

UNIT

8

Working with Percents

Stores offer goods on sale to encourage you to spend your money.

What is the sale price of each item in the picture?

How did you calculate the sale price?

What do you need to add to find the price you pay?



Ice Skates
\$50.00



Skis
\$200.00



Running Shoes
\$150.00

What You'll Learn

- Relate decimals, fractions, and percents.
- Solve problems that involve fractions, decimals, and percents.
- Multiply decimals.
- Divide decimals.
- Draw circle graphs by hand.

Why It's Important

When you buy something, you pay sales tax. To be able to calculate the sales tax is useful. Then you know if you have enough money to buy the item.



Hockey
Sweater
\$80.00

Half price
Sale!
Everything
50% off
tag price!

Key Words

- percent
- percent circle

Skills You'll Need

Writing a Fraction As a Decimal

To write a fraction as a decimal, try to write an equivalent fraction with denominator 100.

When we cannot write an equivalent fraction, we use a calculator to divide.



Example 1

Convert each fraction to a decimal.

a) $\frac{3}{5}$

b) $\frac{7}{8}$

Solution

a) $\frac{3}{5}$

Write an equivalent fraction.

$$\frac{3}{5} \xrightarrow{\times 20} \frac{60}{100}$$

$$\frac{60}{100} = 0.60$$

So, $\frac{3}{5} = 0.60$

b) $\frac{7}{8}$

We cannot write an equivalent fraction with denominator 100.

Use a calculator.

$\frac{7}{8}$ means $7 \div 8$.

Key in: 7 $\boxed{\div}$ 8 $\boxed{=}$ to display 0.875

$$\frac{7}{8} = 0.875$$

Some conversions from fractions to decimals are worth remembering.

Try to remember these:

$$\frac{1}{2} = 0.5 \quad \frac{1}{4} = 0.25 \quad \frac{1}{5} = 0.2 \quad \frac{1}{8} = 0.125 \quad \frac{1}{10} = 0.1 \quad \frac{1}{100} = 0.01$$

You can use these conversions to write other fractions as decimals.

For example, since $\frac{1}{10} = 0.1$, then $\frac{2}{10} = 0.2$, $\frac{3}{10} = 0.3$, and so on.



Check

1. Write each fraction as a decimal. Use mental math.

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

b) $\frac{2}{5}$

c) $\frac{6}{10}$

d) $\frac{68}{100}$

2. Write each fraction as a decimal.

a) $\frac{5}{8}$

b) $\frac{3}{16}$

c) $\frac{3}{8}$

d) $\frac{7}{16}$

Percent

Percent means per hundred. One whole, or 1, is 100%.

So, 70% means $\frac{70}{100}$, 4% means $\frac{4}{100}$, and 100% means $\frac{100}{100}$, or 1.

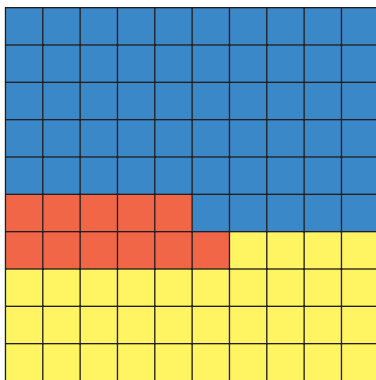
Example 2

What percent of this hundred chart is shaded each colour?

a) Red

b) Blue

c) Yellow



Solution

- a) There are 11 red squares out of 100 squares.
That is: $\frac{11}{100} = 11\%$
- b) There are 55 blue squares out of 100 squares.
That is: $\frac{55}{100} = 55\%$
- c) There are 34 yellow squares out of 100 squares.
That is: $\frac{34}{100} = 34\%$

✓ Check

Use a hundred chart.

3. Shade:

a) 15% red

b) 26% yellow

c) 43% green

d) 10% blue

4. What percent of the hundred chart in question 3 is not shaded?

8.1

Relating Fractions, Decimals, and Percents

Focus Relate percent to fractions and decimals.

We see uses of percent everywhere.

What do you know from looking at each picture?

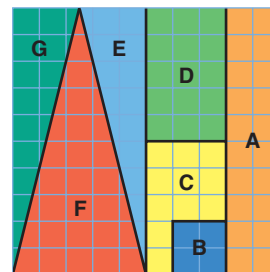


Explore

Work with a partner.

Your teacher will give you a large copy of this puzzle.

Describe each puzzle piece as a fraction, a decimal, and a percent of the whole puzzle.



Reflect & Share

Compare your answers with those of another pair of classmates. If the answers are different, how do you know which are correct?

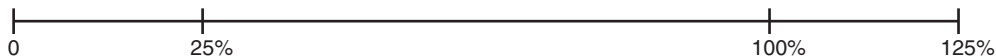
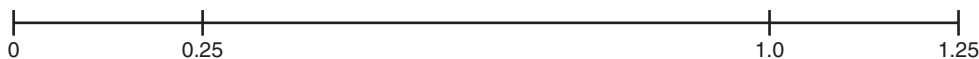
Connect

➤ Since a percent can be written as a fraction, a percent can also be written as a decimal.

We can use number lines to illustrate the relationships.

For example:

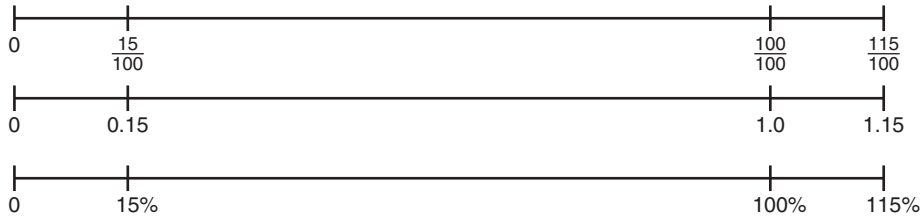
$$25\% = \frac{25}{100} = 0.25 \qquad 125\% = \frac{125}{100} = 1.25$$



➤ Conversely, a decimal can be written as a percent:

$$0.15 = \frac{15}{100} = 15\%$$

$$1.15 = \frac{115}{100} = 115\%$$

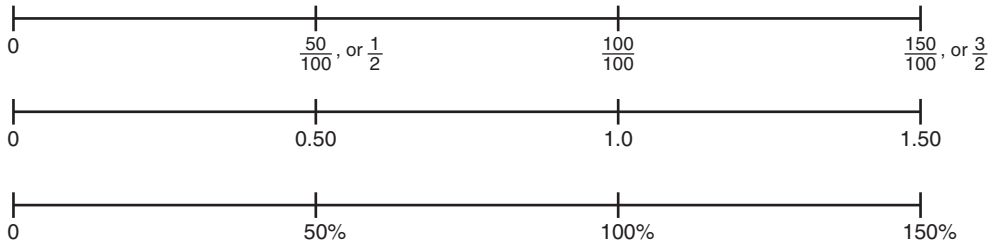


➤ To write a fraction as a percent, first write the fraction with denominator 100.

For example:

$$\frac{1}{2} = \frac{50}{100} = 50\%$$

$$\text{and } \frac{3}{2} = \frac{150}{100} = 150\%$$



When a decimal has 3 digits after the decimal point, we can write it as a fraction with denominator 1000.

➤ Some fractions cannot be written with denominator 100. Use a calculator to divide.

$$\begin{aligned} \frac{5}{8} &= 0.625 \\ &= \frac{625}{1000} \\ &= \frac{62.5}{100} \\ &= 62.5\% \end{aligned}$$

Divide numerator and denominator by 10.

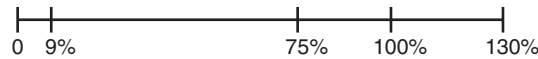
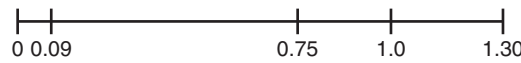
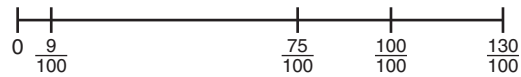
Example

- a) Write each percent as a fraction and as a decimal.
- i) 75% ii) 9% iii) 130%
- b) Write each fraction as a percent and as a decimal.
- i) $\frac{2}{5}$ ii) $\frac{5}{2}$

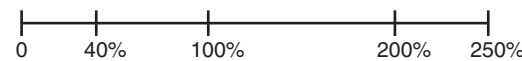
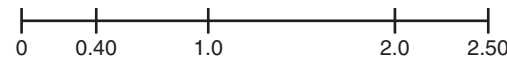
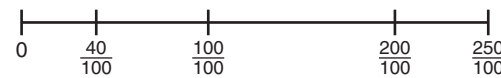
Draw number lines to show how the numbers are related.

Solution

- a) i) $75\% = \frac{75}{100} = 0.75$
 ii) $9\% = \frac{9}{100} = 0.09$
 iii) $130\% = \frac{130}{100} = 1.30$

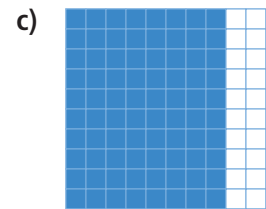
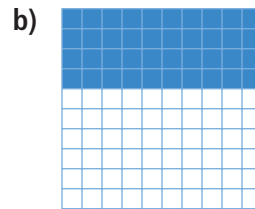
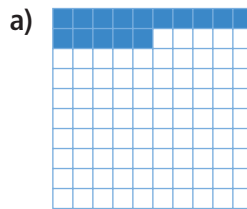


- b) i) $\frac{2}{5} = \frac{40}{100} = 40\%$ ii) $\frac{5}{2} = \frac{250}{100} = 250\%$
- $\frac{40}{100} = 0.40$ $\frac{250}{100} = 2.50$



Practice

1. What percent of each hundred chart is shaded?
 Write each percent as a fraction and a decimal.



2. Write each fraction as a percent.
 Sketch number lines to show how the numbers are related.

a) $\frac{1}{4}$ b) $\frac{3}{10}$ c) $\frac{7}{5}$ d) $\frac{3}{4}$

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

a) $\frac{2}{10}$ b) $\frac{3}{50}$ c) $\frac{4}{25}$ d) $\frac{23}{20}$ e) $\frac{14}{10}$



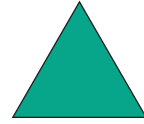
4. Fred had 8 out of 10 on a test. Janet had 82% on the test. Who did better? How do you know?

5. This equilateral triangle is 20% of a larger figure.

Use triangular grid paper.

Draw a figure that shows 100%.

Is there more than one answer? Explain.



6. This orange square represents 25% of a larger figure.

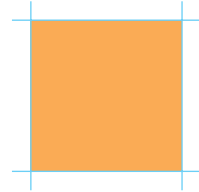
Use 2-cm grid paper.

a) Draw 50% of the larger figure.

b) Draw 75% of the larger figure.

c) Draw the larger figure.

d) Draw 125% of the larger figure.



7. **Assessment Focus** You will need a sheet of paper and coloured pencils.

Divide the paper into these 4 sections.

- 1 blue section that is $\frac{1}{2}$ the page
- 1 red section that is 10% of the page
- 1 yellow section that is 25% of the page
- 1 green section to fill the remaining space

Explain how you did this.

What percent of the page is the green section?

How do you know?

8. What does it mean when someone states, “She gave it 110%”? How can this comment be explained using math?

9. Suppose each pattern is continued on a hundred chart. The numbers in each pattern are coloured red. For each pattern, what percent of the numbers on the chart are red?

Explain your strategy for each pattern.

- | | |
|--------------------------|---------------------|
| a) 4, 8, 12, 16, 20, ... | b) 1, 3, 5, 7, ... |
| c) 2, 4, 8, 16, ... | d) 1, 3, 7, 13, ... |

Number Strategies

How many:

- centimetres in 1 m?
- square centimetres in 1 m²?
- cubic centimetres in 1 m³?

Sketch a picture to show each relationship.

Take It Further

Reflect

Suppose you know your mark out of 20 for an English test. How could you write the mark as a percent?

Showdown



YOU WILL NEED

2 sheets of SHOWDOWN playing cards (48 cards); scissors; a calculator

NUMBER OF PLAYERS

2

GOAL OF THE GAME

To have all the cards when the game ends

What strategies did you use to find which number was greater?

HOW TO PLAY THE GAME:

1. Cut out the cards, then shuffle them. Deal all the cards. Each player stacks his cards face down in a pile.
2. Players turn over the first card in their piles, then compare the numbers. The player whose card shows the greater number wins and takes both cards. Both cards are placed in a “captured pile” next to the winner’s original pile. See *Step 6* when there is a tie.
3. Play continues until all cards are turned up.
4. Each player then shuffles his captured pile of cards and play continues.
5. The game ends when one player has no cards.
6. **Showdown** If there is a tie between two cards, a showdown occurs. Each player takes the next two cards from his pile and places them face down on top of the original card. A third card is then turned over by each player, and these cards are compared. The player whose card shows the greater number takes all cards involved in the showdown. If there is a tie, another showdown occurs until the tie is broken.

Note: If a player is unable to place cards in a showdown because the player has only one card, the player’s last card is the turnover card.



Explore

Work with a partner.

Look at the surface of your desk.



There is probably a textbook on it, and maybe a pencil case, an eraser, or a ruler.

How much of the surface is covered?

How much of the surface is not covered?

Use a calculator and a ruler.

Estimate the percent of your desk's surface that is covered and the percent that is not. Show your work.

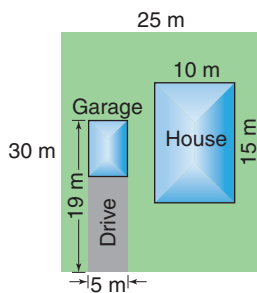
Reflect & Share

Compare your results with those of another pair of classmates.

Discuss the strategies you used to find the percent of surface not covered.

Connect

Here is a sketch of a yard.



Round 245 to 250 to get a "friendly" number. Both 250 and 750 have 250 as a common factor.

➤ To find the percent of the yard that is covered by the house, garage, and drive, calculate the area covered by

- the house: $15 \text{ m} \times 10 \text{ m} = 150 \text{ m}^2$
- the garage and the drive: $19 \text{ m} \times 5 \text{ m} = 95 \text{ m}^2$

Total area covered is: $150 \text{ m}^2 + 95 \text{ m}^2 = 245 \text{ m}^2$

The area of the yard is: $30 \text{ m} \times 25 \text{ m} = 750 \text{ m}^2$

The fraction of the yard that is covered is: $\frac{245}{750}$

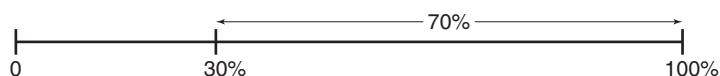
For an estimate of the fraction, round 245 to 250.

The fraction of the yard that is covered is about $\frac{250}{750} = \frac{1}{3}$.

$\frac{1}{3}$ is about 30%.

So, about 30% of the yard is covered by the house, garage, and drive.

- To find the percent of the yard made up of garden and grass:
The yard is 100%.
Subtract: $100\% - 30\% = 70\%$
So, about 70% of the yard is made up of garden and grass.
We can show these percents on a number line.



We can use mental math to estimate and calculate percent.

Example 1

There are 27 students in the Grade 7 class.
Five students are left-handed.

- What is the fraction of students who are left-handed?
- Estimate the percent of students who are left-handed.

Solution

a) The fraction of students who are left-handed is $\frac{5}{27}$.

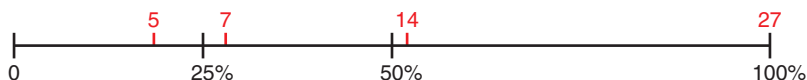
b) *Method 1*

One whole or 100% is 27 students.

50% of 27 students is about 14 students.

25% of 27 students is about 7 students.

So, the percent of students who are left-handed is less than 25%.



Method 2

Approximate $\frac{5}{27}$ to a “friendly” fraction: $\frac{5}{27} \doteq \frac{5}{25}$

$$\frac{5}{25} \begin{array}{c} \times 4 \\ \curvearrowright \\ = \\ \frac{20}{100} = 20\% \\ \curvearrowleft \\ \times 4 \end{array}$$

Approximately 20% of the students are left-handed.

A “friendly” fraction has a denominator such as 5, 10, 20, 25, 50. A fraction with one of these denominators can be more easily converted to a percent.

Example 2

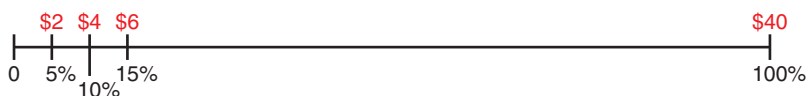
A pair of pants costs \$39.99.
The sales tax is 15%.
Estimate the cost of the pants.



Solution

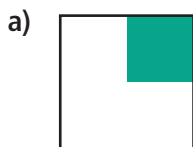
Mental math strategy:
A quick way to find 10% is to move the decimal point 1 place to the left:
10% of 40. = 4.0

Round \$39.99 to \$40.
To find 15%, find 10% and 5%.
10% of \$40 = $0.1 \times \$40 = \4
5% is $\frac{1}{2}$ of 10%.
So, 5% of \$40 = $\frac{1}{2}$ of \$4 = \$2
So, the sales tax is $\$4 + \$2 = \$6$.
The cost of the pants is about $\$40 + \$6 = \$46$.
We can show these percents on a number line.



Practice

1. Estimate the percent of each figure that is shaded.



2. Find 10% of each number.

- | | | | |
|-------|-------|-------|--------|
| a) 50 | b) 40 | c) 90 | d) 300 |
| e) 75 | f) 33 | g) 45 | h) 18 |

3. Use your answers to question 2.

Find 5% of each number in question 2.

4. Use your answers to questions 2 and 3.
Find 15% of each number in question 2.
5. This strip is 12 cm long.



Mental Math

How many squares are there on an 8 by 8 checkerboard?

Remember to count squares of all sizes.

Find the length of:

- a) 25% of the strip b) 10% of the strip
c) 20% of the strip d) 150% of the strip

Sketch number lines to illustrate your answers.

6. A pair of shoes costs \$65. The sales tax is 15%. Explain how to find the cost of the shoes using two different methods.

7. Estimate.

- a) 49% of 150 b) 31% of 40
c) 149% of 60 d) 98% of 54
e) 90% of 44 f) 61% of 88
g) 2% of 200 h) 5% of 81

8. Scott estimated that 22% of 160 is approximately 30.

Do you agree with his estimate? Explain.

Sketch number lines to support your answer.

9. There were 341 pine trees and spruce trees in a woodlot.

One hundred twenty-two trees were pine.

- a) What fraction of the trees were spruce?
b) Estimate the percent of spruce trees.



10. In a parking lot, there are 45 North American cars and 21 foreign cars.

- a) What fraction of the cars are foreign?
b) Estimate the percent of cars that are foreign.
c) Estimate the percent of cars that are not foreign.



11. **Assessment Focus** Look at the front and back cover of this textbook, including the spine. Explain how you might estimate the percent of the book cover that is illustrated.

Show all your steps. Provide numbers to support your answer.

- 12.** About 8% of Canada is covered by fresh water.
The area of Canada is approximately 9 970 000 km².
a) Estimate the area of Canada covered by fresh water.
b) About how much of Canada is not covered by fresh water?
- 13.** About 23% of Canada is covered by tundra.
Use the data in question 12.
Estimate the area of tundra in Canada.
- 14.** Raji's bedroom floor has an area of 12 m². She estimates that her bed, desk, and bookshelf cover approximately 7.5 m² of floor space.
a) What fraction of the floor space is not covered?
b) What percent of the floor space is not covered?
Sketch number lines to illustrate your answers.

Take It Further

- 15.** Edward estimates he has travelled approximately 80 km.
The total length of Edward's trip is 430 km.
About what percent does Edward still have left to go?

Reflect

Which percents can you find by using mental math or estimation?
Give an example of how to find each percent you name.

Math Link

Your World

Percents are printed on the side of a cereal box to indicate the nutritional value of the contents. The percents relate to every 30-g serving (about 1 cup). Suppose there is a 10% sugar content. Then, in a 30-g serving, there are 3 g of sugar per cup of cereal. Next time you look for a box of your favourite cereal, check out the percents of sugar and fat. Compare them to another brand of cereal. Would your family doctor or dentist approve of your choice? Explain.



Explore

Work with a partner.



How could you find how much you save on an item that originally cost \$48.00?

Find several ways to solve this problem.

Reflect & Share

Compare strategies with another pair of classmates.

Which strategy would you use if the sale was 45% off? Explain.

Connect

A paperback novel originally cost \$7.99.

It is on sale at 15% off.

To find how much you save, calculate 15% of \$7.99.

$$15\% = \frac{15}{100} = 0.15$$

$$\begin{aligned} \text{So, } 15\% \text{ of } \$7.99 &= \frac{15}{100} \text{ of } 7.99 \\ &= 0.15 \times 7.99 \end{aligned}$$

Recall, from Unit 4, how we multiply two decimals with tenths.

We use the same method to multiply two decimals with hundredths.

To multiply: 0.15×7.99 , multiply without the decimal points.

Then insert the decimal point in the answer by estimation or by counting decimal places.

$$\begin{array}{r} 799 \\ \times 15 \\ \hline 3995 \\ 7990 \\ \hline 11985 \end{array}$$

There is a total of 4 decimal places in the question; so, there will be 4 decimal places in the answer.

Estimate:

15% is about 20%, which is $\frac{1}{5}$.

\$7.99 is about \$10.00.



So, 0.15×7.99 is about $\frac{1}{5}$ of 10, which is 2.

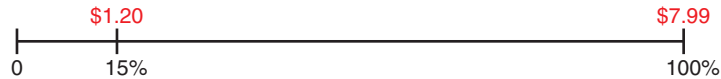
So, $0.15 \times 7.99 = 1.1985$

Round to 2 decimal places.

1.1985 is 1.20, to 2 decimal places.

You save \$1.20 by buying the book on sale.

We can show this on a number line.



Example

A park has an area of 52.6 km^2 .

Sixty-five percent of the park is forest.

The rest of the park is lakes.

What is the area of the lakes?

Solution

65% of the park is forest.

So, $100\% - 65\%$, or 35% of the park is lakes.

The area of the lakes is: 35% of 52.6

$$35\% = \frac{35}{100} = 0.35$$

So, 35% of $52.6 = 0.35 \times 52.6$

Multiply: 526×35

$$\begin{array}{r} 526 \\ \times 35 \\ \hline 2630 \\ 15780 \\ \hline 18410 \end{array}$$

Since the area of the park is given to 1 decimal place, we round the answer to 1 decimal place.

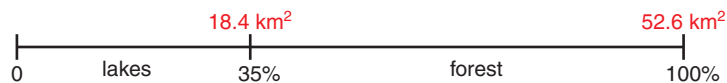
Estimate:

35% of 52.60 is about 50% of 50, which is 25.

So, $0.35 \times 52.6 = 18.41$

35% of 52.6 km^2 is 18.41 km^2 .

The area of the lakes is about 18.4 km^2 .



Practice



- Calculate.
a) 10% of 27.3 b) 20% of 48.4 c) 1% of 30.6 d) 120% of 81.2
- Find.
a) 18% of 36 b) 24% of 67 c) 98% of 28 d) 67% of 112
- Find each percent of \$59.99.
a) 25% b) 75% c) 30% d) 70% e) 80% f) 90%
- The regular price of a radio is \$60.00. Find the sale price when the radio is on sale for:
a) 25% off b) 30% off c) 40% off
- Find the cost of each item on sale.
Each item has a 15% sales tax added to the sale price.
a) coat: 55% off \$90 b) shoes: 45% off \$40
- Assessment Focus**
 - Calculate each percent of 52.3.
How can you do this by completing only one multiplication?
i) 2% ii) 20% iii) 200%
 - Make up a similar example. Choose a number and 3 related percents. Show how you only need to multiply once to find all the percents of the number.
- How is calculating 25% of \$15.00 the same as calculating 15% of \$25.00? How are the calculations different? Sketch number lines to illustrate your answer.
- A garage floor is rectangular.
Its length is 9.0 m and its width is 5.1 m.
The length and width of a Toyota Corolla are 4.5 m and 1.7 m.
What percent of the garage floor is occupied by the car?

Number Strategies

Use Pattern Blocks.

Suppose the red block represents 1 whole.

What does each block represent?

- the blue block
- the green block
- the yellow block

Reflect

Choose a percent. Choose an amount of money.
Calculate the percent of the money. Show your work.

Mid-Unit Review

LESSON

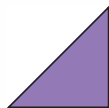
- 8.1 1.** Write each fraction as a decimal and as a percent. Sketch number lines to illustrate.

a) $\frac{4}{5}$ b) $\frac{3}{25}$ c) $\frac{118}{50}$ d) $\frac{7}{20}$

- 2.** Write each fraction as a decimal and as a percent. Sketch number lines to illustrate.

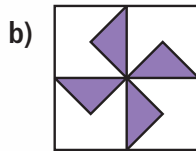
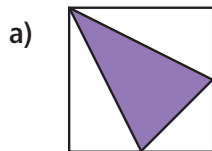
a) $\frac{27}{20}$ b) $\frac{14}{25}$ c) $\frac{15}{8}$ d) $\frac{7}{16}$

- 3.** This right isosceles triangle is 20% of a larger figure.



Draw a figure that represents 100%.

- 8.2 4.** Estimate the percent of each figure that is shaded.



- 5.** In a piggy bank, there were 21 pennies, 32 nickels, and 13 dimes.
- What fraction of the coins were nickels?
 - Estimate the percent of coins that were nickels.
 - How much money was in the piggy bank?
 - Estimate the percent of money that was in dimes.

- 6.** Find 10% of each number.
a) 28 b) 66 c) 35 d) 180

- 7.** Use the results of question 6. Find 60% of each number in question 6.

- 8.** Use estimation. Find an approximate percent for each fraction.

a) $\frac{14}{17}$ b) $\frac{21}{30}$ c) $\frac{118}{60}$ d) $\frac{172}{80}$ e) $\frac{2}{21}$

- 9.** Estimate.

a) 14% of 98 b) 61% of 52
c) 76% of 202 d) 98% of 134

- 8.3 10.** a) Find:

- 5% of \$1.00
- 30% of \$1.00
- 130% of \$1.00
- 20% of \$1.00

- b) Sketch a number line to illustrate your answers to part a.

- 11.** Toni wants to buy a shirt. The original price is \$85.00, but it is on sale for 30% off. Toni will pay 15% sales tax. How much will the shirt cost?

- 12.** How is calculating 85% of \$40.00 the same as calculating 40% of \$85.00? How are the calculations different? Sketch number lines to illustrate your answers.

Focus Use circle graphs to display data and solve problems.

You have drawn a circle graph using a computer.

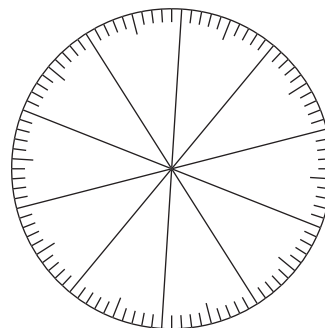
Now that you can calculate percents, you can draw a circle graph by hand.

This is a **percent circle**.

The circle is divided into 100 congruent sectors.

Each sector is 1% of the whole circle.

You can draw a circle graph on a percent circle.



Explore

Work with a partner.

Your teacher will give you a percent circle.

Everyone in the class writes on the board the number of siblings he or she has.

Copy this table.

0 Siblings	1 Sibling	2 Siblings	More than 2 Siblings

Record the data.

Use the percent circle.

Draw a circle graph to display the data.

Write 2 questions you can answer by looking at the graph.

Reflect & Share

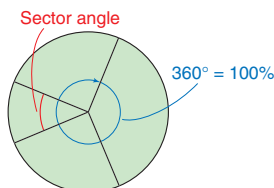
Trade questions with another pair of classmates.

Use your graph to answer your classmates' questions.

Compare graphs. If they are different, try to find out why.

How did you use fractions and percents to draw a circle graph?

Connect



Recall that a circle graph shows how parts of a set of data compare with the whole set.

Each sector of a circle graph represents a percent of the whole circle.

The whole circle represents 100% and has a central angle of 360° .



This table shows the 2003 top 10 Ladies' Professional Golf Association (LPGA) money winners' place of birth.

Asia	Australia	Europe	North America
Kung	Teske	Sorenstam	Daniel
Pak			Inkster
Park			Jones
Han			Ochoa

To draw a circle graph to show what percent of the top 10 were born in each place, follow these steps.

Step 1

Write the number of players born in each place as a fraction of 10, then as a percent.

$$\begin{aligned} \text{Asia: } \frac{4}{10} &= 0.4 = \frac{40}{100} = 40\% & \text{Australia: } \frac{1}{10} &= 0.1 = \frac{10}{100} = 10\% \\ \text{Europe: } \frac{1}{10} &= 0.1 = \frac{10}{100} = 10\% & \text{North America: } \frac{4}{10} &= 0.4 = \frac{40}{100} = 40\% \end{aligned}$$

The area of the circle represents all the golfers. All the sector angles add to 360° .

Step 2

To find the sector angle for each place of birth, multiply each decimal by 360° .

Round to the nearest degree, when necessary.

Asia 40%: $0.40 \times 360^\circ = 144^\circ$

Australia 10%: $0.10 \times 360^\circ = 36^\circ$

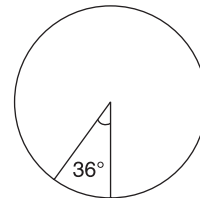
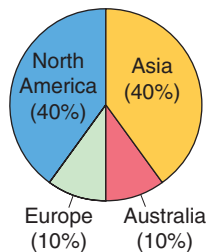
Europe 10%: same as Australia, so 36°

North America 40%: same as Asia, so 144°

To check, add the angles. The sum should be 360° .

$$\begin{array}{r} 144^\circ \\ 36^\circ \\ 36^\circ \\ + 144^\circ \\ \hline 360^\circ \end{array}$$

Top 10 LPGA Winners' Place of Birth



Step 3

Construct a circle.

Use a protractor to construct each sector angle.

Start with the smallest angle. Draw a radius.

Measure 36° .

Start the next sector where the previous sector finished.

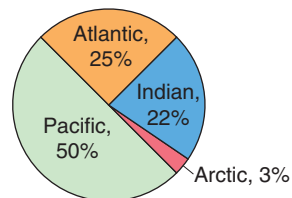
Label each sector with its name and percent.

Write a title for the graph.

$$\begin{aligned} \text{Indian: } 22\% \text{ of } 360^\circ &= 0.22 \times 360^\circ \\ &= 79.2^\circ \\ &\approx 79^\circ \end{aligned}$$

$$\begin{aligned} \text{Pacific: } 50\% \text{ of } 360^\circ &= 0.50 \times 360^\circ \\ &= 180^\circ \end{aligned}$$

Areas of Oceans



Construct a circle.

Use a protractor to construct each sector angle.

Label each sector with its name and percent.

Write a title for the graph.

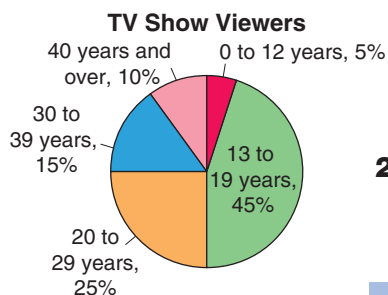
- b) The largest ocean is the Pacific Ocean.

Its area is:

$$\begin{aligned} 50\% \text{ of } 337\,000\,000 \text{ km}^2 &= 0.50 \times 337\,000\,000 \text{ km}^2 \\ &= 168\,500\,000 \text{ km}^2 \end{aligned}$$

The largest ocean has an area about 168 500 000 km².

Practice



1. This circle graph shows the ages of viewers of a TV show. One week, approximately 250 000 viewers tuned in.

How many viewers were in each age group?

- a) 13 to 19 b) 20 to 29 c) 40 and over

2. a) Can the data in each table below be displayed in a circle graph? Explain.

i)

ii)

Canadians, Educational Attainment, 2001

0 to 8 years of elementary school	10%
Some secondary school	17%
Graduated from high school	20%
Some post secondary education	9%
Post-secondary certificate or diploma	28%
University degree	16%


Canadian Households with These Appliances, 2000

Automobiles	64%
Cell phone	42%
Dishwasher	51%
Internet	42%

- b) For the data that could not be displayed in a circle graph, state what type of graph you would use to display it.

3. The table shows the number of Grade 7 students with each eye colour at Northern Public School.

Eye Colour	Number of Students
Blue	11
Brown	24
Green	9
Grey	6



- a) Calculate the percent of students with each eye colour.
b) Draw a circle graph to represent the data.

4. In a telephone survey, 400 people voted for their favourite radio station.

Radio Station	Votes
MAJIC99	88
EASY2	?
ROCK1	120
HITS2	100

- a) How many people chose EASY2?
b) Write the number of people who voted for each station as a percent of the total number surveyed.
c) Draw a circle graph to display the results of the survey.

5. **Assessment Focus** Choose some labels from canned food, cereal boxes, or other foods.

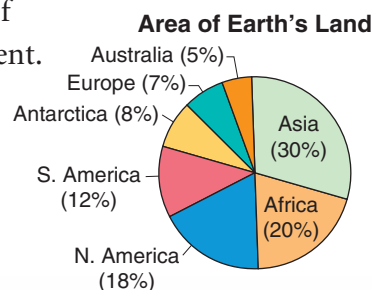
- a) List the nutritional information on each label.
b) Calculate the mass of each nutrient as a percent of the total mass.
c) Find the mass of each nutrient in 50 g of the food.
d) Draw a circle graph to display the percent of each nutrient. Show your work.

Calculator Skills

How many times can you multiply 2 by itself until the product gets too big for your calculator display? Write the greatest product as a power of 2.

Take It Further

6. This circle graph shows the percent of Earth's land occupied by each continent. The area of North America is approximately 220 million km². Use the percents in the circle graph. Find the approximate area of each of the other continents.



Reflect

What do you need to know about percents to be able to draw a circle graph? Include an example in your answer.

Explore

Work with a partner.

Suppose you pay \$15.00 for a shirt. How could you find out what the original price was?

Draw a diagram to model this problem.

Show several strategies for solving the problem.



Reflect & Share

Compare your strategies with those of another pair of classmates. Which strategies can you use to find the original price if you paid 35% of the original price? Explain.

Connect

Jenny wanted to know her brother Alan's mass.

Alan told Jenny that 15% of his mass is 6.75 kg.



Jenny knows what 15% is.

She wants to find 100%.

15% is 6.75.

So, 1% is: $\frac{6.75}{15}$

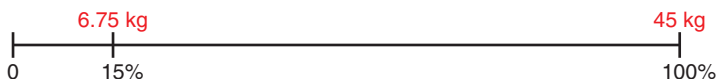
Use long division: $6.75 \div 15$

1% is 0.45.

So, 100% is: $0.45 \times 100 = 45$

Alan's mass is 45 kg.

$$\begin{array}{r} 0.45 \\ 15 \overline{) 6.75} \\ \underline{60} \\ 75 \\ \underline{75} \\ 0 \end{array}$$



Example

This sign appeared in a shop window.

Eric pays \$58.50 for a jacket.

What is the list price of the jacket?



Solution

Use a calculator or long division to find $\frac{\$58.50}{65}$.

65% of the list price is \$58.50.

So, 1% of the list price is: $\frac{\$58.50}{65} = \0.90

And, 100% is: $\$0.90 \times 100 = \90.00

The list price of the jacket is \$90.00.



Practice

1. 25% is 1.25 m.

a) What is 50%?

b) What is 100%?

Sketch a number line to show your answer.

2. 35% is 4.2 kg.

a) What is 1%?

b) What is 100%?

Sketch a number line to show your answer.

3. 45% is 13.5 cm.

a) What is 1%?

b) What is 100%?

Sketch a number line to show your answer.

4. The principal reported that 75% of the total number of families attended the school's Fun Fair. Three hundred sixty families went to the fair. How many families have children at the school?

5. A hockey team played 30 games. It won 60% of the games. How many games did the team lose?

6. Grace has read 30% of a book. She has read 72 pages. How many pages are in the book?



Number Strategies

Add or subtract.

- $\frac{3}{5} + \frac{3}{6}$
- $\frac{4}{5} - \frac{1}{2}$
- $\frac{3}{4} + \frac{4}{3}$
- $\frac{5}{6} - \frac{1}{4}$

7. Paco ate 25% of a 16-slice pizza and placed the rest in the fridge. Santos ate 25% of the leftovers.
- a) How many pieces were left?
 - b) What percent of the original pizza remained?
8. This year, 40 more children joined the local soccer club than last year. This is a 10% increase. How many students played in the club last year?
9. **Assessment Focus** Anika wants to buy a blouse. The original price is \$75.00. It is on sale for 30% off. Anika will pay 15% sales tax.
- a) How much will the blouse cost?
 - b) Does it make any difference to the cost in each situation?
 - i) The 30% is taken off before the 15% tax is added.
 - ii) The 15% tax is added before the 30% is taken off.Explain. Draw number lines to show your thinking.
10. Write your own problem that involves working with percents. Solve your problem. Show your work.

Take It Further

11. A pair of shoes in a clearance store went through a series of reductions. The regular price was \$125. The shoes were reduced by 20%. Three weeks later, the shoes were reduced by a further 20%. Later in the year, the shoes were advertised for sale at $\frac{3}{4}$ off the ticket price. Sean wants to buy the shoes. He has to pay 15% sales tax.
- a) Sean has \$40.00. Can Sean buy the shoes? Explain.
 - b) If your answer to part a is yes, how much change does Sean get?
- Sketch number lines to illustrate your work.
12. A box was $\frac{3}{4}$ full. The box fell on the floor. Thirty marbles fell out. This was 20% of the marbles that were in the box. How many marbles were in a full box?



Reflect

How does a good understanding of percents help you outside the classroom? Give an example.

Choosing a Strategy

Strategies

- Make a table.
- Use a model.
- Draw a diagram.
- Solve a simpler problem.
- Work backward.
- Guess and check.
- Make an organized list.
- Use a pattern.
- Draw a graph.
- Use logical reasoning.

Use a calculator when you need to.

1. Write 720 as the product of consecutive whole numbers. Find all the possible ways.

2. A digital clock shows this time.

Seven minutes past 7 is a palindromic time.

- a) List all the palindromic times between noon and midnight.
- b) What is the shortest time between two palindromic times?
3. I am a perfect square less than 400. The sum of my digits is also a perfect square. Which number could I be? Find all possible numbers.
4. The trail around Lake Pender is 20 km long. How long do you think it would take you to walk around the lake? Explain.



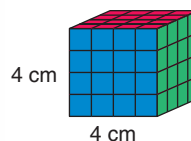
5. Jack's heart rate is 72 beats/min. How long will it take for Jack's heart to beat one million times?

6. A 4-cm cube is painted red on the top and bottom faces, blue on the front and back faces, and green on the side faces.

The cube is cut into 1-cm cubes.

How many of the small cubes will have:

- a) 3 colours of paint?
- b) 2 colours?
- c) 1 colour?
- d) no paint?
7. Use dot paper. Draw a quadrilateral with at least two sides equal. How many different quadrilaterals can you draw?





- 8.** The decimals 0.1, 0.2, 0.3, up to 1.0, are written on ten cards.

How many sets of three cards have a sum of 2?

- 9.** Use 1-cm grid paper.

Draw a 6 cm by 4 cm rectangle.

Shade $\frac{1}{4}$ red.

Shade $\frac{1}{3}$ of the remainder blue.

Shade $\frac{1}{2}$ of the unshaded area green.

What fraction is unshaded?

- 10.** A small company consists of the owner and 3 employees.

The owner earns \$10 000 a month. The employees earn \$4000, \$4000, and \$6000 per month.

- a)** The employees ask the owner for a pay raise.

Should they use the mean, median or mode salary when they present their case? Explain.

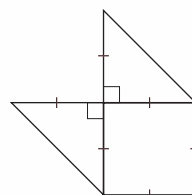
- b)** Should the owner use the mean, median or mode when she explains she cannot give the employees a raise? Explain.

- 11.** The area of a rectangular field is 3496 m^2 .

Its perimeter is 260 m.

What are the dimensions of the field?

- 12.** This figure comprises a square and two halves of a congruent square.



Arrange the parts of the figure to produce each new figure.

- a)** a rectangle **b)** a parallelogram **c)** a trapezoid **d)** a triangle

Sketch your answers.



Sports Trainer

Sports trainers use scientific research and scientific techniques to maximize an athlete's performance. An athlete may be measured for percent body fat, or percent of either fast- or slow-twitch muscle fibre.

A trainer may recommend the athlete eat pre-event meals that contain a certain percent of carbohydrate, or choose a "sports drink" that contains a high percent of certain minerals. The trainer creates and monitors exercise routines. These enable the athlete to attain a certain percent of maximum heart rate, speed, or power.

Most sports drinks contain minerals. Research shows that the most effective sports drink has a magnesium to calcium ratio of 1:2. The body absorbs about 87% of magnesium in a drink, and about 44% of calcium in a drink. One sports drink lists 100 mg of calcium per scoop. About how much magnesium is there in 1 scoop?



What Do I Need to Know?

 Here are some fractions, decimals, and percents you should know.

$$1 = 1.0 = 100\%$$

$$\frac{1}{2} = 0.5 = 50\%$$

$$\frac{1}{4} = 0.25 = 25\%$$

$$\frac{1}{5} = 0.2 = 20\%$$

$$\frac{1}{10} = 0.1 = 10\%$$

$$\frac{1}{100} = 0.01 = 1\%$$

What Should I Be Able to Do?

For extra practice, go to page 445.

LESSON

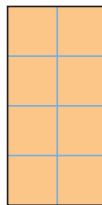
8.1 1. Write each fraction as a decimal and as a percent.

- a) $\frac{8}{20}$ b) $\frac{14}{5}$ c) $\frac{14}{25}$
 d) $\frac{7}{10}$ e) $\frac{9}{8}$ f) $\frac{17}{10}$

2. Write each number two other ways.

- a) 0.18 b) 0.3
 c) 80% d) $\frac{3}{8}$

3. This rectangle is 40% of a larger figure.



Use grid paper.

- a) Draw a figure that shows 100%.
 b) Draw a figure that shows 120%.

8.2 4. Estimate.

- a) 39% of 250 b) 41% of 89
 c) 19% of 60 d) 91% of 46
 e) 97% of 64 f) 59% of 98
 g) 3% of 300 h) 4% of 92

5. A DVD costs \$29.99.

The sales tax is 15%.

Estimate the cost of the DVD.

8.3 6. There are 35 students in a Grade 7 class. On one day, 20% of the students were at a sports meet. How many students were in class?

7. The regular price of a DVD player is \$120.00. What is the sale price in each case?

- a) 25% off b) 30% off
 c) 40% off d) 50% off
 e) 60% off f) 45% off

8. The regular price for a mountain bike is \$640.00.

It is on sale for 30% off.

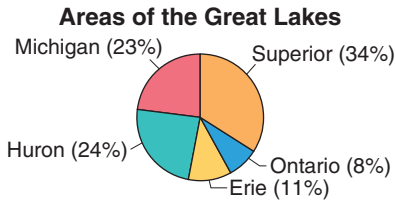
The sales tax is 15%.

a) Jamie bought the bike at the regular price.

What did it cost her?

b) Sam bought the bike on sale. How much did Sam save?

- 8.4** 9. This circle graph shows the surface area of the Great Lakes.



- Which lake has a surface area about $\frac{1}{4}$ of the total area?
 - Explain why Lake Superior has that name.
 - The total area of the Great Lakes is about 244 000 km². Find the surface area of Lake Erie.
- 10.** These tables show energy resources and electricity generation in Canada.

Primary Energy Resources in Canada, 2001	
Coal	11%
Hydro-electric	27%
Natural gas	24%
Nuclear	6%
Oil	32%

Electricity Generation by Fuel Type, 2001	
Coal	18%
Hydro-electric	61%
Natural gas	4%
Nuclear	13%
Oil	4%

- Draw a circle graph to display the data in each table.
- What do you know from looking at the two graphs?

- 11.** Here are 25 players on the Toronto Maple Leafs roster for the 2003/2004 season. The table shows each player's place of birth.

USSR	Canada	Europe	U.S.
Antropov	Belak	Berg	Fitzgerald
Mogilny	Belfour	Kaberle	Johnson
	Berehowsky	Nolan	Kidd
	Domi	Pilar	Klee
	Marchment	Ponikarovsky	
	McCabe	Reichel	
	Nieuwendyk	Renberg	
	Perrott	Sundin	
	Roberts		
	Stajan		
	Tucker		

- Draw a circle graph to show what percent of the team was born in each place.
- What if a U.S.-born player was traded for a USSR-born player? How would the graph change?

- 8.5** **12.** Eighty percent of Areyana's height is 140 cm. How tall is Areyana? Draw a number line to illustrate your answer.

- 13.** At Lakehead Elementary School, 280 students participate in a walk for charity. That is 70% of the students in the school. How many students attend the school?

Practice Test

1. How can 25% of one item be different from 25% of another? Explain.
2. The strip below is 25% of a longer strip.
 - a) What is the length of a strip that is 80% of the longer strip?
 - b) Draw the longer strip.



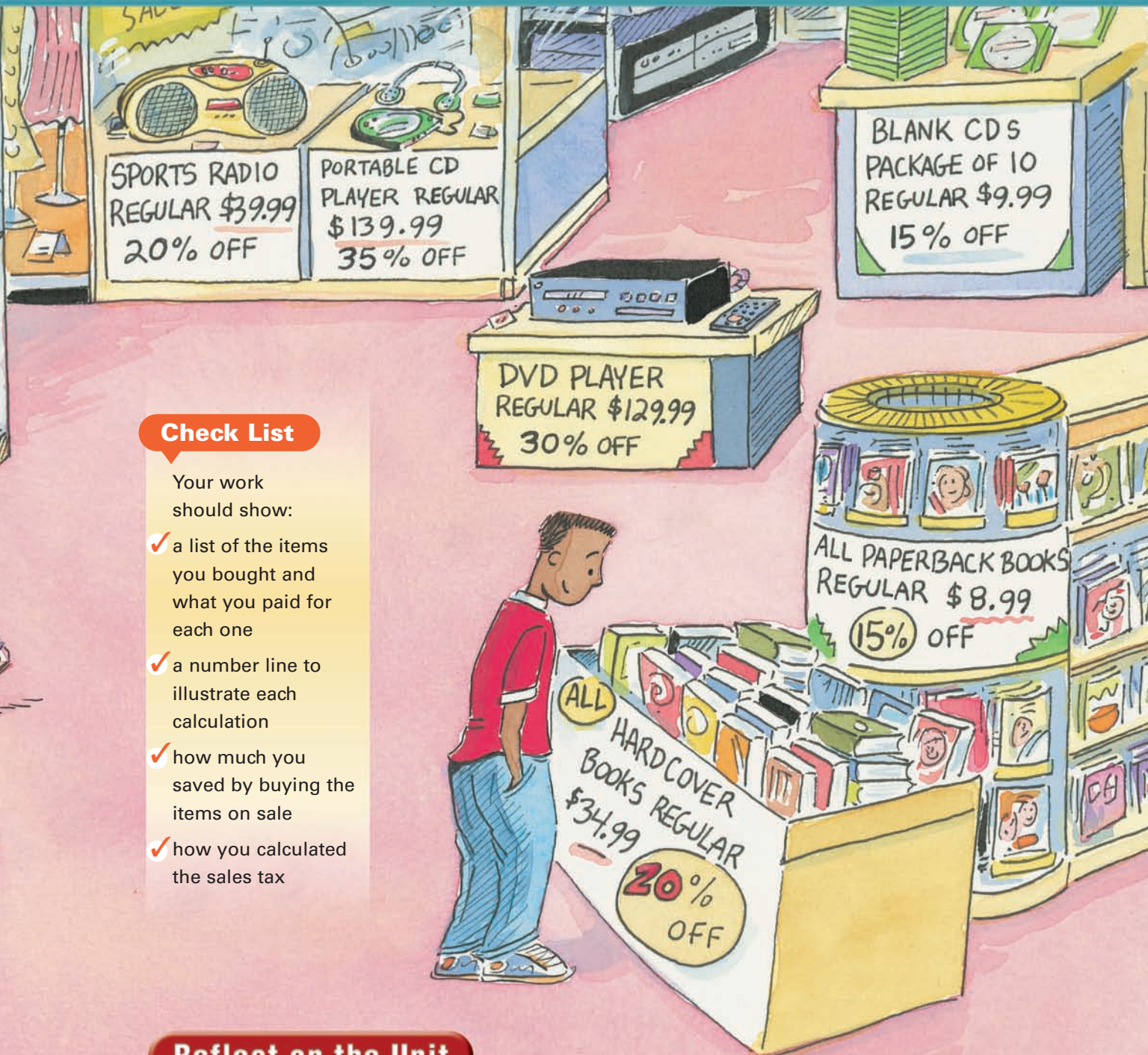
3. Find.
 - a) 600% of 40
 - b) 60% of 40
 - c) 6% of 40
 What patterns do you see in the answers?
4. The regular price of a pair of shoes is \$75.00. The shoes are on sale for 25% off. The sales tax is 15%.
 - a) What is the sale price of the pair of shoes?
 - b) What do the shoes cost, with sales tax?

Type of Land Cover in Canada	
Type	Percent of Total Area
Forest and taiga	45
Tundra	23
Wetlands	12
Fresh water	8
Cropland and rangeland	8
Ice and snow	3
Human use	1

5. The table shows the type of land cover in Canada, as a percent of the total area.
 - a) Draw a circle graph to display these data.
 - b) Did you need to know the area of Canada to draw the circle graph? Explain.
6. This spring, 26 dogs were adopted from the local animal shelter. This is 130% of the number of dogs that were adopted last spring. How many dogs were adopted last spring? Draw a number line to illustrate your answer.

Suppose you won a competition at a shopping mall. You won \$500.00 to spend at any store in the mall. You wait to spend your money until the mall has a sidewalk sale. Look at the items for sale. How would you spend your money? Don't forget to add 15% sales tax for each item. How much do you save by buying the items on sale? Show your work. Use number lines to illustrate your work.





Check List

Your work should show:

- ✓ a list of the items you bought and what you paid for each one
- ✓ a number line to illustrate each calculation
- ✓ how much you saved by buying the items on sale
- ✓ how you calculated the sales tax

Reflect on the Unit

What have you learned about percents and how they are used?