discount

\[
= 100 - 50
\]

\[
= 50
\]

**Store B:**

25% of 100

First discount = 25% × 100

Second discount = 25% of sale price

Final sale price =

Sentence: ________________________________

---

**Communicate the Ideas**

1. Explain how to calculate the cost of an item including the tax in 1 step.

________________________________________________________________________

________________________________________________________________________

2. Kyle says that a discount of 15%, then an additional discount of 10% on the sale price, is the same as 25% discount.

Is he correct? Circle YES or NO. Give 1 reason for your answer.

________________________________________________________________________

________________________________________________________________________
   Find the total cost, including 5% GST and 6% PST.

   The total cost of the DVD is ____________.

   Find the total cost, including 5% GST and 7% PST.

   The total cost of the binder and math set is ____________.

5. Complete the table. Use 5% GST and 6% PST.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>GST 5%</th>
<th>PST _____</th>
<th>Total Tax</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Boots</td>
<td>$119.99</td>
<td>$119.99 \times 0.05</td>
<td>$119.99 \times _____</td>
<td>GST + PST</td>
<td>Price + Total Tax</td>
</tr>
<tr>
<td>b) Gloves</td>
<td>$39.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Pants</td>
<td>$89.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Helmet</td>
<td>$189.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Jasmine wants to buy a CD player that costs $85.00. The store has a sale: 50\% off the original price the first week. If it is not sold out: 10\% off the sale price the second week. How much is the CD player after the second week?

50\% of $85

\[ \text{Discount} = 50\% \text{ of } 85 \]
\[ = \frac{50}{100} \times 85 \]
\[ = 42.5 \]

Sale price = price – discount

\[ = 85 - 42.5 \]
\[ = 42.5 \]

Second discount = 10\% of sale price

\[ = \frac{10}{100} \times 42.5 \]
\[ = 4.25 \]

Final sale price = sale price – second discount

\[ = 42.5 - 4.25 \]
\[ = 38.25 \]

Sentence: 

7. Last year, the car Arjay wanted to buy cost $23 000. One year later, the cost increased by 3.2\%. What is the price of the car now?

Sentence: 

Apply
8. What is the total cost of 4 tires that sell for $85 each, plus 5% GST and 1.5% environment tax?

Cost of 4 tires

\[ \text{Cost of 4 tires} = 4 \times 85 \]

\[ = 340 \]

Total cost:

Sentence: __________________________________________________________________________

**MATH LINK**

a) A regular toilet uses 6 L of water per flush.
   If you flush the toilet 30 times a day, how much water are you using every day?

\[ \text{L per flush} \times \text{times} \]

\[ = \text{L} \]

Sentence: __________________________________________________________________________

b) A dripping faucet wastes about 25 L of water each day.
   What percent of the water used by the toilet in part a) is wasted by the dripping faucet?

\[ \frac{\text{dripping faucet}}{\text{toilet flush}} = \frac{25 \text{ L}}{\text{L}} \]

\[ = \text{L} \]

\[ = \text{L} \]

\[ = \% \]

Sentence: __________________________________________________________________________
4 Chapter Review

Key Words
For #1 to #3, unscramble the letters. Use the clues to help you.

1. PCEERNT
   ______________________ means out of 100.

2. FIONAARTCL
   A ______________________ percent is a percent that is less than 1%.

3. CIMBOEND
   Percents that are added together are called ______________________ percents.

4.1 Representing Percents, pages 166–171

4. How many hundred grids are needed to show each percent?
   a) 55% ________
   b) 589% ________

5. What percent is shown in each diagram?
   a) ________
   b) ________

6. Use hundred grids to show each percent.
   a) 110% ________
   b) 3 \( \frac{7}{8} \) % ________
4.2 Fractions, Decimals, and Percents, pages 173–186

7. Write 0.115 as a percent and a fraction. Write the fraction in lowest terms.

Percent: $\frac{\phantom{1}115}{1000} \times 100 = \phantom{0}11.5\%$

Fraction: $\frac{115}{1000} \div \phantom{0} \times 100 = \phantom{0}11.5\%$

8. Write $\frac{3}{200}$ as a decimal and a percent.

Decimal: $\phantom{0}0.015$

Percent: $\frac{3}{200} \div \phantom{0} \times 100 = \phantom{0}1.5\%$

9. Write each percent as a decimal and a fraction in lowest terms.
   a) Sales increased by 140%.

   Decimal: $\phantom{0}1.4$

   Fraction: $\frac{14}{10} \div \phantom{0} \div \phantom{0} \div \phantom{0} \times 100 = \phantom{0}140\%$

   b) You can reduce harmful emissions by $\frac{9}{10}$% if you get your car tuned up.

   Decimal: $\phantom{0}0.9$

   Fraction: $\frac{9}{10} \div \phantom{0} \div \phantom{0} \div \phantom{0} \times 100 = \phantom{0}90\%$

   $0.\phantom{0}9\% \div 100 = \phantom{0}9\%$
4.3 Percent of a Number, pages 188–194

10. Find the percent of each number.

   a) 115% of 230

      Write 115% as a decimal: ____________

      ____________ \times \ _________ = \ _________\% \\

   b) 500% of 0.2

      500\% = 100\% + 100\% + \ _________ + \ _________ + \ _________

      100\% of 0.2 = \ _________

      500\% of 0.2 = \ _________ + \ _________ + \ _________ + \ _________ + \ _________ = \ _________

      or

      Write 500\% as a decimal: \ _________

      \ _________ \times \ _________ = \ _________

   c) \frac{1}{10}\% of 800

      \frac{1}{10}\% = 0.\ _________\%

      To write the percent as a decimal, divide by 100.

      \ _________\% = \ _________ + 100

      \ _________

      Multiply the decimal by 800.

      \ _________ \times 800 = \ _________
11. Julia borrowed $100 from her brother. He charged her 5% interest per month. How much does Julia owe her brother at the end of the month?

Interest = 5% of $100

= \frac{5}{100} \times 100

= \frac{5}{10} \times \frac{100}{10}

Amount owed = amount borrowed + interest

= 100 + \frac{5}{10} \times \frac{100}{10}

= 105

Sentence: ___________________________________________________________________

4.4 Combining Percents, pages 196–202

12. Cedarville had a population of 1200 people. During the last 2 years, its population has increased by 15%. What is the new population of Cedarville?

Sentence: ________________________________________________________________

13. The cost of an airline ticket is $289.50. Find the total cost after adding 5% GST, 7% PST, and 1% airport improvement tax.

Sentence: ___________________________________________________________________
4 Practice Test

For #1 to #4, circle the correct answer.

1. What is 0.035 as a percent?
   A 35%  B 3%  C 3.5%  D 0.35%

2. What is 135% as a decimal?
   A 0.135  B 1.35  C 13.5  D 135

3. What is 70% as a fraction?
   A \( \frac{35}{10} \)  B \( \frac{7}{50} \)  C \( \frac{7}{10} \)  D \( \frac{28}{50} \)

4. What is \( \frac{1}{8} \) as a percent?
   A 0.0125%  B 0.125%  C 1.25%  D 12.5%

For #5 and #6, complete the statements.

5. The hundred grids show ____________%.

   ![Hundred grids]

6. The hundred grid shows ____________%.

   ![Hundred grid]
Short Answer

7. Use hundred grids to show each percent.

   a) 102%  
   
   b) 40%  
   
   c) 0.1%  
   
   d) 11\frac{1}{4}%  

8. Change each of the following:

   a) 15% to a decimal and a fraction in lowest terms

      Decimal: \[ \frac{\text{ } }{\text{ }} \div \frac{\text{ } }{\text{ }} = \frac{\text{ } }{\text{ }} \]

      Fraction: \[ \frac{\text{ } }{\text{ }} = \frac{\text{ } }{\text{ }} \]

   b) \[ \frac{13}{25} \] to a decimal and a percent

      Decimal: \[ \frac{\text{ } }{\text{ }} \div \frac{\text{ } }{\text{ }} = \frac{\text{ } }{\text{ }} \]

      Percent: \[ \frac{\text{ } }{\text{ }} \div \frac{\text{ } }{\text{ }} = \frac{\text{ } }{\text{ }} \]

   c) 1.24 to a percent and a fraction in lowest terms

      Percent: \[ \frac{\text{ } }{\text{ }} \]

      Fraction: \[ \frac{\text{ } }{\text{ }} \]
9. Helen bought a scooter for $64.98 plus 5% GST and 7% PST.
   
a) How much tax did she pay?

   Sentence: __________________________________________________________

b) What was the total price of the scooter?

   Sentence: __________________________________________________________

10. A town’s population is 50 000.
    The population increased by 0.7% in 1 year.

a) How much was the increase in population?

   Sentence: __________________________________________________________

b) What was the population after 1 year?

   Sentence: __________________________________________________________
Use the information that you have learned in the Math Links in this chapter to create a water conservation plan.

**conservation plan**
- a way to protect and save natural resources so they are not wasted

1. Fill in the table.

   a) Think of 3 ways you could conserve water.
   b) How much water do you use now?
   c) How much water would you use after you start conserving it?
   d) How much water would you save?
   e) What percent of water would you save?
   f) Find the total of each column.

<table>
<thead>
<tr>
<th>Way to Conserve Water</th>
<th>Water Used Now</th>
<th>Water Used After</th>
<th>Water Saved</th>
<th>Percent Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: flushing toilet less</td>
<td>6 L/flush × 30 = 180 L</td>
<td>6 L/flush × 28 = 168 L</td>
<td>180 – 168 = 12 L</td>
<td>12 saved (\frac{12}{180} \times 100% = 6.6%)</td>
</tr>
</tbody>
</table>

2. On a separate piece of paper, write a newspaper article or draw a cartoon strip about your Water Conservation Plan. Or, think of another way to show your plan.

   How will you show your plan? ________________________________

Conserve means save.
Key Word Builder

Across

1. A percent that includes part of a percent.

4. The number of squares on a grid to show percent.

6. Goods and Services Tax


8. Means out of 100.

9. Provincial Sales Tax

Down

2. Several percents put together to solve problems.

3. Amount added to the price to get total cost.

5. Percent off the regular price.
Math Games

Number Match

In this card game, players take turns flipping cards until they find a match. There are 40 cards with whole numbers, decimals, fractions, and percents. You need to figure out matching values written in different forms.

For example, $\frac{6}{5}$, $\frac{12}{10}$, 1.2, and 120% all have the same value.

Rules:

• Play the game with a partner.
• Choose 1 card from the deck. Whoever has the highest value deals first.
• One player shuffles the cards and deals all the cards face down.
• Each player should have a stack of 20 cards.
• Players flip the top card from their stack, so both players can see.
• Check if the 2 cards have the same value.
  Change 1 or both of the values to a fraction, decimal, or percent, or do some calculations to compare.
• If the cards have the same value, say “match.” The first player to say “match” wins all the flipped cards. These cards go to the bottom of the stack.
• If a player says “match” when the cards do not have the same value, then the other player gets all the flipped cards.
• If the cards do not match, continue to play by flipping another card.
• The game is over when 1 player no longer has any cards, or after a set time. The player with the most cards wins.
Challenge in Real Life

The Buying and Selling Game

People buy and sell things every day. In this challenge, you will be both the seller and the buyer.

Sellers

1. Choose 2 items to sell.

2. On a separate sheet of paper, make an advertisement to show what items you are selling.
   • Draw a picture and give a price for each item. GST and PST will be added to the price later.

3. Complete the record sheet to keep track of your sales.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>GST</th>
<th>PST</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Buyers

You want to spend as close to $100 as you can, without going over $100.

4. Choose at least 3 different items from the advertisement below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backpack</td>
<td>$24.99</td>
</tr>
<tr>
<td>Calculator</td>
<td>$12.98</td>
</tr>
<tr>
<td>Lock</td>
<td>$5.40</td>
</tr>
<tr>
<td>Music CD</td>
<td>$19.99</td>
</tr>
<tr>
<td>Running Shoes</td>
<td>$42.99</td>
</tr>
<tr>
<td>Pencil Sharpener</td>
<td>$1.25</td>
</tr>
</tbody>
</table>

5. On a separate sheet of paper, create a table with columns like the one shown below. Keep a record of each item you buy in the table below. Calculate the total cost of each item.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>GST</th>
<th>PST</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Keep a running total of the cost of your items. Remember not to go over $100.
Chapters 1–4 Review

Chapter 1 Representing Data

1. Five hundred people were asked what types of food they liked. They were allowed to give more than 1 answer.

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal</td>
<td>325</td>
</tr>
<tr>
<td>Chinese</td>
<td>400</td>
</tr>
<tr>
<td>French</td>
<td>250</td>
</tr>
<tr>
<td>Italian</td>
<td>450</td>
</tr>
</tbody>
</table>

a) What symbol(s) would you use in a pictograph?

__________________________

b) How many votes would each symbol represent?

__________________________

c) Draw a pictograph using the data from the table.

2. Eighty grade 8 students named 1 item they would want to take on a long trip. The pictograph shows the results.

a) Describe how this graph is misleading.

__________________________

__________________________

__________________________

b) Draw a bar graph to display the data.

☐ Give the graph a title.
☐ Label the x-axis “Types of Items.” Mark your intervals.
☐ Label the y-axis “Number.” Mark your intervals.
☐ Draw bars.

c) What is 1 advantage of using a bar graph to show the data?

__________________________
3. Silvio recorded his pulse for 5 minutes while he was riding his bike. The table shows his results.

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Rate (beats per min)</td>
<td>65</td>
<td>78</td>
<td>92</td>
<td>110</td>
<td>110</td>
<td>112</td>
</tr>
</tbody>
</table>

a) What kind of graph should Silvio use to show his pulse rate?

b) Make a graph to show the data in Silvio’s table.
   - Give the graph a title.
   - Label the x-axis “Time (min).”
     - Mark your intervals by 1 s.
   - Label the y-axis “Pulse Rate.”
     - Mark your intervals by 5 s.
   - Draw your graph.

c) What conclusion can you make from your graph?

   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

d) Write 1 advantage of using the type of graph you made.

   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

e) Name another type of graph you could use to show Silvio’s information.

   ______________________________
Chapter 2 Ratios, Rates, and Proportional Reasoning

4. There are 32 students in a class. Three eighths of the students are boys.

   a) How many students are boys?

   \[ \times \quad \frac{3}{8} = \frac{32}{x} \]

   _______ students are boys.

   b) How many students are girls?

   _______ students are girls.

   c) What is the ratio of girls to total students? Write the ratio as a fraction and a percent.

   \[ \frac{\text{girls}}{\text{total # of students}} = \frac{\_}{\_} \]

   = \_

   = \_

   d) What is the ratio of girls to boys? Use ratio notation.

   _______ students are boys.

5. Use a proportion to solve each question.

   a) Three lemons cost 96¢. How much is 9 lemons?

   \[ \times \quad \frac{0.96}{3} = \frac{c}{9} \]

   \[ c = \_ \]

   b) Jason is paid $25 for 4 h of babysitting. How much is he paid for 16 h of babysitting?
6. Two brands of noodles are shown.

   a) Calculate the unit price per 100 g for each brand. Round your answer to 2 decimal places.

   \[
   \text{Super Choice:} \\
   \text{Unit price} = \frac{\text{price}}{\# \text{ of grams}} \\
   = \frac{\$0.99}{700 \text{ g}} \\
   = \frac{700 \text{ g}}{100 \text{ g}} \\
   = 7 \\
   \]

   100 g of noodles cost ________.

   \[
   \text{Pasta Supreme:} \\
   1 \text{ kg} = 1000 \text{ g} \\
   1.25 \text{ kg} = \text{______} \text{ g} \\
   \]

   b) Which is the better buy? Circle SUPER CHOICE or PASTA SUPREME.

   c) Give 1 reason why estimating unit costs is useful when shopping.

---

Chapter 3 Pythagorean Relationship

7. A triangle has sides that measure 8 cm, 7 cm, and 9 cm. Prove this is not a right triangle by using the Pythagorean relationship. Show your work.

   \[
   \text{Step 1:} \text{ Find the areas of the 3 squares that can be drawn on each side of the triangle.} \\
   \]

   \[
   \begin{align*}
   \text{Square 1:} & \quad s = \_\_\_\_\_ \_ \\
   & \quad A = \_\_\_ \times \_\_\_ \\
   & \quad A = \_\_\_\_\_\_\_ \\
   & \text{The area is} \_\_\_\_\_\_ \text{ cm}^2. \\
   \text{Square 2:} & \quad \\
   \text{Square 3:} & \quad \\
   \end{align*}
   \]

   \[
   \text{Step 2:} \text{ Add the areas of the 2 smallest squares.} \\
   \]

   \[
   \text{Step 3:} \text{ Does the sum of the areas of the smaller squares equal the area of the bigger square? Circle YES or NO.}
   \]
8. Sarah has a rectangular field for her horses. She wants to put a new fence all around the field.

   a) Find the length of the missing side.

   \[ c^2 = a^2 + b^2 \]
   
   \[
   \begin{align*}
   c^2 & = a^2 + b^2 \\
   c^2 - b^2 & = a^2 \\
   \sqrt{c^2 - b^2} & = a
   \end{align*}
   \]

   Sentence: ____________________________________________________________________

   b) How much fencing will she need?
   Round your answer to 1 decimal place.

   Sentence: ____________________________________________________________________

   c) Fencing costs $15/m.
   What is the total cost of the fencing before tax?

   Sentence: ____________________________________________________________________

Chapter 4 Understanding Percent

9. What percent does the diagram show? A completely shaded diagram shows 100%.

   ________ shaded squares ________ shaded squares  

   Total shaded squares = ________________%
10. In a recent survey, $\frac{1}{10}$% of people liked Brussels sprouts.

a) Write this percent as a decimal and a fraction.

\[
\begin{align*}
\text{Decimal:} & \quad \text{Fraction:} \\
\frac{1}{10} \% = & \quad 0.\text{__________} \% \\
= & \quad \frac{\text{__________}}{100} \\
= & \quad \text{__________}
\end{align*}
\]

b) If 9000 people were surveyed, how many people like Brussels sprouts?

\[
\begin{align*}
\frac{1}{10} \% \text{ of 9000} & \quad \text{Use your decimal answer from part a).} \\
= & \quad \frac{\text{__________}}{100} \times 9000 \\
= & \quad \text{__________}
\end{align*}
\]

Sentence: ___________________________________________________________________

11. A credit card charges 18% interest per year.
How much interest is charged on $150?

Sentence: ___________________________________________________________________

12. The cost of a CD is $10.99, plus 5% GST and 7% PST.
What is the total cost of the CD?

Sentence: ___________________________________________________________________
Task

Test the Efficiency of a Ramp

Engineers design and build bridges, roads, ramps, and much more. Your team’s task is to design a ramp that allows a vehicle to travel the farthest distance possible.

1. Make a platform at the height you want your ramp to start. Use the Task BLM to record the height (in cm).

2. Make a ramp for the vehicle to roll down. Record the length of the ramp.

3. a) Test your ramp by placing the vehicle at the top of the ramp and letting it go. Do not push it. b) Measure the distance the vehicle travelled (end of the ramp to where the vehicle stopped). c) Record the distance. Repeat parts a) and b) 3 times to get an average distance.

4. a) Change your ramp by either changing the height of the platform or changing the length of the ramp. b) Repeat #3 three times and record your results.

5. a) Which ramp allowed the vehicle to travel the farthest? ________________ b) Label the diagram with the measurements of this ramp.

\[ c^2 = a^2 + b^2 \]

\[ \frac{c}{b} = \text{height of ramp (a)} \]
\[ \text{length of ramp (b)} \]

Write this ratio as a percent. ____________

Materials
- Task BLM
- toy vehicle, such as Hot Wheels®
- books
- material to create ramp (smooth board or stiff cardboard)
- metre stick
- tape measure
Answers

Get Ready, pages 162–163

1. a) 25%  b) 89%

2. a) \[ \frac{1}{4} ; 0.25; 25% \]  b) \[ \frac{4}{5} ; 0.8; 80% \]

3. a) \[ \frac{1}{4} ; 0.25; 25% \]  b) \[ \frac{4}{5} ; 0.8; 80% \]

4. a) 0.3  b) 0.27

5. a) 50  b) 20

Math Link

a) There are 15 000 to 20 000 visitors every day in the summer.
b) no watering gardens and lawns; and no washing sidewalks, driveways, and vehicles
c) 0.05, 5%

4.1 Warm Up, page 165

1. a) 2%  b) 50%  c) 98%  d) 21%

2. a) \[ \frac{25}{100} \]  b) \[ \frac{7}{100} \]

3. a) \[ \frac{87}{100} \]  b) \[ \frac{95}{100} \]

4. a) 0.5  b) 0.25  c) 0.7  d) 0.75

5. a) \[ \frac{1}{2} \]  b) \[ \frac{1}{10} \]

4.1 Representing Percents, pages 166–171

Working Example 1: Show You Know

a) 248%  b) \[ \frac{4}{5} \]  c) 74\( \frac{8}{10} \)%; 74.8%

Working Example 2: Show You Know

a) \[ \frac{1}{2} \]  b) \[ \frac{1}{10} \]

Communicate the Ideas

1. Answers will vary. Examples:
a) \[ \frac{1}{2} ; 25% \]  b) \[ \frac{1}{10} ; 10% \]

c) \[ \frac{1}{2} ; 25% \]  b) \[ \frac{1}{10} ; 10% \]

Practise

2. a) 112%  b) \[ \frac{2}{10} \]  c) 282%

3. a) \[ \frac{1}{2} ; 25% \]  b) \[ \frac{1}{10} ; 10% \]

4. a) \[ \frac{2}{3} \]  b) \[ \frac{1}{5} \]

Apply

5. \[ \frac{2}{3} \]

6. Answers will vary. Example: The amount of water in the ocean compared to the amount of water in the lake.

7. 4 glasses

Math Link

4.2 Warm Up, page 172

1. a) 0.2  b) 0.75  c) 0.75  d) 0.6

2. a) 12%  b) 45%  c) 60%  d) 314%

3. a) \[ \frac{30}{100} \]  b) \[ \frac{9}{100} \]

4. a) 8  b) 70

5. a) hundredths  b) tenths  c) thousandths  d) thousandths

4.2 Fractions, Decimals, and Percents, pages 173–186

Working Example 1: Show You Know

a) 0.57; 57%  b) 0.075; 7.5%  c) \[ \frac{7}{15} \]

Working Example 2: Show You Know

a) 56%; \[ \frac{14}{25} \]

b) 398%; \[ \frac{199}{50} \]

Working Example 3: Show You Know

a) 7.5; \[ \frac{15}{2} \]  b) 0.003; \[ \frac{3}{1000} \]  c) 0.1525; \[ \frac{61}{400} \]

Working Example 4: Show You Know

a) 750%  b) 0.1875%

Communicate the Ideas

1. JORDON. He multiplied the decimal by 100.

2. YES. \( 60 \div 25 = 2.4 \)

Practise

3. a) 0.11; 11%  b) 1.7; 170%

4. a) 56%; \[ \frac{14}{25} \]  b) 150%; \[ \frac{3}{2} \]

5. a) 0.006; \[ \frac{3}{500} \]  b) 2.48; \[ \frac{62}{25} \]

6. 0.058; \[ \frac{29}{500} \]

7. a) \[ \frac{17}{25} ; 0.68 ; 68% \]  b) \[ \frac{9}{24} \] or \[ \frac{3}{8} ; 0.375 ; 37.5% \]

Apply

8. 0.48%

9. 2.25%

10. 2000%
4.3 Warm Up, page 187
1. a) 100; 40; 20; 4  b) 50; 30; 15; 3
2. a) 0.55  b) 2  c) 1.4  d) 0.06
3. a) 0.015  b) 0.0055  c) 0.2035  d) 0.0375
4. a) 0.0025  b) 0.005  c) 0.0075  d) 0.006
5. a) 30  b) 50  c) 100  d) 1000

4.3 Percent of a Number, pages 188–194

Working Example 1: Show You Know
a) $35  b) $5  c) $42

Working Example 2: Show You Know
a) $85.23  b) 1.0125  c) 279  d) 0.75

Communicate the Ideas
1. Step 1: Find 100% of 40. Step 2: Multiply by 3.
2. fraction; decimal; decimal; 120; 7.2

Practise
3. a) 0.015  b) 0.0055  c) 0.2035  d) 0.0375
4. a) 0.0025  b) 0.005  c) 0.0075  d) 0.006
5. a) 30  b) 50  c) 100  d) 1000

4.4 Combining Percents, pages 196–202

Working Example 1: Show You Know
$38.85

Working Example 2: Show You Know
Store A is offering the better price.

Practise
3. a) $22.19  b) $10.06
4. $38.25

5.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>GST 5%</th>
<th>PST 6%</th>
<th>Total Tax</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Boots</td>
<td>$119.99</td>
<td>6.00</td>
<td>7.20</td>
<td>13.20</td>
<td>133.19</td>
</tr>
<tr>
<td>b) Gloves</td>
<td>$ 39.99</td>
<td>2.00</td>
<td>2.40</td>
<td>4.40</td>
<td>44.39</td>
</tr>
<tr>
<td>c) Pants</td>
<td>$ 89.99</td>
<td>4.50</td>
<td>5.40</td>
<td>9.90</td>
<td>99.89</td>
</tr>
<tr>
<td>d) Helmet</td>
<td>$189.99</td>
<td>9.50</td>
<td>11.40</td>
<td>20.90</td>
<td>210.89</td>
</tr>
</tbody>
</table>

6. $38.25

Apply
7. $23 736
8. $362.10

Math Link
a) 180 L  b) 13.9%

Chapter Review, pages 203–206
1. percent  2. fractional  3. combined
4. a) 1  b) 6
5. a) 100%  b) 3 5%
6. a)  4  b) 3 7%
7. 11.5%; 23 200
8. 0.015; 1.5%
9. a) 1.4; 7 5  b) 0.009; 9 1000
10. a) 264.50  b) 1  c) 0.8
11. $105
12. 1380 people
13. $327.14

Practice Test, pages 207–209

5. 130%
6. 2 5%

Exercises
7. a) 0.15; 3 20  b) 0.52; 52%  c) 124%; 31 25
8. a) 1.4; 7 5  b) 0.009; 9 1000
9. a) $7.80  b) $72.78
10. a) 350 people  b) 50 350 people

Wrap It Up!, page 210
1. Answers will vary. Example:

<table>
<thead>
<tr>
<th>Way to Conserve Water</th>
<th>Water Used Now</th>
<th>Water Used After</th>
<th>Water Saved</th>
<th>Percent Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. low-flow toilet</td>
<td>6 L/flush × 30 = 180 L</td>
<td>2 L/flush × 30 = 60 L</td>
<td>180 – 60 = 120 L</td>
<td>66.7%</td>
</tr>
<tr>
<td>2. washing car less</td>
<td>10 L × 4/month = 40 L</td>
<td>10 L × 2/month = 20 L</td>
<td>40 – 20 = 20 L</td>
<td>50%</td>
</tr>
<tr>
<td>3. taking shorter showers</td>
<td>40 L × 1/day = 40 L</td>
<td>25 L × 1/day = 25 L</td>
<td>40 – 25 = 15 L</td>
<td>37.5%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>260 L</td>
<td>105 L</td>
<td>155 L</td>
<td>59.6%</td>
</tr>
</tbody>
</table>

2. Answers will vary.
Key Word Builder, page 211

Across
1. fractional percent  4. hundred  6. GST  7. double  8. percent  9. PST

Down
2. combined percent  3. tax  5. discount

Challenge in Real Life, pages 213
Answers will vary.

Chapters 1–4 Review, pages 214–219

1. a) Answers will vary. Example: I would use an apple.
   b) Answers may vary. Example: Each symbol represents 50 votes.
   c) Favourite Type of Food

Aboriginal
Chinese
French
Italian

2. a) This graph is misleading because all of the symbols are different sizes.
   b) A bar graph would make it easy to compare the numbers of items chosen.

3. a) line graph
   b) [Pulse Rate Graph]
   c) His pulse rate increased for the first 3 minutes and then levelled off.
   d) A line graph shows changes over time, so it shows how Silvio’s pulse rate changed over time.
   e) bar graph

4. a) 12  b) 20  c) $\frac{20}{32} = 62.5\%$  d) 20 : 12

5. a) $2.88$  b) $100$

6. a) Super Choice: $0.14$, Pasta Supreme: $0.10/100$ g  b) PASTA SUPREME  c) It can help you find the cheapest brand.

7. The two smaller areas add to 113 cm², which is greater than the area of the larger square of 81 cm².

8. a) 31.3 m  b) 118.6 m  c) $1779$

9. $125 \frac{1}{2}$

10. a) 0.001  b) $\frac{1}{1000}$  c) 9 people

11. $27.00$

12. $12.31$

Task, page 220
Answers will vary.