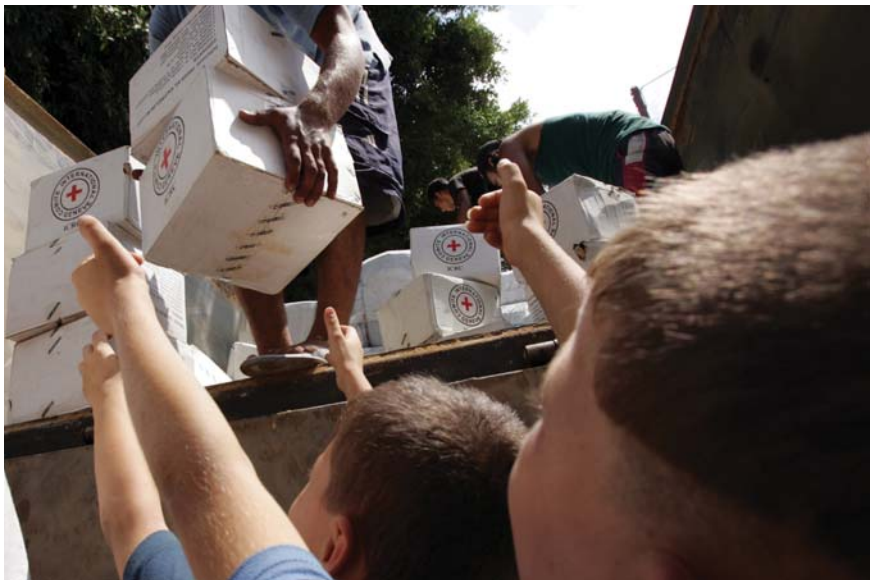
4.3 Percent of a Number



Focus on...

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

- ❑ solve problems that involve percents less than 1%
- ❑ solve problems involving percents greater than 100%
- ❑ solve problems involving fractional percents

Literacy Link

Profit is the amount of money left over after all expenses are paid.

You often use percents to make comparisons and help make decisions.

A fundraising team is raising money for a relief organization. The team wants to use their profits for several purposes.

How could the team use percents to decide how much money to donate for each purpose?

Explore the Math

How can you solve problems involving percents?

Last year the fundraising team ran a school store and made $50\frac{1}{2}\%$ profit. The school store usually has total sales of about $10 000 per year.

1. **a)** How much is 50% profit?
   b) How much is 1% profit?
   c) How much is $\frac{1}{2}\%$ profit?
   d) How much is $50\frac{1}{2}\%$ profit?

2. The committee wants to donate 10% of the store profits for providing food.
   a) What is 10% of the profit calculated in #1d)?
   b) How could you determine 10% of a number mentally? Explain.

3. The committee knows that access to clean drinking water is critical in preventing serious illness. They would like to donate 20% of their profits for providing clean drinking water. How could you determine 20% of the profits mentally using your answer to #2?

4. Oral rehydration therapy (ORT) is a simple yet inexpensive medicine designed to fight dehydration.

a) If it costs \$0.10 to prepare 1 L of ORT solution, how many litres of ORT can be prepared using the money from the $\frac{1}{2}$% portion of the store profits?

b) If the average adult needs about 4 L of ORT for adequate rehydration, how many adults can be treated using the $\frac{1}{2}$% profit?

Did You Know?

Oral rehydration therapy (ORT) is a mixture of water, salt, and sugar. It is used to restore necessary water content to people who have become dehydrated because of illness or a lack of proper drinking water. What do you think is the purpose of the salt and the sugar?

Reflect on Your Findings

5. How can you use mental math techniques to help you find the percent of a number?

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

Use mental math to determine each of the following.

a) 150% of \$5 **b)** 0.1% of \$1000 **c)** $1\frac{1}{2}$% of \$20 000

Solution

a) 150% is 100% + 50%.
100% of 5 is 5.
50% is half of 100%.

Use halving to find 50% of 5.
Half of 5 is 2.5.

150% of 5 is 5 + 2.5.
5 + 2.5 = 7.5

So, 150% of \$5 is \$7.50.

Literacy Link

Halve means divide by two.
Double means multiply by two.

Strategies

Look for a Pattern

b) To determine 0.1% of \$1000, divide repeatedly by tens.
100% of 1000 is 1000.
10% of 1000 is 100.
1% of 1000 is 10.
0.1% of 1000 is 1.

So, 0.1% of \$1000 is \$1.

You could also determine 1.5% of $20 000 as:
30% of 20 000 is 6000.
3% of 20 000 is 600.
1.5% of 20 000 is 300.

c) Divide repeatedly by tens to reach 1%, and then divide by two.
100% of 20 000 is 20 000.
10% of 20 000 is 2000.
1% of 20 000 is 200.
$\frac{1}{2}$% of 20 000 is 200 ÷ 2.
200 ÷ 2 = 100
$1\frac{1}{2}$% of 20 000 is 200 + 100.
200 + 100 = 300

So, $1\frac{1}{2}$% of $20 000 is $300.

Show You Know

Use mental math to determine each of the following.
a) 350% of $10
b) 0.1% of $5000
c) $2\frac{1}{10}$% of $20 000

Example 2: Calculate the Percent of a Number

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

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

c) Adele invested $40.12 in a savings plan at the beginning of the year. By the end of the year her investment was worth 120% of its original value. How much was her investment worth, to the nearest cent?

Literacy Link

In math, the word *of* often means to multiply.

Solution

a) Determine $\frac{1}{4}$% of 800.
$\frac{1}{4}$% = 0.25%

Divide by 100 to write the percent as a decimal.
0.25 ÷ 100 = 0.0025
0.0025 of 800 = 0.0025 × 800
= 2

C .0025 × 800 = 2.

So, two students out of 800 students used inline skates to get to school.

10% of 800 is 80.
1% of 800 is 8.
$\frac{1}{4}$% of 800 is 2.

b) Determine $30\frac{3}{4}\%$ of 400.

Since $\frac{3}{4}\%$ is 0.75%, $30\frac{3}{4}\% = 30.75\%$.

Divide by 100 to write the percent as a decimal.

$30.75 \div 100 = 0.3075$

$0.3075 \text{ of } 400 = 0.3075 \times 400$
$= 123$

C .3075 × 400 = 123.

So, 123 of the 400 students own a cell phone.

10% of 400 is 40.
30% of 400 is 120.
1% of 400 is 4.
$\frac{1}{4}\%$ of 400 is 1.
$\frac{3}{4}\%$ of 400 is 3.
$30\frac{3}{4}\%$ of 400 is 120 + 3.
120 + 3 = 123

c) Determine 120% of \$40.12.

Divide by 100 to write the percent as a decimal.

$120 \div 100 = 1.2$

$1.2 \text{ of } 40.12 = 1.2 \times 40.12$
≈ 48.14

C 1.2 × 40.12 = 48.144

So, 120% of \$40.12 is \$48.14.

To the nearest cent means to the nearest hundredth of a dollar.

100% of 40.12 is 40.12.
10% of 40.12 is 4.012.
20% of 40.12 is 8.024.
120% of 40.12 is 40.12 + 8.024.
40.12 + 8.024 = 48.144

Show You Know

Determine the percent of each number.

a) 160% of \$53.27

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

c) $55\frac{8}{10}\%$ of 500

Key Ideas

- You can use mental math strategies such as halving, doubling, and dividing by ten to find the percents of some numbers.
- To calculate the percent of a number, write the percent as a decimal and then multiply by the number.

$12\frac{1}{2}\% \text{ of } 50 = 0.125 \times 50$
$= 6.25$

$12\frac{1}{2}\% = 12.5\%$
$= 0.125$

Communicate the Ideas

1. Explain to a classmate how you could use mental math to find each of the following.

a) 300% of 40 **b)** 0.5% of 120 **c)** $10\frac{1}{2}\%$ of 80

2. Describe two ways to find 6% of 120.

Check Your Understanding

Practise

For help with #3 and #4, refer to Example 1 on pages 139–140.

3. Use mental math to determine each of the following.

a) 300% of 2000

b) $1\frac{1}{4}$% of 60

c) 0.1% of 40

4. Use mental math to find the following.

a) 20% of 60

b) 250% of 400

c) $10\frac{1}{2}$% of 100

For help with #5 and #6, refer to Example 2 on pages 140–141.

5. Determine the percent of each number. Give your answer to the nearest hundredth.

a) $\frac{2}{5}$% of 325

b) $15\frac{1}{4}$% of 950

c) 175% of $125.50

6. What is the percent of each number? Give your answer to the nearest hundredth.

a) $\frac{5}{8}$% of 520

b) $75\frac{2}{5}$% of 200

c) 250% of $76.50

Apply

7. Two hundred tickets are being sold for a school draw.

a) What is your chance of winning with one ticket? Express your answer as a percent.

b) How many tickets would you need to purchase to have a 2.5% chance of winning?

8. The original price of a jacket was $84.00. A store manager marked the price down by $25\frac{1}{2}$%. By how much was the price reduced?

9. The highest point in Canada is Mount Logan, which is in the Yukon Territory. Mount Logan is 159% as high as the highest point in Alberta, Mount Columbia. The elevation of Mount Columbia is 3747 m. What is the elevation of Mount Logan?

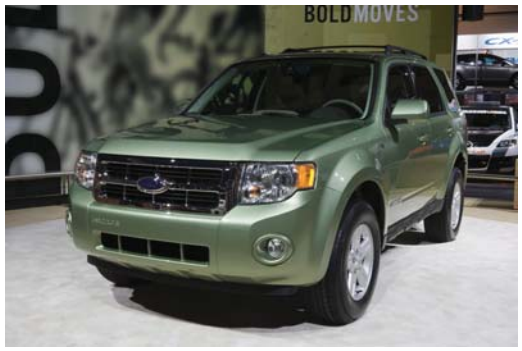
10. When water freezes, its volume increases by approximately 10%.

a) By how much does the volume of 750 mL of water increase when it freezes?

b) What is the volume of ice created?

11. The area of Canada is approximately 9 984 670 km^2. The area of Manitoba is about $6\frac{1}{2}$% of the area of Canada. What is the area of Manitoba to the nearest square kilometre?

12. A manufacturer of electric hybrid vehicles claims its vehicle will travel 200% as far as its regular vehicle on a full tank of gas. If the regular vehicle travels an average of 550 km on a full tank, how far will the hybrid go?



13. Suppose a real estate agent receives 5% commission on the first $200 000 of a house's selling price, and 6% on the remaining amount.

a) What does *commission* mean?

b) If a house sells for $345 000, how much commission does the real estate agent make on the sale of the house?

Extend

14. 4% of 100 is the same as 8% of what number? Explain how you arrived at your answer.

15. A new video gaming system was auctioned on the Internet. The starting bid was $100. The second bid was 135% of the first bid. The third bid was 257% of the second bid. There were then five more bids, each $10\frac{1}{2}$% over the previous bid. The winning bid came with only seconds left and was only 0.1% greater than the previous bid. What was the winning bid? What assumptions did you make to arrive at your answer?

16. Josephine scored 12 baskets out of 30 shots in her first basketball game this year. Her scoring average was then 40%. The next game, she made ten shots and raised her scoring average for both games to 50%. How many of the ten shots in the second game were baskets?

MATH LINK

Water conservation is very important to protect local fresh water supplies.

a) Research at least three ways that your home, school, and community could reduce water consumption.

b) Develop three water math problems that ask how much water you might save if you used some of these ways of conserving.

WWW Web Link

Did you know that a swimming pool cover can help reduce water loss by evaporation by 90%? To find data and tips on conserving water, go to www.mathlinks8.ca and follow the links.