

4

Fractions, Decimals, and Percents

The BMX rider in the picture is one quarter of the way through a race course. Her time at this point is 4 min, 52.9 s.

When training in hot weather, riders need to make sure they keep up their fluid levels. Losing 4 to 5 percent of body mass through sweat can seriously decrease a rider's performance. Further dehydration may cause illness.

Fractions, decimals, and percents are used in many sports, as well as in other aspects of daily life. When you get a test score back, you might change it to a percent so you can compare it to your other test results. You often think of money in both decimals and fractions. For example, \$1.25 is one whole dollar plus a quarter.

In this chapter, you will learn how fractions, decimals, and percents are related and use them to solve problems.

What You Will Learn

- to compare and order fractions, decimals, and percents
- to convert among fractions, decimals, and percents
- to relate fractions to terminating or repeating decimal numbers
- to solve problems involving percents

Key Words

percent
repeating decimal
terminating decimal

MATH LINK

How are fractions, decimals, and percents used in the media? Start collecting newspaper headlines, articles, and advertisements that show different ways to use fractions, decimals, and percents.

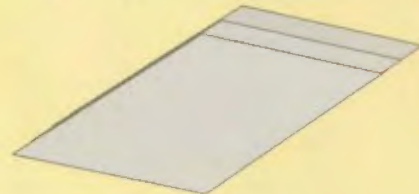
Headlines

- GST Drops by 1%
- Young Derby Winner Catches 2.65 kg Rainbow Trout
- 7 Out of 10 Students Participate in Fund Raising



Make the following Foldable to organize what you learn in Chapter 4.

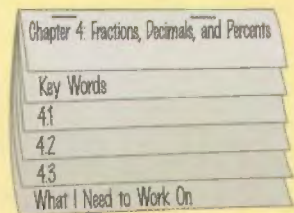
Step 1 Collect three sheets of paper and place them 2 cm apart. Keep the edges straight.




Step 2 Fold the bottom edge of the paper. Stop 2 cm from the top edge. This makes all tabs the same size. Staple together along the fold.



Step 3 Label the tabs.



Literacy  Link

As you work through Chapter 4, take notes under the appropriate tab. Include information about the key words, examples, and key ideas.

4.1

Connect Fractions, Decimals, and Percents

Focus on...

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

- estimate percents as fractions or as decimals
- compare and order fractions, decimals, and percents
- estimate and solve problems involving percent



loading ... 25%

percent

- means "out of 100"
- 30% means 30 out of 100 or $\frac{30}{100}$ or 0.30.



Materials

- cardboard or index card
- ruler
- scissors
- 25-cm length of ribbon or paper strip (at least 1 cm wide)
- felt marker
- tape

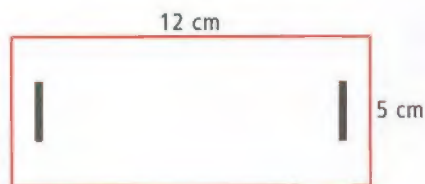
Kim likes to do research on the Internet before he travels. He has found a video of orcas, or killer whales, migrating off the coast of British Columbia. The video is 20 megabytes, and 25% has already downloaded. How many megabytes is that?

Explore the Math

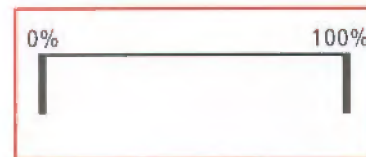
How can you estimate percents?

You can use a visual model like an Internet loading strip to help make reasonable estimates of **percent** and corresponding number values.

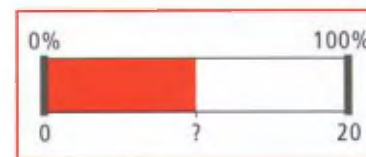
1. Cut a piece of index card or cardboard to make a rectangle that is 5 cm by 12 cm. Cut a slot 1.5 cm in from each end of your cardboard. Make each slot slightly longer than the width of the ribbon or paper strip you will use in step 3.



2. Use a ruler to draw a 10-cm line between the slots, just above the top end of the slots. Label 0% and 100%.
3. Draw a line at the 12.5-cm point on your ribbon or paper strip. Colour exactly one half of the ribbon with a marker, so you have a two-colour ribbon.
4. Thread the ribbon or paper strip through the slots. Connect the ribbon tightly at the back. You have now created a “loading-strip model.” You can pull the coloured part of your ribbon loop back and forth to show different percents of coloured ribbon.



5.
 - a) Set your loading-strip model to show 50%.
 - b) What fraction of the ribbon shown is coloured? What is this fraction as a decimal number?
6. You can use your loading strip to estimate a percent of a number, such as 50% of 20.
 - a) Write 0 below the 0% end of your loading strip.
 - b) Write 20 below the 100% end of your loading strip.
 - c) How could you use your answer to 5b) to estimate 50% of 20? Mark your estimate below the ribbon on your loading strip.



7.
 - a) Set your loading-strip model to show 25%.
 - b) What fraction of the ribbon shown is coloured? What is this fraction as a decimal number?
 - c) How could you use your answer to #7b) to estimate 25% of 20?

Reflect on Your Findings

8. How could you use your loading-strip model to estimate 75% of 20?





Use your money skills to think about fractions, decimals, and percents.



\$0.25
 $\frac{1}{4}$ of a dollar
25% of a dollar



\$0.50
 $\frac{1}{2}$ of a dollar
50% of a dollar



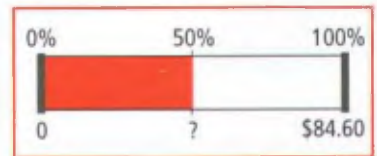
\$0.10
 $\frac{1}{10}$ of a dollar
10% of a dollar

Example 1: Find a Percent of a Number

- a) Four brothers bought their mother a birthday present for \$84.60. They each paid 25% of the bill. How much was each brother's share?
- b) Ten co-workers are buying Ted a going away present and will each pay 10%. They decide to buy him a backpack for \$92.30, including tax. How much should each pay?

Solution

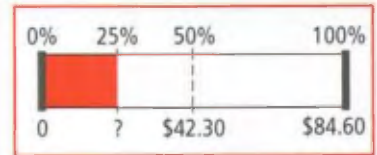
- a) Find 50% of \$84.60.
50% of \$84.60 is half of \$84.60.



- Half of \$84.60 is \$42.30.

Now find 25% of \$84.60.
25% is half of 50%.

- Half of \$42.30 is \$21.15.
- So, 25% of \$84.60 is \$21.15.



Check:
 $\$21.15 \times 4 = \84.60
Each brother's share is \$21.15.

- b) Find 10% of \$92.30.

Recall that $10\% = \frac{10}{100}$
 $= \frac{1}{10}$

10% of \$92.30 is one tenth of \$92.30.
One tenth of \$92.30 is \$9.23.

$\$92.30 \div 10 = \9.23

Each co-worker should pay \$9.23.

$\$84.60 \div 2 = \42.30

$\$42.30 \div 2 = \21.15

25% is also $\frac{1}{4}$.
I could have
divided by 4.
 $\$84.60 \div 4 = \21.15

Show You Know

- a) Find 50% of \$45.80.
- b) Find 25% of \$50.00.
- c) Find 10% of \$72.40.

Example 2: Find the Percent of a Number Mentally



What is 75% of 80?

Solution

Method 1: Use Percents You Know

50% of 80 is half of 80.

Half of 80 is 40.

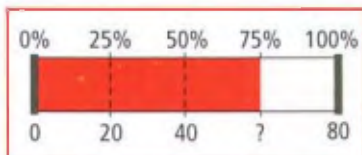
25% is half of 50%.

Half of 40 is 20.

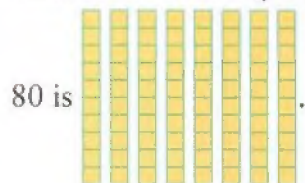
75% is 50% + 25%.

$$\begin{aligned} 75\% \text{ of } 80 &= 40 + 20 \\ &= 60 \end{aligned}$$

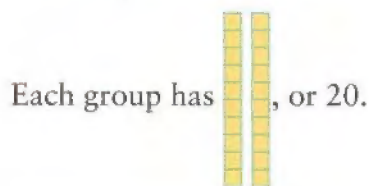
So, 75% of 80 is 60.



Method 2: Think of a Model



75% is $\frac{3}{4}$, so divide the blocks into 4 groups.



Count the number of blocks in 3 groups.

Three groups will have 3×20 or 60.

So, 75% of 80 is 60.

Strategies

What other method could you use?

Show You Know

Use mental math to find each percent.

- a) 75% of 16
- b) 60% of 90
- c) 40% of 80

Literacy Link

Ascending order means from least to greatest.

Descending order means from greatest to least.

Example 3: Compare Fractions, Decimals, and Percents

Compare $\frac{3}{4}$, 70%, and 0.72. Write them in ascending order.

Solution

Express all three values in decimal form.

$\frac{3}{4}$ is 0.75.

70% is 0.70

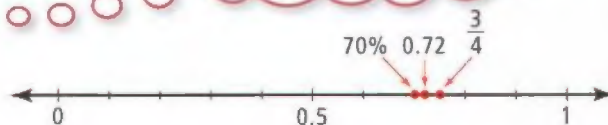
0.72 is 0.72

Compare 0.75, 0.70, and 0.72.

$0.70 < 0.72 < 0.75$

So, $70\% < 0.72 < \frac{3}{4}$.

Compare place values.
Look at the hundredths place.



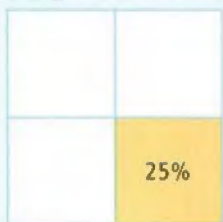
Show You Know

Write each set of numbers in ascending order using the $<$ symbol.

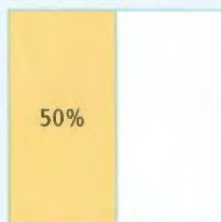
- a) 56%, 0.48, $\frac{1}{2}$ b) 35%, $\frac{39}{100}$, 0.36

Key Ideas

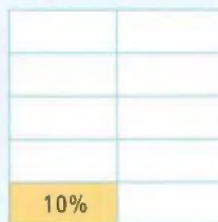
- A visual model can help you solve problems involving percents.
- Every percent has an equivalent decimal and fraction value.



25% is 0.25 or $\frac{1}{4}$



50% is 0.50 or $\frac{1}{2}$



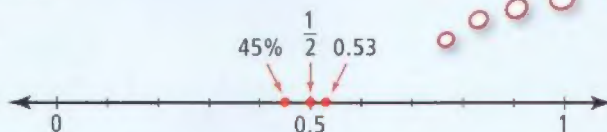
10% is 0.10 or $\frac{1}{10}$



- You can use place value or a number line to compare fractions, decimals, and percents.

$\frac{1}{2}$ is between 45% and 0.53.

$45\% < \frac{1}{2} < 0.53$



45% is 0.45

$\frac{1}{2}$ is 0.5

Communicate the Ideas

- How could you find 60% of 120? Explain using diagrams or a loading-strip model.
 - Can you find 60% of 120 in more than one way? Explain.
- Your friend missed the lesson on understanding how to find 25% of a number. Explain at least two ways to visualize or understand 25%.
 - Show your friend how to find 12.5% of a number.
- You know how to mentally find 10% and 25% of a number. Write at least three other percent amounts you could find using that knowledge.
- How could you mentally find 1% of a number?

Practise

For help with #5 to #8, refer to Example 1 on page 126.

- What is 50% of each quantity?
 - 134 marbles
 - 46 cookies
 - \$74.80
 - 65.4 m
- What is 25% of each quantity?
 - 68 daffodils
 - 7.2 cm
 - 42 min
 - \$0.56
- What is 10% of each quantity?
 - 15 min
 - 34 cm
 - 50 cats
 - \$89.50
- Show how to find each amount.
 - 50% of 44
 - 25% of 20
 - 10% of 12
 - 1% of 150

For help with #9 to #11, refer to Example 2 on page 127.

- Show how to find each amount mentally.
 - 60% of \$40
 - 75% of 44
 - 20% of 750
 - 35% of 240
- Show how to find each amount mentally.
 - 75% of \$60
 - 35% of 120 m
 - 85% of 280 students
 - 30% of 45 cm



- Describe how you could find 37.5% of 68 using only the ability to divide in half and to perform addition. Show your numbers for each step.

For help with #12 to #18, refer to Example 3 on page 128.

12. Change each percent to a decimal number.

- a) 57% b) 30% c) 5% d) 88%

13. Change each percent to a decimal number.

- a) 42% b) 38% c) 15% d) 73%

14. Compare the numbers in each set. Write them in ascending order.

- a) 14%, $\frac{1}{10}$, 0.12 b) 27%, $\frac{1}{4}$, 0.24

- c) $\frac{41}{100}$, 40%, 0.39

15. Compare the numbers in each set. Write them in descending order.

- a) 32%, $\frac{3}{10}$, 0.35 b) 76%, 0.72, $\frac{3}{4}$

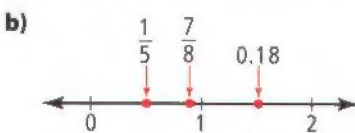
- c) $\frac{1}{2}$, 45%, 0.54

16. Use the number line to help answer the questions below.



- a) What is a fraction between 25% and 50%? How do you know?
 b) What is a decimal number between 0% and 25%?
 c) What is a decimal number between 75% and 100% that is closer to 75%?

17. On each number line, which number is correctly placed? How do you know?



18. What decimal number could be placed at A on the number line? Justify your answer.



Apply

19. In Australia, the GST is 10%. How would you estimate the GST on items you might buy on holiday in Australia?

20. According to an article in the newspaper, 35% of Regina residents like winter. If the population of Regina is 178 000, how many people like winter? Show two different ways to find the answer.

21. Your bill at a restaurant is \$28. You want to leave a 15% tip. How could you calculate the amount mentally?

22. Carey found that 35% of the students in her school read fantasy books. If there are 840 students in the school, how many students read fantasy books?



23. John's mass was 62 kg last year. If his mass increased by 10% this year, what is his current mass?

24. Three years ago, Sam's height was 108 cm. Since that time he has grown 25% in height.

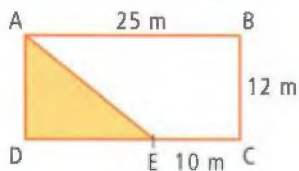
- a) How much has he grown?
 b) How tall is he now?



25. Clare saved 25% more than Rita. How much did Clare save if Rita saved \$288.60?
26. Arrange the following numbers in descending order. Show your answer using both a labelled number line and the $>$ symbol.
 $37\frac{1}{2}\%$, $\frac{1}{4}$, 0.41, and $\frac{4}{10}$
27. At a concert, 75% of the seats were filled. 60% of the audience was female. If there are 3200 seats in the concert hall, how many in the audience were female? Explain.

Extend

28. At a concert, 60% of the seats were occupied. 520 seats were empty. What is the total number of seats in the concert hall?
29. Figure ABCD is a rectangle with the dimensions shown. What percent of the figure is shaded? Justify your response.



30. Brannon runs a bubble tea café in Winnipeg. The table shows the cost of ingredients for one drink. The prices are \$3.50, \$4.50, and \$5.50 for each of the three different sizes.

Ingredient	Cost to Make		
	Junior Size	Jumbo Size	Kong Size
Tapioca	10¢	20¢	25¢
Ice	2¢	4¢	6¢
Juice	30¢	50¢	80¢
Syrup	5¢	6¢	8¢

- a) What is the cost for making each size drink?
- b) What is the profit for each size of drink sold?
- c) On an average day, Brannon sells 80 Junior size, 250 Jumbo size, and 120 Kong size drinks. What is the expected profit for the day?

WWW Web Link

Bubble tea originated in Taiwan in the 1980s and was first sold in Canada in the 1990s. For more information about the history of bubble tea, go to www.mathlinks7.ca and follow the links.

Art 8 Link

Create a personal logo from two triangles, two rectangles, and two circles. Your logo can resemble a person, animal, or thing.

- You can cut any of the six shapes, but only into halves or quarters (50% or 25%) of the original shape.
- You must use all of the triangles, rectangles, and circles or their parts in your logo.
- Pieces may overlap.
- Decorate and colour your logo.
- Label each part shape with its fraction, decimal, or percent equivalent.



4.2

Fractions, Decimals, and Percents

Focus on...

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

- convert among fractions, decimals, and percents
- estimate percent values
- distinguish between terminating and repeating decimals
- relate fractions to terminating and repeating decimals



Individual statistics from sporting events are often reported as percents or decimal numbers. It may be necessary to convert among fractions, decimals, and percents to better understand these statistics.

Discuss the Math

How can you convert among fractions, decimals, and percents?

1. Look at the statistics in the table. Which hockey goalie do you think is having the best season? Why?

Goalie	Shots on Goal	Saves
A. Auld	673	606
M. Fernandez	586	545
M. Kiprusoff	797	726
D. Hasek	709	658

2. Goalies can be rated on “save percentage.” This statistic is the ratio of saves to shots on goal.

$$\text{Save percentage} = \frac{\text{Number of saves}}{\text{Shots on goal}}$$

- a) Copy the table into your notebook. Extend the table to include two more columns.

Sports Link

Although the statistic is called “save percentage,” the result is a decimal number.

Did You Know?

The first Canadian hockey sticks were modelled on Irish hurley sticks and were made by the Mi'kmaq in Eastern Canada over 100 years ago.

- b) In the first new column, write the save percentage for each goalie as a fraction.
 - c) In the second new column, write the save percentage as a decimal to the nearest thousandth.
 - d) Decide which goalie is having the best season. Explain.
3. a) How does the save percentage help you determine a goalie's performance?
- b) Is it better to have a higher or a lower save percentage? Explain why.
4. The save percentage is usually stated as a decimal.
- a) How are the decimal and fraction forms of the save percentage related?
 - b) Which form is more useful? Why?
 - c) Is either form an actual percent value?

Reflect on Your Findings

5. Summarize methods you can use to
- a) convert a fraction to a decimal
 - b) convert a decimal to a percent

Example 1: Convert From Fractions to Decimals and Percents

The following data were gathered one season for three National Basketball Association (NBA) teams.

Team	Wins	Losses
Miami	59	23
New Jersey	42	40
Los Angeles	34	48

A statistic called “team percentage” is the ratio of team wins to total games.

$$\text{Team percentage} = \frac{\text{Number of wins}}{\text{Total games played}}$$

- a) What is the team percentage for each team? Leave your answer as a fraction.
- b) Change each fraction to a decimal number rounded to the nearest thousandth.
- c) Use your rounded decimal value to show the approximate percent value for each team.

Solution

- a) Total games = wins + losses

Miami:

$$\begin{aligned}\text{Total games} &= 59 + 23 \\ &= 82\end{aligned}$$

$$\text{Team percentage} = \frac{59}{82}$$

New Jersey:

$$\begin{aligned}\text{Total games} &= 42 + 40 \\ &= 82\end{aligned}$$

$$\text{Team percentage} = \frac{42}{82}$$

Los Angeles:

$$\begin{aligned}\text{Total games} &= 34 + 48 \\ &= 82\end{aligned}$$

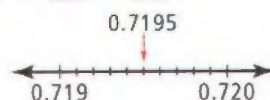
$$\text{Team percentage} = \frac{34}{82}$$

- b) Convert each fraction to a decimal.

Miami:

$$\frac{59}{82} \approx 0.720$$

$$\boxed{C} \ 59 \div 82 \equiv 0.719512191\dots$$

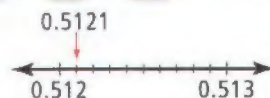


The digit to the right of the thousandths place is 5, so round up.

New Jersey:

$$\frac{42}{82} \approx 0.512$$

$$\boxed{C} \ 42 \div 82 \equiv 0.512195121\dots$$

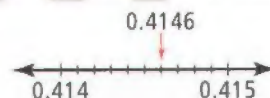


The digit to the right of the thousandths place is 1, so round down.

Los Angeles:

$$\frac{34}{82} \approx 0.415$$

$$\boxed{C} \ 34 \div 82 \equiv 0.414634146\dots$$



The digit to the right of the thousandths place is 6, so round up.

- c) To convert to a percent, multiply the decimal by 100.

$$\begin{aligned}\text{Miami team percentage} &= 0.72 \times 100\% \\ &= 72\%\end{aligned}$$

$$\begin{aligned}\text{New Jersey team percentage} &= 0.512 \times 100\% \\ &= 51.2\%\end{aligned}$$

$$\begin{aligned}\text{Los Angeles team percentage} &= 0.415 \times 100\% \\ &= 41.5\%\end{aligned}$$

Show You Know

Convert each fraction to a decimal number. Round each decimal number to the indicated place value. Then, convert to a percent.

a) $\frac{27}{56}$ (tenths) b) $\frac{125}{396}$ (thousandths) c) $\frac{1496}{2005}$ (hundredths)

Example 2: Change Fractions to Repeating Decimals

Some common fractions may change to **repeating decimal** numbers. These decimal numbers contain one or more digits that repeat over and over without ending.

Use a calculator to change each fraction to a repeating decimal.

a) $\frac{1}{3}$ b) $\frac{5}{9}$ c) $\frac{5}{6}$

Solution

a) $\frac{1}{3} = 1 \div 3$ $\boxed{C} \ 1 \div 3 \equiv 0.333333333$
 $= 0.\overline{3}$

Use a bar over the 3 to show the repeating part.

b) $\frac{5}{9} = 5 \div 9$ $\boxed{C} \ 5 \div 9 \equiv 0.555555556$
 $= 0.\overline{5}$

The calculator shows the final digit as 6 because it rounds up. It would show more 5s if it had a larger display.

c) $\frac{5}{6} = 5 \div 6$ $\boxed{C} \ 5 \div 6 \equiv 0.833333333$
 $= 0.8\overline{3}$

Place a bar over only the 3 since the 8 does not repeat.

repeating decimal

- a decimal number with a digit or group of digits that repeats forever
- repeating digits are shown with a bar, e.g., $0.777 \dots = 0.\overline{7}$

Show You Know

Show the following fractions as repeating decimals.

a) $\frac{2}{3}$ b) $\frac{7}{9}$

Example 3: Estimate Percents

Paige has answered 94 questions correctly out of 140 questions. Estimate her mark as a percent.



Solution

Think: What is 50% of 140?
Half of 140 is 70.

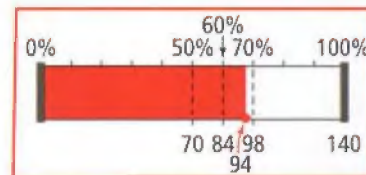
Think: What is 10% of 140?
 $140 \div 10 = 14$

Add 50% and 10% parts together to estimate.

$$50\% + 10\% = 60\% \text{ of } 140$$
$$70 + 14 = 84 \quad \text{Too low.}$$

$$50\% + 10\% + 10\% = 70\% \text{ of } 140$$
$$70 + 14 + 14 = 98 \quad \text{Too high.}$$

The answer is between 60% and 70% but closer to 70%.



Strategies

Guess and Check

Refer to page xvi.

Show You Know

Estimate each of the following as a percent.

- a) 23 out of 80 b) 421 out of 560

Example 4: Change Terminating Decimal Numbers to Fractions

- a) What fraction of a dollar is \$0.75?
b) Change 0.652 to a fraction.

Solution

- a) The decimal number 0.75 is a **terminating decimal**. The last digit is in the hundredths place, so the denominator is 100.

$$0.75 = \frac{75}{100}$$

So, \$0.75 is $\frac{75}{100}$ of a dollar or $\frac{3}{4}$ of a dollar.



- b) The 2 is in the thousandths place, so the denominator is 1000.

$$0.652 = \frac{652}{1000}$$

Show You Know

Change each terminating decimal number to a fraction.

- a) 0.48 b) 0.078

terminating decimal

- a decimal number in which the digits stop
- examples include 0.4, 0.86, 0.125

Key Ideas

- To change a fraction to a decimal number, divide the numerator by the denominator.
$$\frac{3}{8} = 3 \div 8 = 0.375$$
- Repeating decimal numbers can be written using a bar notation.
$$\frac{1}{3} = 0.333\dots = 0.\overline{3}$$
- To express a terminating decimal number as a fraction, use place value to determine the denominator.
$$0.9 = \frac{9}{10} \quad 0.59 = \frac{59}{100} \quad 1.463 = \frac{1463}{1000}$$
- You can use mental math to estimate percents.

Communicate the Ideas

1. a) Express 0.7 and 0.67 as fractions.
b) How are the number of digits after the decimal point for each number related to the number of zeros in the denominator of each fraction? Explain.
2. Vernon was asked to estimate 63 out of 160 as a percent. He said the answer was between 40% and 50%. Do you agree? Justify your answer.
3. Eleven out of 15 calves born on a ranch in one week had white faces. What percent of the calves born that week had white faces? Round your answer to the nearest tenth of a percent. Show how you got your answer.
4. Kanisha said that $0.6555\dots$ could be written as $0.\overline{65}$ using bar notation. What mistake has she made? Show how she could write the answer correctly.

Practise

For help with #5 to #7, refer to Example 1 on page 133.

5. Use a calculator to change each fraction to a decimal number. Round to the place value indicated.

a) $\frac{13}{25}$ (tenths) b) $\frac{107}{215}$ (hundredths)

c) $\frac{43}{50}$ (tenths) d) $\frac{197}{289}$ (thousandths)

6. Use a calculator to change each fraction to a decimal number. Round to the place value indicated.

a) $\frac{11}{25}$ (tenths) b) $\frac{171}{280}$ (thousandths)

c) $\frac{43}{60}$ (hundredths) d) $\frac{19}{313}$ (thousandths)

7. A baseball player's batting average is the ratio of number of hits to times at bat. It is usually expressed as a decimal number.

$$\text{Batting average} = \frac{\text{Number of hits}}{\text{Times at bat}}$$

The following data are for one baseball season.

Player	Times at Bat	Hits
A	605	194
B	624	197





- a) What is the batting average for each player? Round each answer to the nearest thousandth.
- b) Which player had a better batting average for the season? Justify your response.

For help with #8 to #11, refer to Example 2 on page 135.

8. Write each repeating decimal number using bar notation.
- a) 0.555555... b) 0.090909...
c) 0.1877777... d) 2.0151515...
9. Write each repeating decimal number using bar notation.
- a) 0.4444444... b) 0.2666666...
c) 0.1851851... d) 1.0626262...
10. Change each fraction to a repeating decimal. Then use bar notation to show the repeating part.
- a) $\frac{5}{6}$ b) $\frac{2}{3}$ c) $\frac{45}{99}$ d) $\frac{7}{11}$
11. Change each fraction to a repeating decimal. Then use bar notation to show the repeating part.
- a) $\frac{1}{6}$ b) $\frac{3}{7}$ c) $\frac{25}{99}$ d) $\frac{4}{11}$


For help with #12 and #13, refer to Example 3 on page 136.

12. Estimate each of the following as a percent. 
- a) 36 out of 70 b) 125 out of 300
13. Estimate each of the following as a percent. 
- a) 275 out of 500 b) 46 out of 90

For help with #14 and #15, refer to Example 4 on page 136.

14. Change each decimal number to a fraction.
- a) 0.95 b) 0.3 c) 0.243 d) 0.08
15. Change each decimal numbers to a fraction.
- a) 0.80 b) 0.2 c) 0.18 d) 0.455

Apply

16. 
- a) Express the value of each coin as a fraction of a dollar. Write the fractions in ascending order.
- b) Express the value of each coin as a decimal number. Write the decimal numbers in ascending order.
- c) Write a statement using percent that compares the three coins.
17. For each of the following statements, rewrite each percent or decimal as a fraction.
- a) 0.71 of Earth's surface is covered with water or ice.
- b) Matthew's batting average is .421.
- c) Nitrogen makes up approximately 78% of the air we breathe.

18. There are 81 girls and 59 boys in River City Day Care.
- Estimate the percent of the children in the day care that are girls.
 - Show how you made your estimate.
19. A small town in southern British Columbia has a population of 270. Of these people, 85 are over the age of 60.
- Estimate the percent of the town's population that is older than 60.
 - Show the number of people over 60 as a fraction of the town's population. Express your fraction as a decimal number correct to 3 decimal places.
 - What is your decimal value from b) expressed as a percent? How does this value compare with your estimate in a)?

20. Rachel and Tim notice a pattern when changing ninths into decimal numbers. Here is what they see on their calculator.

$$\frac{1}{9} = 0.11111111 \qquad \frac{2}{9} = 0.22222222$$

$$\frac{3}{9} = 0.33333333$$

- Without dividing, what do you think $\frac{4}{9}$ is as a decimal number? Write your answer using bar notation.
- Predict the decimal equivalent for $\frac{8}{9}$. Check your answer using a calculator.

Extend

21. Look at each repeating decimal and its fraction equivalent.
- $$0.363636... = \frac{36}{99} = \frac{4}{11}$$
- $$0.545454... = \frac{54}{99} = \frac{6}{11}$$
- $$0.636363... = \frac{63}{99} = \frac{7}{11}$$
- What would the fraction equivalent be for 0.272727...? 0.909090...? 0.818181...?
 - Write a rule to convert each repeating decimal to a fraction. Hint: Write the repeating decimals using bar notation.
 - Write four other repeating decimals that would follow the same pattern.
22. a) Use a calculator to find repeating decimal numbers for $\frac{1}{7}$, $\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{7}$, $\frac{5}{7}$, and $\frac{6}{7}$.
- Add the numbers in the first half of each repeating part to the numbers in the last half. For example, $\frac{1}{7} = 0.\overline{142857}$, so add 142 to 857.
 - What pattern did you find?
 - What do you think will happen with $\frac{7}{13}$? $\frac{4}{11}$? Do you get the same results?

MATH LINK

Each of the headlines shown contains a fraction, a decimal, or a percent.

Which headlines would be better written using a different representation? Rewrite them with a more appropriate representation. Explain your reasoning.

Headlines

- Baseball Ticket Sales Up 0.06
- Profits Fall 31%
- $\frac{22}{100}$ of Young Teens See Parents as Role Models
- Bicycle Helmets Can Prevent $\frac{4}{5}$ Serious Head Injuries
- Prices Increase by 0.25
- Almost 0.5 Canadians Read a Daily Newspaper

4.3

Applications of Percents

Mike's mother is taking him with his friends Tran and Gerry to a go-kart track in Saskatoon for his birthday.

Focus on...

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

- estimate answers to percent calculations
- solve percent problems



Discuss the Math

How can you apply percents to solve problems?

1. The sign shows the cost of go-karting. What is the cost per lap if you purchase the 20-lap package?
2. Tran was not sure if he will like go-karting so he asks for tickets for 5 laps only. The other three each choose the 20-lap tickets. Estimate, and then calculate, the total cost of the tickets before tax.
3. An adult and three children qualify for the 25% family discount.
 - a) Calculate the amount of the discount.
 - b) What is the total cost of the tickets after the discount?
4. GST is added to the cost of go-karting.
 - a) What percent is the GST in Canada?
 - b) Use your knowledge of percent to estimate the amount of GST.
 - c) Use a calculator to find the exact amount of the GST to be added to the go-karting bill.
 - d) What is the total cost of the tickets, including tax?



Literacy Link

GST means Goods and Services Tax.
PST means Provincial Sales Tax.

5. Each person is required to wear a helmet. Helmet rental is \$5.00 plus GST and PST.
 - a) What is the cost to rent four helmets before tax?
 - b) The PST in Saskatchewan is 5%. How much PST and GST is charged to rent four helmets?
 - c) What is the cost to rent four helmets, including tax?
6. What is the total cost for go-karting?

Reflect on Your Findings

7. a) What total amount of tax is charged in your area?
- b) Describe how you could estimate the total tax on a purchase in your area. Would your estimate be high or low?
- c) How could you estimate and calculate a discount?

Example: Use Percents to Make Comparisons

Lauren bought and planted two packages of flower seeds to use in her science fair project. Package A contained 44 seeds of which 32 grew into plants. Package B contained 36 seeds of which 27 grew into plants. Which package of seeds was better?

Solution

Method 1: Estimate the Percents



Use mental math techniques to estimate the percent of growth.

Package A:

32 out of 44 seeds grew.
 50% of 44 is half of 44.
 Half of 44 is 22.
 25% is half of 50%.
 Half of 22 is 11.
 $50\% + 25\% = 75\%$
 $22 + 11 = 33$ A little high.

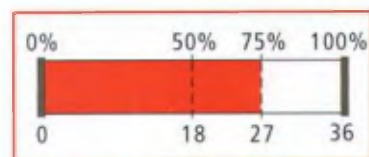
A little less than 75% of the seeds from Package A grew.

Package B was better than Package A.

Package B:

27 out of 36 seeds grew.
 50% of 36 is half of 36.
 Half of 36 is 18.
 25% is half of 50%.
 Half of 18 is 9.
 $50\% + 25\% = 75\%$
 $18 + 9 = 27$

Exactly 75% of the seeds from Package B grew.



Method 2: Calculate the Percents

Package A:

$$\text{C } 32 \div 44 \approx 0.727272727$$

$$\frac{32}{44} = 0.\overline{72}$$

$$\approx 0.727 \text{ to 3 decimal places}$$

$$0.727 = 72.7\%$$

Package A had 72.7% growth.

Package B:

$$\text{C } 27 \div 36 \approx 0.75$$

$$\frac{27}{36} = 0.75$$

$$0.75 = 75\%$$

Package B had 75% growth.

Since $75\% > 72.7\%$, Package B was better than Package A.

When you round a decimal value, the number becomes approximate.

Key Ideas

- Decimal numbers and percents are often easier to compare than fractions.
- When you round a decimal value, the number becomes approximate. Fractions are exact numbers.

Communicate the Ideas

- a) Measure the heights of yourself, a friend, and the classroom door.
 - b) Explain how to estimate your height as a percent and as a fraction of the door height.
 - c) How can you calculate your height as a percent and as a fraction of the door height?
 - d) Check your suggestions for b) and c) with the height of your friend. Do they work?
2. Bruce is practising throwing darts. He hits the bulls-eye 26 times out of 40 shots.
 - a) Show this result as a fraction, a decimal number, and a percent.
 - b) Which type of number do you think is best to explain his results? Justify your response.
3. Carly and Shannon are practising their free-throw shots. Carly makes 23 out of 25 shots. Shannon makes 18 out of 20 shots.
 - a) Show each girl's result using a fraction, a decimal number, and a percent.
 - b) Which type of number is best to compare their results? Explain why.

Practise

4. Estimate which percent is larger. Then calculate each percent.
- a)** 50% of 184 or 25% of 208
- b)** 10% of 640 or 1% of 325
- c)** 35% of 140 or 70% of 60
5. 1% of a number is \$5.40.
- a)** What is 10% of the number?
- b)** What is 25% of the number?
- c)** What is 100% of the number?
- d)** How is the answer in c) related to the answer in b)?



For help with #6 and #7, refer to the Example on pages 141–142.

6. Melissa's father bought two groups of chicken eggs to hatch for his kindergarten class. First he bought 28 eggs of which 14 hatched. Then he bought 36 eggs of which 20 hatched. Which group of eggs was better?



7. A school librarian placed two orders for new books. There were 68 books in the first order of which 24 were adventure novels. There were 82 books in the second order of which 35 were adventure novels. Which order of books had the greater percent of adventure novels?

Apply

8. Natalie volunteers in the community library. On Tuesday, 378 people visited the library, and 342 people signed out books. On Thursday, 480 people visited the library, and 420 people signed out books. On what day did a greater percent of people sign out books?
9. Desmond wants to list the foods shown in descending order according to the percent of protein content.

Food	Protein (g)	Mass of Food (g)
Roast turkey	18	84
Ground beef	30	142
Almonds	10	45
Tuna	32	150

- a)** What is the percent of protein for each food? Give your answers to the nearest tenth of a percent.
- b)** Arrange the foods in descending order of their percent of protein content.
10. A vacation package at a travel agency costs \$1240. The package is advertised at 20% off. What is the new price of the package? Show your reasoning.
11. A snowboard shop is clearing last year's stock at 35% off.



- a)** Estimate the amount of discount for boots that were regularly priced at \$199.99.
- b)** Calculate the amount of discount.
- c)** What is the final sale price before tax?

12. A transit company wants to raise its fares by 15% beginning April 1st. Current ticket prices are \$1.90 for adults and \$1.40 for students.

- What is the exact value of each increased ticket price?
- Transit officials want to have ticket prices ending in 0 or 5. Do you think this is a good idea? Explain.
- What are the increased ticket prices rounded to the nearest multiple of 5?



13. Naomi is the manager of a restaurant in Yellowknife. Her annual salary is \$40 691.00. After a performance review, her boss awards her a pay raise of 8.5%.

- What is the amount of her salary increase?
- What is her new annual salary?

14. The chart shows the weekly pay for a number of part-time workers. Each worker gets a pay raise as shown.

Worker	Weekly Pay	Weekly Pay Raise
Meagan	\$210.00	\$30.00
Carl	\$378.95	\$45.50
Billi	\$410.50	\$41.55

- Which worker received the largest dollar increase?
- What is the percent increase for each worker? Give each answer to the nearest tenth of a percent.
- Which worker received the largest percent increase?

15. The chart gives the lengths of some Western Canadian rivers.

River	Length (km)
Churchill	1608
Fraser	1368
MacKenzie	1800
North Saskatchewan	1392
Thelon	904

- What is the length of the Fraser River as a percent of the length of the MacKenzie River? Round your answer to the nearest whole percent.
- Estimate the length of the Thelon River as a percent of the length of the Churchill River. Express your estimate as a whole percent.



16. The table shows the number of boys and girls in a school who wear glasses.

	Wear Glasses	Total Population
Girls	120	420
Boys	136	450
Total	256	870

- Estimate the percent of girls who wear glasses.
- What percent of the boys wear glasses? Give your answer to the nearest tenth of a percent.
- What percent of all the students who wear glasses are boys? Give your answer to the nearest tenth of a percent.
- What is the number of girls who do not wear glasses as a percent of the total school population? Give your answer to the nearest tenth of a percent.

17. Alicia is planning a trip to the beach while visiting relatives abroad. She needs to buy each item shown.



- a) Estimate her total cost before tax.
 b) The country she is visiting charges 5% tax on purchases. Estimate her total cost after tax.
18. A northern airline flies passengers and freight from Winnipeg to Baker Lake with stops in Churchill and Rankin Inlet. One plane can carry up to 50 passengers with no freight. To each location along the flight, the plane carries a different amount of freight.

Location	Amount of Load as Freight		
	Percent	Decimal	Fraction
Winnipeg	10%		
Churchill		0.50	
Rankin Inlet			$\frac{1}{4}$
Baker Lake		0.75	

- a) Copy and complete the table showing the amount of load that is carried as freight to each location along the flight.
 b) For each location, what percent of the load is carried as passengers?

Extend

19. 81 is 45% of what number?
20. 30% of a number is 48.
 a) What is 80% of the same number?
 b) What is the number?
21. Emon spends 80% of his income and saves the rest. He saves \$11 000 a year. What is his annual income before any deductions?
22. There were 760 girls and 740 boys who wrote a grade 6 achievement test. 65% of the girls and 55% of the boys scored more than 60%. What percent of the population that wrote the test scored 60% or less? Give your answer to the nearest whole percent.

MATH LINK

Collect at least ten headlines or advertisements that use fractions, decimals, or percents from newspapers, magazines, the Internet, or signs.

Copy and complete this table in your notebook. Use it to show the numbers in each headline in three different ways.

Sentence or Phrase	Source	Fraction	Decimal	Percent
Almost 60%, or 700 000 tonnes, of Canada's beef is produced in Alberta.	http://www.mysource	$\frac{60}{100} = \frac{3}{5}$	0.60	60%
Sunglasses 25% off	store window	$\frac{25}{100} = \frac{1}{4}$	0.25	25%

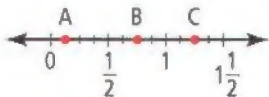
Key Words

For #1 to #3, choose the letter representing the term that best matches each statement.

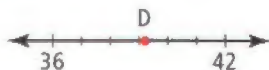
- Out of 100 **A** approximate
- $\frac{5}{8}$ as a decimal number **B** percent
- Can be expressed as $0.\bar{3}$ **C** repeating decimal
D terminating decimal

4.1 Connect Fractions, Decimals, and Percents, pages 124–131

- Show how to find each amount.
 - 10% of 25
 - 25% of 84
 - 50% of 98
 - 75% of 124
- Use the number line to help answer the questions that follow.



- What is a fraction value of A?
 - What is a number at B expressed as a percent?
 - What is a decimal value of C?
- Arrange the following numbers in ascending order. Show your answer two different ways. $\frac{3}{4}$, $0.\bar{7}$, and 76%
 - What is a decimal number that could be placed at D on the number line? Justify your answer.



- How could you mentally find 40% of 180?
- The cost of a backpack is 60% of the cost of a shirt.
 - If the shirt costs \$32.60, how much does the backpack cost?
 - What is the total price of the backpack and shirt before tax?



4.2 Fractions, Decimals, and Percents, pages 132–139

- Copy the table into your notebook. Fill in the missing values.

	Fraction	Decimal Number	Percent
a)	$\frac{1}{4}$		
b)		0.75	
c)			20%
d)		0.05	
e)			35%

- Nine out of 24 students who wrote a math test received an A. What percent is that?
- Express each fraction as a decimal number. Is the decimal number a terminating decimal or a repeating decimal?
 - $\frac{5}{6}$
 - $\frac{3}{4}$
 - $\frac{4}{9}$
- Use a calculator to show each fraction as a decimal number and round it to the place value shown.
 - $\frac{23}{35}$ (hundredths)
 - $\frac{45}{82}$ (tenths)
 - $\frac{108}{211}$ (thousandths)
 - $\frac{76}{320}$ (tenths)

14. Randy got 86 out of 120 on a test.
- Estimate the percent.
 - How did you make your estimate?
 - Calculate the actual percent. Give your answer to the nearest tenth of a percent. Show your thinking.
15. Express each decimal number as a fraction.
- 0.8
 - 0.35
 - 0.167

4.3 Applications of Percents, pages 140–145

16. The town of Tofino, on the west coast of Vancouver Island, hosted a beach concert for young people and their families. The following table provides information on those who attended.

	Younger Than 21	Age 21 and Older	Total
Male	472	398	870
Female	380	345	725
Total	852	743	1595

- Estimate the percent of males younger than 21 who attended the concert. Show your thinking.
 - What percent of females younger than 21 attended the concert?
 - What percent of all attendees were female?
17. Which quarterback has better passing statistics? Show how you know.
- Jason Maas completed 302 passes out of 450 attempts.
 - Ricky Ray completed 247 passes out of 375 attempts.

18. Catriona saved 654 shots and let in 26 goals in a hockey season. Becky saved 532 shots and let in 16 goals. Which goalie had a better season? Show how you know.



19. Some Manitoba researchers measured wheat heights to see how the height was affected by fertilizer application. A crop with no fertilizer reached a height of 79.4 cm, and one that received fertilizer reached a height of 102.4 cm. What was the percent increase with the fertilizer application? Give your answer to the nearest hundredth of a percent.
20. Tess bought a DVD for \$22 and a sweat shirt for \$36. She received a 25% discount.
- What is the dollar value of the discount Tess received?
 - What did the DVD and sweat shirt cost her before tax?
21. In Kimmirut, Nunavut, the sun is up for 20% of the day on December 21. How many hours of the day does the sun shine?

4

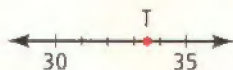
Practice Test

For #1 to #4, choose the best answer.

- Which number is largest?
A 65% **B** $\frac{3}{5}$ **C** $\frac{2}{3}$ **D** 0.7
- Which statement is true?
A $6 < 9 < 8.9$
B 1.47 is between 79% and $1\frac{1}{2}$
C $12\frac{1}{2}\% = 12.5$
D $\frac{3}{8}$ can be converted to a repeating decimal
- Which number is halfway between 9.5 and 9.6?
A 9.49 **B** $9.\bar{5}$ **C** 9.55 **D** 9.7
- Which of the following has the same value as 80% of 90?
A 90% of 70 **B** 90% of 80
C 40% of 200 **D** 60% of 150

Complete the statements in #5 to #7.

- The decimal equivalent of $\frac{14}{99}$ is ■.
- 20% of \$3500 is ■.
- A decimal number that could be placed at T on the number line is ■.



Short Answer

- A hiking club has 75 members. If 24 members are male, what percent of the members are female?
- Model planes are on special at two for \$39.90. Model cars are on special at three for \$90.



- What is the cost of one model plane?
 - What is the cost of one model car?
 - Show the cost of the model plane as a percent of the cost of the model car.
- Arrange the numbers 14.7, 14.71, and 14.709 in ascending order.
 - Arrange the numbers 28%, $\frac{1}{4}$, and 0.3 in descending order.
 - Find 75% of 120 in two different ways.
 - Matthew said his calculator changed $\frac{2}{3}$ into 0.6666667, which is not a repeating decimal. Therefore, it must be a terminating decimal. Is Matthew correct? Explain.
 - Calculate 35% of 40, 18% of 80, 60% of 60, and 20% of 200.
 - Arrange your answers in descending order.
 - Write a fraction, a decimal, and a percent for each situation.
 - 18 out of 30 workers eat their lunch at Joe's diner.
 - Barry ate one sixth of the apple pie.
 - Raina sold 45 of the 60 T-shirts she ordered for her store.
 - Kala ate 14 chocolates from a box that had 21 chocolates.

Extended Response

15. Three friends went shopping together at the mall.
- One bought a CD for 40% off its regular price of \$21.99.
 - Another bought a poster for 15% off its regular price of \$16.
 - The third bought them all lunch for \$4.29 each.
- a) Who spent the most money? Show how you know.
- b) Who spent the least? Justify your response.
16. On Saturday, a survey company finds that 429 of 738 people prefer brand A soap to brand B soap. On Monday, they find that 621 of 974 people prefer brand B soap to brand A soap.
- a) Estimate the percent of people on Saturday who preferred brand A. Show your thinking.
- b) Calculate the percent of people on Monday who preferred brand B. Show your calculations.
- c) Use front-end estimation to estimate the percent of people who preferred brand A in total.
- d) Calculate the percent of people who preferred brand A in total. Round your answer to the nearest tenth of a percent.
17. There are 12 people, 3 budgies, 3 guinea pigs, a rat, 4 cats, a snake, and 6 dogs in the waiting room of an animal clinic. If no creature is missing a leg, show what percent the number of human legs is of the total number of legs at the clinic. Round your answer to the closest whole percent.



WRAP IT UP!

Create a poster reporting on how fractions, decimals, and percents are used in the media. Your poster should include

- a catchy heading
- a variety of headlines
- an analysis of how each headline attracts readers

What story do you want your poster to tell?

How can you attract reader attention?

When is it better to use decimals? fractions? percents?

Math Games

Math's a Snap

In the card game called Snap, players take turns flipping cards until the last two cards flipped are a match. They can match in value (e.g., two 8s) or in pictures (e.g., two queens). The first player to say “snap” wins all the cards that have been flipped.


You will now play a different type of Snap using number cards. Instead of a regular deck with 4 sets of 13 cards each, you will use 3 sets of 18 cards. The 3 sets are made up of fractions, decimals, and percents. The aim is to identify matching values when the cards are flipped.

For example, $\frac{4}{5}$, $\frac{8}{10}$, 0.8, and 80% all have the same value.

These are the rules for Math's a Snap:

- Play the game with a partner.
- One player shuffles the cards.
- With the deck face down, each player draws a card.
The player with the higher-value card is Player 1.
The player with the lower-value card is Player 2.
If the two cards have the same value, try again.
- Player 1 again shuffles the cards and deals all of them, face down. Each player gets 27 cards.
- Beginning with Player 2, the players take turns flipping the top card from their stack.
- If the last two cards flipped have the same value, the first player to say “Snap!” wins all the flipped cards.
- If a player says “Snap!” when the last two flipped cards do not match, the other player wins all the flipped cards.
- The first player to run out of cards loses the round.
- Play as many rounds as you choose to decide who wins the game.

Materials

- one deck of Math's a Snap cards per pair of students 

WWW Web Link

For a suitable set of playing cards to use for this game, go to www.mathlinks7.ca and follow the links.



Challenge in Real Life

Fraction Converter for Everyday Life

Fractions and their equivalent values in percents and decimals are part of life. Explore by asking friends, family members, and neighbours how they use fractions, percents, and decimals in their jobs and everyday lives. Research how they are used in careers of your choice. Keep a record of specific fractions, percents, and decimals that you come across.

- Note the fractions, percents, and decimals mentioned most often.
- Organize them into a table. Make columns that include percent and decimal equivalents. Also include jobs and real-life situations that use these fractions, decimals, and percents. Complete your table by filling in all the columns.
- You be the designer! Use your table to design a fraction converter. It could be in the form of a ruler or wheel, or any other form that is simple to use.
- If possible, build a model of your design, using materials at school or at home.

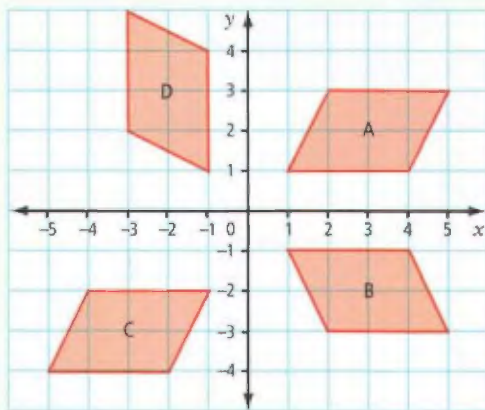
0.05	$\frac{1}{20}$	5%
0.1	$\frac{1}{10}$	10%
0.2	$\frac{1}{5}$	20%
0.25	$\frac{1}{4}$	25%
0.33	$\frac{3}{10}$	33%
0.5	$\frac{1}{2}$	50%
0.66	$\frac{2}{3}$	66%
0.75	$\frac{3}{4}$	75%



Chapters 1–4 Review

Chapter 1 Coordinates and Design

- Plot the following points on a coordinate grid: $A(-3, 5)$, $B(-1, 3)$, $C(0, 2)$, $D(1, 3)$, $E(2, 0)$, $F(3, -1)$.
 - Which one point seems out of place?
 - The coordinates of the other five points follow a pattern. Name and plot two new points G and H that follow the pattern.
- Create square $DEFG$ on a coordinate grid. Start at $(2, -2)$. The square must have a perimeter of 16 units. The points must lie in all four quadrants. Label the vertices. What are the ordered pairs?
- Nicholas is drawing plans for his garden on a coordinate grid. The coordinates of three vertices of a rectangular flower bed are $(5, 2)$, $(-3, 2)$, and $(-3, -3)$. What are the coordinates of the fourth vertex?
- What transformation would move parallelogram A to parallelogram B ?
 - What transformation would move parallelogram A to parallelogram C ?
 - What transformation would move parallelogram A to parallelogram D ?



- Construct $\triangle ABC$ with vertices at $A(0, 0)$, $B(4, 0)$, and $C(0, 4)$. Rotate $\triangle ABC$ 90° clockwise about the centre of rotation at $(0, 0)$. Then, reflect $\triangle A'B'C'$ in the y -axis.
 - Draw $\triangle A'B'C'$. What are the coordinates of the vertices?
 - Draw $\triangle A''B''C''$. What are the coordinates of the vertices?
 - Describe the horizontal and vertical distance between vertex B and B'' .
- A cheerleading squad forms a square with vertices at $T(-2, -4)$, $E(-2, -7)$, $A(-5, -7)$, and $M(-5, -4)$. The cheerleaders rotate the square 90° counterclockwise about the centre of rotation $R(-2, -1)$. Then, they move square $T'E'A'M'$ 2 units horizontally left and 3 units vertically up to form square $T''E''A''M''$.
 - What are the coordinates of vertices T'' , E'' , A'' , and M'' ?
 - Describe the horizontal and vertical distances between vertex E and E'' .

Chapter 2 Operations on Decimal Numbers

- Without calculating the answer, place the decimal point in the correct position. Show your thinking.
 - $0.458 + 0.319 + 0.2 = 9770$
 - $48.31 - 27.65 = 2066$
 - $5.9 \div 0.314 = 187898$
 - $24 \times 0.083 = 19920$

8. Estimate and then calculate.

- a) $6.7 + 1.15$ b) $9.6 - 2.8$
c) 2.6×3.7 d) $4.06 \div 0.7$

9. Calculate the value of each expression.

- a) $4.2 + 0.6 \div 3 - 0.3 \times 4$
b) $17.5 - (1.5 \times 2) \div 5 + 2.8$

10. During summer vacation, Remi and Kali each earn \$10.25 per hour for doing odd jobs. One weekend, they each worked 9.5 h. How much did they earn altogether?



11. On a shopping trip for school supplies you buy a package of coloured pencils, 7 scribblers, a ruler, a calculator, and 12 pencils.

Glue Stick	\$1.97
Coloured pencils	\$7.46
Calculator	\$8.77
Pencils	6@\$1.97
Erasers	\$1.87
Ruler	\$0.94
Scribbler	\$1.97
Pencil case	\$3.96

- a) Estimate the total cost before tax. Is your estimate over or under the total?
b) What is the total cost of all your items?
c) What is the total bill including any PST and GST?
d) You give the cashier two \$20 bills. How much change should you receive?

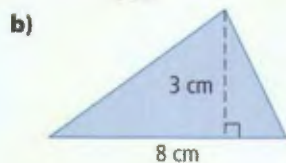
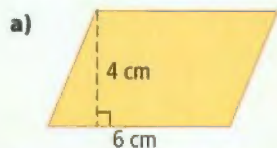
12. Audra and Tom are working in the school kitchen on Soup Day. Their job is to make 8 L of chicken noodle soup in a large pot. They have only small cans (0.284 L) of soup. They will add 1 can of water for each can of soup.

- a) How many small cans of soup are needed to make 8 L?
b) How many students could be served if each student received 0.190 L of the soup?
c) Small cans of soup each cost \$0.97. The school sells soup at \$1.00 a bowl. What is the profit on the 8 L of soup?
d) What assumptions do you need to make to answer part c)?
e) What other costs might be involved in the sale of soup?

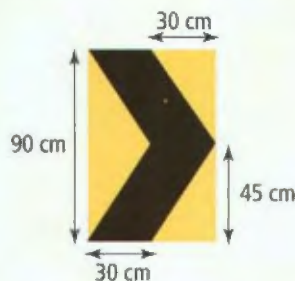
Chapter 3 Geometry and Measurement

13. a) Using only parallel line segments and perpendicular line segments, construct a rectangle with a base of 15 cm and a height of 10 cm.
b) Show how the rectangle can be made into a parallelogram with a base of 15 cm and height of 10 cm.
c) Show how the rectangle can be made into two triangles with a base of 15 cm and a height of 10 cm.
14. Using only perpendicular bisectors and angle bisectors, construct the following:
a) a T that is 10 cm high and 10 cm wide
b) an arrow that is 10 cm high and 6 cm wide

15. What is the area of each shape?



16. The road sign shown is a chevron (arrowhead). This warning sign is posted in groups to guide drivers around sharp curves in the road.



- What is the area of the black chevron?
- What is the total area of the yellow triangles?

Chapter 4 Fractions, Decimals, and Percents

17. Draw a number line. Place each of the following numbers on your number line.

$$62\frac{1}{2}\% \quad 0.6 \quad \frac{2}{3}$$

18. Show each fraction as a repeating decimal.

$$\text{a) } \frac{4}{9} \qquad \text{b) } \frac{3}{11} \qquad \text{c) } \frac{2}{7}$$

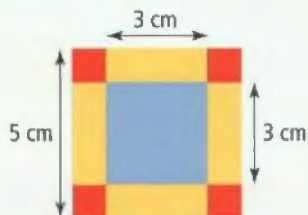
19. Show each terminating decimal as a fraction.

$$\text{a) } 0.35 \qquad \text{b) } 0.2 \qquad \text{c) } 0.025$$

20. Three brands of recordable CD-ROMs are checked for defects.

Brand	Number Tested	Number Passed
Electro-Zip	20	15
Ultraback	10	7
A-Retrieve	30	23

- What fraction of each brand passed the test? What percent of each brand passed?
 - Which brand of CD-ROM seems most reliable? Justify your answer.
21. Jeremy sold 220 out of 250 newspapers. Maria sold 85% of her 260 newspapers.
- Who sold the most newspapers? How many did that person sell?
 - Who sold the greatest percent of newspapers? What was the percent?
22. At a fairground game, you can throw a dart at the square target to win a prize.



- Which do you think is easiest to hit: red, yellow, or blue? Explain your choice.
- Every dart that lands in one of the coloured regions is a winner. What fraction of the total area is each colour? What percent of the total area is each colour?
- Rank the colours in order from greatest to least area. Which colour should get the best prize, and why?

Task

Create a Logo

Create a new logo that might be used on a crest for team shirts, on school banners, and on the opening page of the school's web site.

The student council wants a logo with

- at least three different geometric shapes
- at least two triangles
- at least one parallelogram

1. Create a drawing of your logo on grid paper. Label all dimensions. Explain how your logo meets the requirements set out by the student council.

2. In order to make a school crest, your logo must be sewn onto material. Every line on the edge of each shape must be sewn. Sewing costs \$0.30 per centimetre. How much will it cost to sew one of your logos? Explain.

3. The school is creating a large banner that includes an enlarged logo. White material for the background costs \$4.99 per square metre. Adding colour costs \$5.10 per square metre.

a) Design the banner. Consider the following:

- How large a banner does your school need?
- Where will you place your logo on the banner?
- What else will be on the banner?

b) Estimate and then calculate the total cost of your banner including the logo.

Materials

- grid paper
- ruler

Optional

- coloured pencils

