CHAPTER

2

Ratios, Rates, and Proportional Reasoning

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Get Ready

Writing Ratios

A ratio compares 2 items with the same unit.
The order of the words in a sentence shows the order of the numbers in the ratio.
You can write ratios 3 different ways.

The ratio of the black balls to the *total number* of balls is:

- Words: three to nine, or 3 to 9
- Ratio notation: 3 : 9
- Fraction: $\frac{3}{9}$

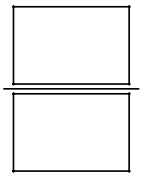
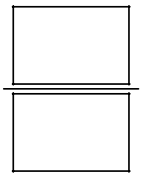
1. Use the diagram above. Write each ratio 3 different ways.

a) black balls to white balls

b) white balls to total number of balls

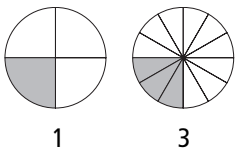
_____ ← Words → _____

_____ : _____ ← Ratio Notation → _____

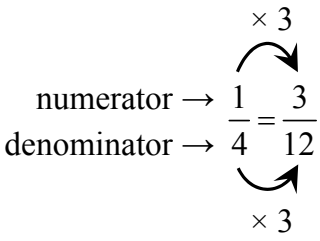
 ← Fraction → 

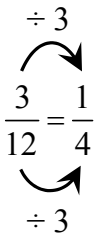
Equivalent Fractions

$\frac{1}{4}$ and $\frac{3}{12}$ are **equivalent fractions**.
To make equivalent fractions, multiply or divide both the numerator and the denominator by the same number.



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





$\frac{3}{3} = 1$, $\frac{8}{8} = 1$.
Multiplying a number by 1 does not change its value.

Name: _____ Date: _____

2. Fill in the blanks and the box to make an equivalent fraction.

a) $\frac{5}{8} = \frac{\boxed{}}{24}$ $\times$ _____ $\times 3$

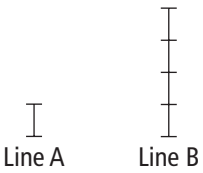
b) $\frac{1}{3} = \frac{5}{\boxed{}}$ $\times$ _____ $\times$ _____

Comparing Quantities

A fraction can show part of a whole.
Half of the rectangle is shaded.

You can use a **multiplier** to compare quantities.

Line B is 4 times as long as Line A.



What would you multiply 5 by to get 50? This is the multiplier.

The **multiplier** of Line A is 4.

So, the ratio of the length of Line B to the length of Line A is 4 to 1 *or* $\frac{4}{1}$.

3. What is the multiplier from Figure 1 to Figure 2?

a)

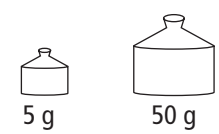


Figure 1 Figure 2

The multiplier is _____.

The ratio of Figure 2 to Figure 1 is

10 : _____ or $\frac{\boxed{}}{\boxed{}}$.

b)

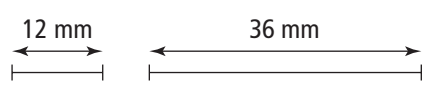


Figure 1 Figure 2

The multiplier is _____.

The ratio of Figure 2 to Figure 1 is

_____ : _____ or $\frac{\boxed{}}{\boxed{}}$.

Name: _____ Date: _____

MATH LINK

Multicultural Festival

Folklorama® is a 14-day multicultural festival in Winnipeg. At this festival, 40 pavilions represent different cultural groups or countries.

Literacy Link

pavilion
- a building, stand, or shelter set up at a festival or fair

Choose a pavilion that shows your family's background or a country that you want to learn more about.

Imagine you are volunteering at Folklorama®.

a) Which pavilion would you choose? _____

b) During the festival, 500 000 people visit the 40 pavilions. Estimate the number of people who will visit your pavilion: _____

Should you multiply or divide?

c) The ingredients for a meal at your pavilion cost $12.00. If the meal serves 30 people, calculate the cost for 1 person.

Sentence: _____

d) Not everyone who visits your pavilion eats there. Estimate the number of people who will eat at your pavilion: _____

e) How much will it cost to feed these people?
Total cost = number of people × cost per person

Use your answer from part b).

= _____ × _____

= _____

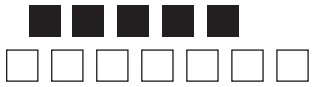
f) Write the ratio of the number of people who will eat at your pavilion to the total number of people who will visit your pavilion:

Words: _____ Fraction: $\frac{\square}{\square}$ Ratio notation: _____

Name: _____ Date: _____

2.1 Warm Up

1. Write each ratio 3 different ways.

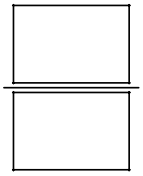
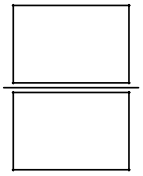


a) black tiles to white tiles

b) white tiles to all tiles

_____ ← Words → _____

_____ ← Ratio Notation → _____

 ← Fraction → 

2. Write each fraction in lowest terms.

a) $\frac{10}{12} = \frac{\square}{\square}$ (÷ 2, ÷ 2)

Divide by common factors until the only factor you can divide by is 1.

b) $\frac{9}{27} = \frac{\square}{\square}$ (÷ _____, ÷ _____)

3. Write each fraction as a decimal. **Example:** $\frac{1}{2} = 1 \div 2 = 0.5$

a) $\frac{4}{5} = 4 \div 5 = 0.$_____

b) $\frac{3}{4} =$ _____

c) $\frac{10}{16} =$ _____

d) $\frac{6}{12} =$ _____

4. Write each decimal as a percent. **Example:** $0.66 = 0.66 \times 100 = 66\%$

a) 0.89 = _____%

b) 0.9 = _____

c) 0.48 = _____

d) 0.5 = _____

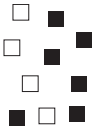
Name: _____ Date: _____

2.1 Two-Term and Three-Term Ratios

Working Example 1: Represent Ratios

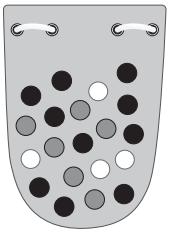
Literacy Link

represent
- to show using a sign or a symbol

2-term ratio
- compares 2 quantities with the same units
- write as $a:b$ or a to b
- example:  black : white is 6 : 4

A bag holds 20 marbles.

a) What is the **2-term ratio** of black marbles to white marbles?



Solution

Method 1: Represent a Ratio Using a Drawing

There are _____ black marbles and _____ white marbles.

This is a part-to-part ratio.

part-to-part ratio
- compares each part of a group to the other parts of the same group
- example: 2 : 3 compares white tiles to black tiles

Method 2: Represent a Ratio Using Symbols or Words

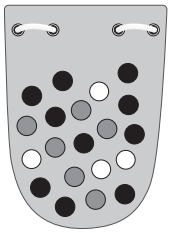
The ratio of black marbles to white marbles is 10 : 4 or 10 _____ 4.
(symbols) *(words)*

Name: _____ Date: _____

part-to-whole ratio

FOLDABLES™ Study Tool

- compares 1 part of a group to the whole group
- example: 2 : 6 compares white tiles to the group of tiles



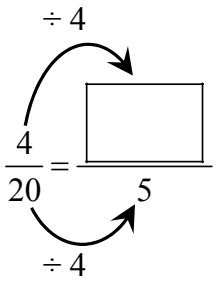
b) Compare the number of white marbles to the *total* number of marbles. Write the **part-to-whole ratio** as a fraction in lowest terms.

Solution

There are _____ white marbles out of a total of _____ marbles.

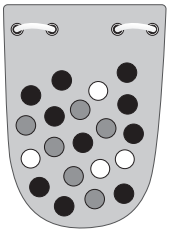
Write a part-to-whole ratio as a fraction: $\frac{\text{white}}{\text{total}}$ is $\frac{4}{20}$

Write the fraction in lowest terms.



Divide the numerator and the denominator by the same number.

c) What marbles show the ratio 6 : 10?



Solution

There are _____ grey marbles and _____ black marbles.

grey : black is _____ : _____

3-term ratio

FOLDABLES™ Study Tool

- compares 3 quantities with the same units
- write as $a : b : c$ or a to b to c
- example: black : white : grey is 10 : 4 : 6

d) Write the **3-term ratio** comparing the white, grey, and black marbles.

Solution

white : grey : black = _____ : _____ : _____

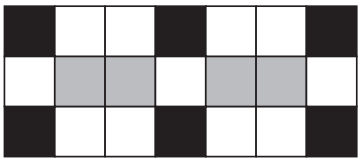
= 2 : _____ : 5

To write this ratio in lowest terms, divide each number by 2.

Name: _____ Date: _____

Show You Know

Use the design to answer the questions.



a) Write the ratio of *grey* tiles to *total* tiles 3 different ways.

There are _____ grey tiles.

There are _____ tiles in total.

Words: _____

Ratio notation: _____

Fraction: $\frac{\square}{\square}$

b) What does the ratio 4 : 6 represent?

There are 4 _____ tiles and 6 _____ tiles.

c) What is the ratio of grey to black to white tiles?

grey : black : white = _____ : _____ : _____

d) What is the ratio of grey to white to total tiles?

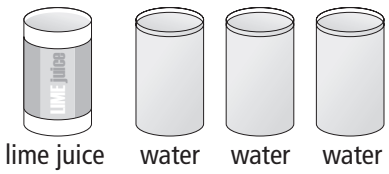
grey : white : total = _____ : _____ : _____

Name: _____ Date: _____

Working Example 2: Apply Ratios

This is Tamara's recipe for fruit drink:
- 3 cans of frozen orange juice
- 2 cans of frozen raspberry juice
- 1 can of frozen lime juice

For each can of juice, add 3 cans of water.



a) Complete the chart.

Solution

	Orange	Raspberry	Lime	Total
Number of Cans of Juice	3	2	1	6
Number of Cans of Water	$3 \times 3 = 9$	$3 \times$ _____ = _____		
Total Number of Cans				

b) Write the ratio of orange juice to lime juice 2 different ways.

Solution

There are 3 cans of orange juice and _____ can of lime juice.

This is a part-to-part ratio.

The ratio of orange to lime juice is 3 : _____ or 3 to _____.

c) Write the ratio of lime to orange to raspberry juice.

Solution

There are 1 can of lime juice, _____ cans of orange juice, and _____ cans of raspberry juice.

The ratio is 1 : _____ : _____.

d) What is the ratio of water to juice?

Solution

There are 18 cans of water and 6 cans of juice.

The ratio is 18 : 6 or _____ : _____.

$\div 6$

$\frac{18}{6} = \frac{3}{1}$

$\div 6$

e) How many cans of fruit drink does the recipe make?

Solution

18 cans of water + 6 cans of juice = _____ cans of fruit drink

Name: _____ Date: _____

f) What is the ratio of cans of juice to total cans of fruit drink?
Write the ratio as a fraction, a decimal, and a percent.

Solution

$$\frac{\text{juice}}{\text{fruit drink}} = \frac{6}{24} = \frac{\boxed{}}{4}$$

$\div 6$ $\div 6$

$1 \div 4 = ?$

$\frac{1}{4} = 0.$_____

$=$ _____%

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

The ratio of cans of juice to fruit drink is $\frac{1}{4}$, 0. _____, or _____%.

Show You Know

Recipe for trail mix:

- 3 cups mini pretzels
- 2 cups roasted soy chips
- 1 cup raisins
- 1 cup sunflower seeds

a) Write the ratio of mini pretzels to raisins 2 different ways.

The ratio is _____ : _____ or _____ to _____.

b) For one batch of trail mix, what is the ratio of soy chips *and* sunflower seeds to total mix?
Write your answer as a fraction, a decimal, and a percent.
Round your answer to 2 decimal places.

_____ cups of soy chips + _____ cups of sunflower seeds = _____ cups

$$\frac{\text{soy chips + sunflower seeds}}{\text{total cups of trail mix}} = \frac{\boxed{}}{\boxed{}}$$

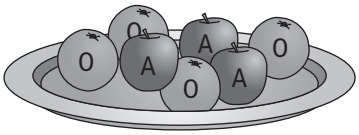
$= 0.$_____

$=$ _____%

The ratio is _____, _____, or _____.
(fraction) *(decimal)* *(percent)*

Name: _____ Date: _____

Communicate the Ideas



1. Janine wants to write the ratio of oranges (O) to apples (A).

Circle the correct answer. 3 : 4 *or* 4 : 3

Give 1 reason for your answer. _____

2. The fraction $\frac{2}{5}$ means 2 parts out of a total of 5 parts.

Draw a diagram to show this fraction as a part-to-whole ratio.

Check Your Understanding

Practise

3. Write each ratio in ratio notation. Then, write the ratio in lowest terms.

a) \$3 compared to \$9

_____ : _____

÷ 3

= _____ : _____

b) Your age compared to a 28-year-old person.

_____

= _____

4. Write each ratio in fraction form.

a) There are 12 red beads and 3 blue beads in a bag.
Compare red beads to *total* beads.

$$\frac{\text{red beads}}{\text{total beads}} = \frac{\square}{\square}$$

b) A team won 3 games and lost 6 games.
What is the ratio of games won to *total* games played?

$$\frac{\text{games won}}{\text{total games played}} = \frac{\square}{\square}$$

Total = 3 + 6

Name: _____ Date: _____

5. Find the missing number to make an equivalent fraction.

a) $\frac{1}{2} = \frac{\square}{8}$ (× 4 above, × 4 below)

b) $\frac{\square}{4} = \frac{3}{12}$ (÷ 3 above, ÷ 3 below)

6. Tyler counted 20 cars in a parking lot.
Six were red, 4 were green, and 1 was yellow.

a) Draw a diagram to show the colours of the cars.

b) How many cars were red, yellow, or green? _____

c) How many cars were *not* red, yellow, or green? _____

d) What is the ratio of yellow to green to red cars? _____

e) What is the ratio of red to total cars?
Write the ratio as a fraction, a decimal, and a percent.

$$\frac{\text{red cars}}{\text{total cars}} = \frac{\square}{\square}$$

$$= \frac{\square}{\square}$$ Write fraction in lowest terms.

= _____ Write as a decimal.

= _____ %

The ratio of red cars to total cars is _____, _____, or _____.

Name: _____ Date: _____

Apply

7. A class of 32 students has 24 girls.

a) How many boys are in the class? _____

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

c) What is the ratio of girls to boys? Write the ratio in ratio notation.

8. The ratio of the width to the length of the Canadian flag is 1 : 2.

a) The flag on the cover of an atlas is 12 cm wide.
How long is the flag?

$$\frac{\text{width}}{\text{length}} \rightarrow \frac{1}{2} = \frac{12}{\square}$$

Sentence: _____

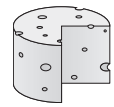
b) A Canadian flag outside a school is 4 m long. How wide is the flag?

$$\frac{\text{width}}{\text{length}} \rightarrow$$

Sentence: _____

Name: _____ Date: _____

9. Diana is making 3-cheese lasagna.
She needs 100 g of Romano cheese, 300 g of mozzarella cheese, and 250 g of cottage cheese.



a) Write the masses of the cheeses in ascending order (smallest to largest).

_____, _____, _____

b) Write the ratio to compare the masses of the cheeses from smallest to largest.

_____ : _____ : _____

c) Write the ratio from part b) in lowest terms.

Divide each term by the same number.

d) How much Romano cheese does Diana need to make a lasagna that has 900 g of mozzarella?

Use equivalent ratios.

$$\frac{\text{Romano}}{\text{mozzarella}} \rightarrow \frac{100}{300} = \frac{\boxed{}}{900}$$

$\times 3$ $\times 3$

Sentence: _____

e) How much cottage cheese does she need to make a lasagna that has 900 g of mozzarella?

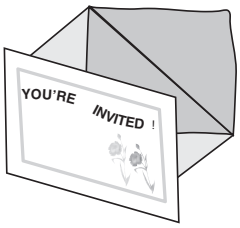
Use equivalent fractions.

$$\frac{\text{cottage cheese}}{\text{mozzarella}} \rightarrow \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{900}$$

Sentence: _____

Name: _____ Date: _____

MATH LINK



Make an invitation for your international meal.
Draw a logo for the front of your invitation.

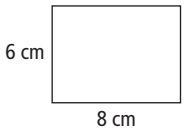
Literacy Link

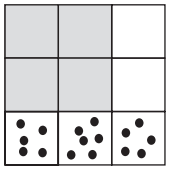
logo
- a symbol to identify a company

Your logo must show these ratios:
- 4 : 3
- 2 : 3 : 4

Use different colours or different measurements to show the ratios.

a) Look at these examples of ratios.





What is the length to width ratio?

_____

What is the white to dots to grey ratio?

_____

b) How will you show the ratio 4 : 3 on your logo?

_____

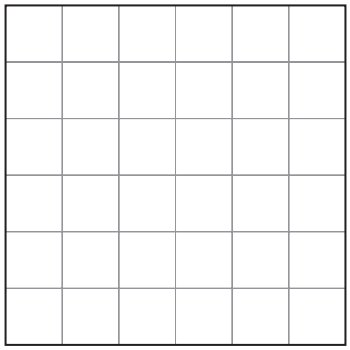
c) How will you show the ratio 2 : 3 : 4 on your logo?

_____

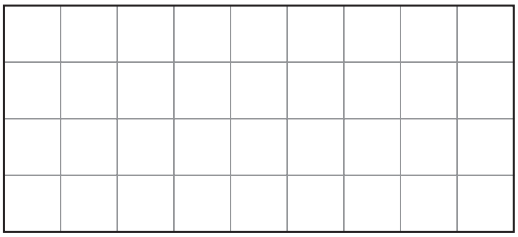
How many parts will there be in total? 2 + 3 + 4 = _____

d) Draw your logo on Grid 1 or Grid 2.
- Use the whole grid.
- Use shapes with straight lines.
- Decorate and colour your logo.
- Label the 2 ratios.

Grid 1



Grid 2



Name: _____ Date: _____

2.2 Warm Up

Thousands	Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths
				.		

1. Round to the nearest 10. Use the place value chart to help you.

a) 18.5 ≈ _____ **b)** 51.6 ≈ _____

2. Round to the nearest 100. Use the place value chart to help you.

a) 489 ≈ _____ **b)** 625 ≈ _____

3. Change dollars ($) to cents (¢).

Example: $0.00839 = $0.00839 × 100
= 0.839¢

a) $0.00908 = $0.00908 × 100

= _____¢

b) $0.00504 = _____ × _____

= _____

4. Write each fraction with a denominator of 1.

a) $\frac{18}{3} = \frac{\boxed{}}{1}$ (÷ 3)

b) $\frac{15}{5} = \frac{\boxed{}}{1}$ (÷ ____)

5. Write each fraction with a denominator of 100.

a) $\frac{\$2.19}{300} = \frac{\boxed{}}{100}$ (÷ 3)

b) $\frac{\$4.20}{400} = \frac{\boxed{}}{100}$

Name: _____ Date: _____

2.2 Rates

rate
- compares 2 quantities measured in different units
- example: \$1.69 per 100 g *or* \$1.69/100 g of food

Working Example 1: Determine Unit Rates

unit rate
- a rate in which the second term is 1
- example: 30 km/h means 30 km travelled in 1 h

Jesse and Brent send text messages to each other.
Jesse can text 187 words in 5 min.
Brent can text 444 words in 10 min.
Estimate and calculate Jesse's and Brent's texting speeds.

Solution

$$\text{Speed of texting} = \frac{\text{number of words}}{\text{time}}$$

To estimate, round the numbers.

Estimate:
187 words is about 200 words.
444 words is about 400 words.

	Jesse	Brent
Estimate Speed	$\frac{200 \text{ words}}{5 \text{ min}}$ = _____ words/min	$\frac{400 \text{ words}}{10 \text{ min}}$ = _____ words/min
Calculate Speed	$\frac{187 \text{ words}}{5 \text{ min}}$ **C 187 ÷ 5 =** _____ = 37.4 words/min	$\frac{444 \text{ words}}{10 \text{ min}}$ **C 444 ÷ 10 =** _____ = _____ words/min

Jesse can text _____ words/min and Brent can text _____ words/min.
The estimates and answers are close to each other, so the answer is reasonable.

Show You Know

Find the unit rates.

a) Brandon runs 150 m in 25 s.

$$\frac{150 \text{ m}}{25 \text{ s}} = \_\_\_\_\_ \text{ m/s}$$

150 ÷ 25 = _____

Brandon runs _____ m/s.

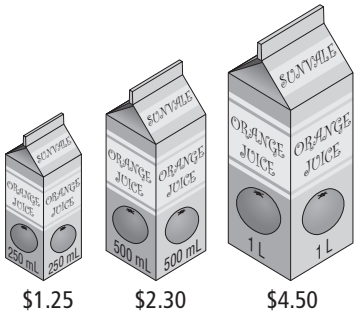
b) Kira earns \$88 for working 8 h.

$$\frac{\$ \square}{\square \text{ h}} = \$ \_\_\_\_\_ /\text{h}$$

Name: _____ Date: _____

Working Example 2: Compare Prices Using Unit Rates

Which container of orange juice is the best buy?



Literacy Link

best buy
- the item that will save the most money
- compare the unit price of each item

Solution

Calculate the **unit price** of each container of orange juice.

FOLDABLES™ Study Tool

unit price
- the price for 1 item
- used to compare items when shopping
- often shown per 100 g *or* per 100 mL

$1 = 100¢
To change dollars to cents, multiply by 100.

Container Size	Calculations for Unit Price $\text{Unit Price} = \frac{\text{cost}}{\text{volume}}$	Change to Cents (¢)	Unit Price (¢)
250 mL	$\frac{\$1.25}{250\text{ mL}} = \$0.005/\text{mL}$ **C 1.25 ÷ 250 = 0.005**	$0.005 \times 100 = 0.5$	0.5¢/mL
500 mL	$\frac{\$2.30}{500\text{ mL}} = \$$ _____/mL **C 2.30 ÷ 500 = 0.0046**	0.0046×100 = _____	0.46¢/mL
1 L = 1000 mL	$\frac{\$4.50}{1000\text{ mL}} =$ _____/mL		

Compare the prices.
The smallest unit price is the best buy.

So, the best buy is the _____ container with a unit price of $_____.

Name: _____ Date: _____

Show You Know

Which container of salsa is the best buy?

$3.44 $6.65 $17.17

Complete the table. Show your work.

Container Size	Calculations for Unit Price Unit Price = $\frac{\text{cost}}{\text{volume}}$	Change to Cents (¢)	Unit Price (¢)
400 mL	$\frac{\$3.44}{400\text{ mL}} = \$\_\_\_\_\_/\text{mL}$ C **3.44** ÷ **400** = _____	$_____ × 100 = _____	_____¢/mL
700 mL	$\frac{\square}{700\text{ mL}} = \$\_\_\_\_\_/\text{mL}$		
1.7 L = 1.7 × 1000 = _____ mL			

The best buy is _____.

Communicate the Ideas

1. a) Give an example of a ratio using words and numbers from the table.

Bear	Birth Mass (kg)	Mass After 60 Days (kg)
Black	0.3	6.5
Polar	0.7	7.4

Ratio: _____

b) The black bear gained 6.2 kg in 60 days.
Explain how to calculate the unit rate for 1 day.

Mass gained = 6.5 – 0.3
= 6.2 kg

_____

_____

Name: _____ Date: _____

2. a) Give 2 examples of rates that are used in everyday life.

_____

_____

b) Write the units for each of your rates in part a).

_____

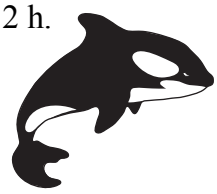
_____

Check Your Understanding

Practise

3. Find the unit rate.

a) An orca swims 110 km in 2 h.



$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

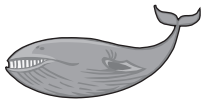
$$= \frac{\square \text{ km}}{\square \text{ h}}$$

= _____ km/h

b) A Canada goose flies 800 km in 12.5 h.

c) Cathy plants 60 daffodils in 30 min.

d) A blue whale eats 8 tonnes of food in 2 days.



e) A blue whale swims 193 km in 10 h.

f) A bull moose roars 15 times in 2.5 h.

Name: _____ Date: _____

4. **a)** Gina earns $78.00 for working 6 h. Find her hourly rate of pay.

b) Asad makes $192.50 for working 14 h. Find his hourly rate of pay.

c) Who has a greater hourly rate of pay?

_____

5. The table shows the prices of different-sized packages of nuts.

Nut Package	Mass	Price
1	300 g	$2.19
2	500 g	$3.09
3	700 g	$4.83

a) What is the unit price per 100 g for each package?

Package 1:

$$\text{Unit price} = \frac{\text{price}}{\text{mass}}$$

$$\frac{\$2.19}{300\text{ g}} \xrightarrow{\div 3} \frac{\square}{100\text{ g}}$$

The unit price is

$_____/100 g.

Package 2:

$$\frac{\$3.09}{500\text{ g}} \xrightarrow{\div \_\_\_\_\_} \frac{\square}{100\text{ g}}$$

The unit price is _____

_____

Package 3:

_____

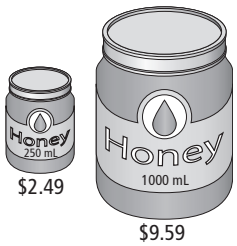
_____

b) Which package is the best buy? _____
Give 1 reason for your answer.

_____

Name: _____ Date: _____

6. Mala is shopping for honey. Her favourite brand is available in 2 sizes.



a) Estimate which is the better buy.

Small jar:
$2.49 is about $2.
250 mL is about 300 mL.

$$\text{Unit price} = \frac{\text{price}}{\text{volume}}$$

$$= \frac{\$2.00}{300 \text{ mL}}$$

= $_____/mL

Large jar:
$9.59 is about _____.
Volume is 1000 mL.

Unit price =

b) Calculate to find the better buy. Round your answers to 2 decimal places.

Small jar:

$$\text{Unit price} = \frac{\text{price}}{\text{volume}}$$

$$= \frac{\$2.49}{250 \text{ mL}}$$

= $_____/mL

Change dollars ($) to cents (¢).

$_____ × 100 = _____¢

The unit price is _____.

Large jar:

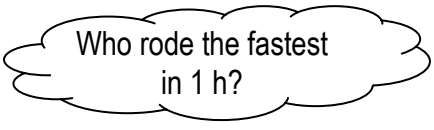
Unit price =

_____

Circle the better buy. SMALL JAR *or* LARGE JAR.

Apply

7. Trevor rode his bike 84 km in 3 h.
Jillian rode 56 km in 2 h.
Who is the faster cyclist?



Trevor: $\frac{\text{distance}}{\text{time}}$

Jillian: $\frac{\text{distance}}{\text{time}}$

Sentence: _____.

Name: _____ Date: _____

8. Shannon buys 12 granola bars for $9.96.

a) Find the price per bar.

Sentence: _____.

b) Is your answer in part a) a rate or a ratio? _____
Give 1 reason for your answer.

_____.

9. The table shows the fuel consumption of 2 cars.

Owner	Distance (km)	Fuel Used (L)
Joe	400	28
Sarah	840	60

Fuel consumption measures how many litres of gas a car uses to travel 1 km. It is a unit rate.

Find the fuel consumption in litres per kilometre (L/km) for each car.
Round your answer to 4 decimal places.

$$\text{Fuel consumption} = \frac{\text{fuel used (L)}}{\text{distance (km)}}$$

Joe's car:

Sentence: The fuel consumption for Joe's car is _____L/km.

Sarah's car:

Sentence: _____
_____

b) Whose car has the lower fuel consumption?

_____

Name: _____ Date: _____

MATH LINK

Kheer is a traditional rice pudding made in India and Pakistan.

The recipe for kheer serves 4 people.
Fill in the table to calculate the amount of each ingredient you need to serve 10 people.

1 recipe serves 4 people. 10 ÷ 4 = 2.5
So, you need to multiply by 2.5.

Ingredients	Amount to Serve 10	Sentence
125 mL rice	$\frac{125\,\text{mL}}{4\ \text{people}} = \frac{312.5\,\text{mL}}{10\ \text{people}}$ (× 2.5)	The amount of rice needed to serve 10 people is 312.5 mL.
1 L milk	$\frac{1\,\text{L}}{4\ \text{people}} = \frac{\square}{10\ \text{people}}$ (× 2.5)	_____ _____
50 mL raisins		_____ _____
250 mL sugar		_____ _____
5 mL cardamom		_____ _____
50 mL almonds		_____ _____

Name: _____ Date: _____

2.3 Warm Up

1. Round to the nearest cent (¢).

Examples: 34.7¢ = 35¢
125.3¢ = 125¢

34.7 means 34 and 7 tenths cents.
Round up 5 tenths or more to the next cent.
Don't round if it is less than 5 tenths.

a) 84.3¢ = _____¢

b) 39.9¢ = _____

c) 173.1¢ = _____¢

d) 75.5¢ = _____

2. Change cents (¢) to dollars ($).

Examples: 35¢ = 35 ÷ 100
= $0.35

158¢ = 158¢ ÷ 100
= $1.58

100¢ = $1.00

a) 58¢ = _____

b) 185¢ = _____

3. Find the missing number to make an equivalent fraction.

a) $\frac{1}{4} = \frac{\square}{8}$ (× _____ above, × _____ below)

b) $\frac{3}{5} = \frac{9}{\square}$ (× _____ above, × _____ below)

c) $\frac{9}{\square} = \frac{3}{4}$ (× _____ above, × _____ below)

d) $\frac{\square}{100} = \frac{3}{10}$ (× _____ above, × _____ below)

Name: _____ Date: _____

2.3 Proportional Reasoning

proportion

- an equation that shows 2 ratios or 2 rates are equal

FOLDABLES™ Study Tool

- examples: $\overset{\times 3}{\underset{\times 3}{\frac{2}{3}=\frac{6}{9}}}$ *or* $\overset{\times 3}{\underset{\times 3}{\frac{2\text{ km}}{3\text{ h}}=\frac{6\text{ km}}{9\text{ h}}}}$

Working Example 1: Solve a Rate Problem Using Proportional Reasoning

Electricity costs 11.58¢ per 2 kWh.
How much does 30 kWh cost? Round your answer to the nearest cent.

A kWh is a unit of energy.

Solution

Method 1: *Use a Unit Rate*

Find the unit rate.

$$\overset{\div 2}{\underset{\div 2}{\frac{11.58¢}{2\text{ kWh}}=\frac{\square}{1\text{ kWh}}}}$$

Electricity costs _____¢ per kWh or _____¢/kWh.

Find the cost of 30 kWh.

30 × 5.79¢ = _____¢. C **30** × **5.79** = **173.7**

So, 30 kWh costs about 174¢ or $_____.

To change ¢ to $, divide by 100.

Method 2: Use a Proportion

$$\overset{\times 15}{\underset{\times 15}{\frac{11.58¢}{2\text{ kWh}}=\frac{\square}{30\text{ kWh}}}}$$

11.58¢ is about 12¢.
12 × 15 = (10 × 15) + (2 × 15)
= 150 + 30
= 180
The answer will be about 180¢ or $1.80.

So, 30 kWh costs about 174¢ or $_____.

Name: _____ Date: _____

Show You Know

a) There are 72 players on 8 baseball teams.
Use 2 methods to find the number of players on 2 teams.

Method 1: Use a Unit Rate

$$\frac{72 \text{ players}}{8 \text{ teams}} = \frac{\square \text{ players}}{1 \text{ team}}$$

÷ _____ above the 8 teams; ÷ _____ below the 8 teams

Number of players on 1 team = _____

Number of players on 2 teams = 2 × _____

= _____

Method 2: Use a Proportion

$$\frac{72 \text{ players}}{8 \text{ teams}} = \frac{\square \text{ players}}{2 \text{ teams}}$$

÷ _____ above the 8 teams; ÷ _____ below the 8 teams

Sentence: _____

b) Which method do you like best? _____
Give 1 reason for your answer.

_____

_____

_____

Name: _____ Date: _____

Working Example 2: Solve a Ratio Problem Using Proportional Reasoning

A biologist catches and tags 24 trout, and then releases them back into the pond. Two weeks later, he catches 30 trout and finds that 5 of them are tagged. Estimate how many trout are in the pond.

Solution

Method 1: Use a Proportion in Lowest Terms

$$\frac{\text{fish recaught with tags}}{\text{total fish recaught}} = \frac{\text{fish tagged and released}}{\text{total fish in pond } (t)}$$

$\frac{5}{30} = \frac{24}{t}$ Set up a proportion using equal ratios.

$\frac{1}{6} = \frac{24}{t}$ Reduce $\frac{5}{30}$ to $\frac{1}{6}$. ($\div 5$)

$\frac{1}{6} = \frac{24}{t}$ ($\times 24$) Make equivalent ratios.

$t = 6 \times 24$

$t =$ _____

Method 2: Use the Original Proportion

$\frac{5}{30} = \frac{24}{t}$

$\frac{5}{30} = \frac{24}{t}$ ($\times 4.8$) Divide to find what number multiplied by 5 gives 24.

$\frac{24}{5} = 4.8$

$t = 30 \times 4.8$

$t =$ _____

I estimate there are _____ trout in the pond.

I estimate there are _____ trout in the pond.

Show You Know

Three erasers cost 75¢.
How much will a dozen erasers cost?

1 dozen erasers = _____ erasers

$$\frac{\square}{\square} = \frac{c}{\square}$$

Sentence: _____

Name: _____ Date: _____

Communicate the Ideas

1. Give an example of a ratio, a rate, and a proportion.

	Ratio	Rate	Proportion
Example			

2. Explain how to use a proportion to solve this problem:
Three balls cost $1.29. What is the cost of 12 balls?

$$\frac{\text{cost}}{\text{\# of balls}} = \frac{\text{cost}}{\text{\# of balls}}$$

_____

_____

Check Your Understanding

Practise

3. Find the missing value.

a) $\frac{2}{3} = \frac{\square}{15}$ (× _____ above, × _____ below)

b) $\frac{\square}{5} = \frac{14}{35}$ (÷ _____ above, ÷ _____ below)

c) $\frac{30}{45} = \frac{6}{\square}$

d) $\frac{3}{\square} = \frac{12}{36}$

Name: _____ Date: _____

4. Find the unit rate.

a) Three dinner rolls cost 99¢.

$$\frac{99¢}{3 \text{ rolls}} = \frac{\square}{1 \text{ roll}}$$

$$\frac{99}{3} \overset{\div 3}{=} \frac{\square}{1}$$

The unit rate is _____ ¢/roll.

b) Seven boxes have a mass of 14 kg.

The unit rate is _____.

c) Two pens cost 84¢.

_____.

d) Four stacking blocks are 24 cm high.

_____.

5. Find the missing value to make each rate equivalent. Include the units.

a)

$$\frac{60 \text{ km}}{3 \text{ h}} \overset{\times \_\_\_\_}{=} \frac{\square}{6 \text{ h}}$$

b)

$$\frac{\$3}{4 \text{ cans}} = \frac{\$15}{\square}$$

6. Delia was paid $35 for 5 h of babysitting.

a) How much will she earn for 1 h? Use a unit rate to find the answer.

b) How much will she earn for 3 h?

Name: _____ Date: _____

7. Meredith was paid \$54 for 6 h of housecleaning.
How much will she earn for 2 h?
Use a proportion to find the answer**.**

$$\frac{\text{pay for housecleaning for 6 h}}{\text{6 h}} = \frac{\text{pay for housecleaning for 2 h } (p)}{\text{2 h}}$$

$\div$ _____

$$= \frac{\$54}{6} = \frac{p}{2}$$

$\div$ _____

$p =$ _____

Sentence: _____

8. Set up a proportion for each situation.

a) If 10 beans have a mass of 17 g, then 30 beans have a mass of 51 g.

$$\frac{17 \text{ g}}{\square \text{ beans}} = \frac{\square \text{ g}}{\square \text{ beans}}$$

b) There are 15 boys for every 13 girls in each classroom in a school.
If there are 75 boys in the school, then there are 65 girls.

$$\frac{\square}{\square} = \frac{\square}{\square}$$

c) On a map, 1 cm represents 25 km.
Kendra wants to ride her bike 160 km.
The distance is 6.4 cm on the map.

Name: _____ Date: _____

9. Set up a proportion for each situation. Use a variable.
Do not find the answer.

a) A recipe for salad dressing uses 150 mL of oil and 50 mL of vinegar.
How much vinegar do you need to mix with 300 mL of oil?

$$\frac{\square \text{ mL oil}}{\square \text{ mL vinegar}} = \frac{\square \text{ mL oil}}{\square \text{ mL vinegar}}$$

$$\frac{\square}{\square} = \frac{\square}{v}$$

v represents the amount of vinegar.

b) A baseball player's ratio of home runs to strikeouts is 3 : 17.
How many home runs does she hit if she strikes out 51 times?

$$\frac{\square \text{ home runs}}{\square \text{ strikeouts}} = \frac{\square}{\square \text{ strikeouts}}$$

h represents the number of strikeouts.

Apply

10. Look at the pattern. Set up a proportion to find the number of small squares in Figure 7.

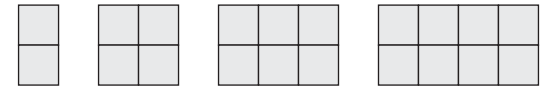


Figure 1 Figure 2 Figure 3 Figure 4

Use $\frac{\text{\# of squares}}{\text{figure \#}}$

Name: _____ Date: _____

11. A gardener charges \$25 to mow a lawn that measures 600 m^2.
How much should he charge for a lawn that measures 1200 m^2?

$$\frac{\text{cost}}{\text{area}} = \frac{\text{cost}}{\text{area}}$$

Sentence: _____

12. It costs \$7.50 for 3 rides at an amusement park.

a) What is the unit rate per ride?

b) At this rate, what would it cost for 18 rides?

_____ _____

_____ _____

13. At a different amusement park, it costs \$10 for 4 rides. What is the cost for 12 rides?

Sentence: _____

14. Fresh pickerel is advertised in a local market.
How much will 6 kg of pickerel cost?

Sentence: _____

Name: _____ Date: _____

MATH LINK

a) It costs $7.60 to make Greek salad for 12 people.

What is the unit price? Round your answer to the nearest cent.

Sentence: _____

b) On a separate sheet of paper, create a table to help you find the amount of each ingredient needed to serve 10 people. Use proportions to help you. Show your work.

Example:
A recipe calls for 270 mL couscous for 5 people.
How much couscous will you need for 10 people?

Recipe Couscous Serves 5		
Ingredients	**Amount Given in Recipe**	**Amount Needed to Serve 10**
Couscous	270 mL	$\frac{270}{5} = \frac{\square}{10}$ $\times 2$ $\frac{270}{5} = \frac{\square}{10}$ $\times 2$ $= 540$ mL

Name: _____ Date: _____

2 Chapter Review

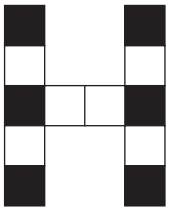
Key Words

For #1 to #5, write the number that matches the description.

1.	proportion	_____	\$2.75 per tin
2.	ratio	_____	$\frac{3}{5}$
3.	3-term ratio	_____	$\frac{7}{50} = \frac{14}{100}$
4.	unit price	_____	4 : 3 : 2
5.	unit rate	_____	27 km/h

2.1 Two-Term and Three-Term Ratios, pages 58–67

6. Use the square tile pattern to answer each question.



a) The ratio of white squares to total squares is _____ : _____.
Write 2 equivalent ratios for this ratio.

$\times$ _____

$\frac{6}{12} = \frac{18}{\square}$

$\times$ _____

18 : _____

$\div 2$

$\frac{6}{12} = \frac{\square}{\square}$

$\div 2$

_____ : _____

b) Find the percent of squares that are white.

$\frac{\text{white}}{\text{total}} = \frac{\square}{\square}$

Change the fraction to a decimal.

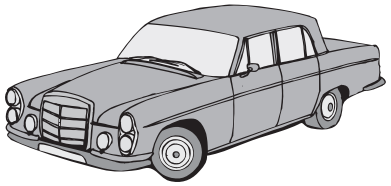
= _____

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

= _____%

Name: _____ Date: _____

7. Stephanie counted 20 vehicles in a parking lot.
Five were silver, 4 were blue, 2 were red, and 1 was yellow.



a) What is the ratio of yellow to red to silver vehicles?

_____

b) What is the total number of silver, blue, red, and yellow vehicles?

Sentence: _____

c) How many vehicles are not silver, blue, red, or yellow?

Sentence: _____

d) Look at the number of each colour of vehicle. What does the ratio 4 to 20 show?

_____

e) Write the ratio of silver to total vehicles as a fraction, a decimal, and a percent.

$$\frac{\text{silver}}{\text{total}} = \frac{\square}{\square} \quad \leftarrow \text{fraction}$$

$= $ _____ ← decimal

$= $ _____ ← percent

f) Write the ratio of silver to total vehicles from part e) in lowest terms.

Name: _____ Date: _____

2.2 Rates, pages 69–76

8. Find the unit rates.

a) Stephen runs up 300 steps in 6 min.

$$\frac{300 \text{ steps}}{6 \text{ min}} = \frac{\square \text{ steps}}{1 \text{ min}}$$

$$\frac{300}{6} \overset{\div 6}{=} \frac{\square}{1}$$

The unit rate is _____ steps/min.

b) $3.60 is the price of 4 L of milk.

The unit rate is _____.

9. The table compares the monthly cost of electricity for a computer and a television.

Equipment	Time On (h)	Monthly Cost ($)
Computer and monitor	120	4.26
Television	180	3.46

What is the hourly unit cost for each piece of equipment?
Round each answer to the nearest tenth of a cent.

Computer:

$$\text{Unit price} = \frac{\text{cost}}{\text{number of hours}}$$

$$= \frac{\square}{120}$$ **C 4.26 ÷ 120 = ?**

$$= \_\_\_\_\_$$

To change $ to ¢, multiply by 100.

$ _____ × 100 = _____¢
(answer)

The unit price is _____¢/h.

Television:

_____

Name: _____ Date: _____

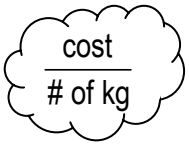
10. Groceries often cost more in Northern communities.
Use the data in the table to answer the questions.

Item	Cost in Winnipeg	Cost in Little Grand Rapids
3 kg bananas	$4.98	$13.95

a) Write the ratio of the cost of bananas in Winnipeg to the cost in Little Grand Rapids.

_____

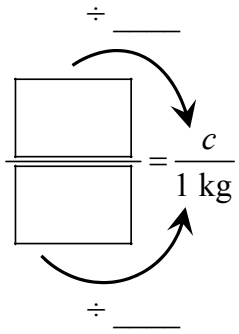
b) Write the *rate* for the cost of 3 kg of bananas in Winnipeg.



_____

c) What is the unit price for bananas in Winnipeg?

$$\frac{\text{cost}}{\text{\# of kg}} = \frac{\text{cost } (c)}{1 \text{ kg}}$$



c = _____

d) What is the unit price for bananas in Little Grand Rapids?

e) What is the difference in unit price for bananas for the 2 communities?

Sentence: _____

Name: _____ Date: _____

2.3 Proportional Reasoning, pages 78–86

11. Find the missing value to make equivalent rates.
Write the unit.

a) $\dfrac{\boxed{}}{1\text{ month}} = \dfrac{40\text{ kg}}{4\text{ months}}$

$\div$ ____ $\div$ ____

b) $\dfrac{\$84}{8\text{ h}} = \dfrac{\boxed{}}{80\text{ h}}$

$\times$ ____ $\times$ ____

12. Use a proportion to solve each question. Use a variable for the unknown quantity.

a) Three bars of soap cost \$2.94.
What is the cost of 9 bars of soap?

$$\frac{\text{cost of soap}}{3\text{ soap}} = \frac{\text{cost of soap }(c)}{9\text{ soap}}$$

$\times$ ____

$$\frac{\$2.94}{3} = \frac{c}{9}$$

$\times$ ____

$c =$ _____

_____

_____

b) On a map, 1 cm represents 200 km.
How many centimetres represent 800 km?

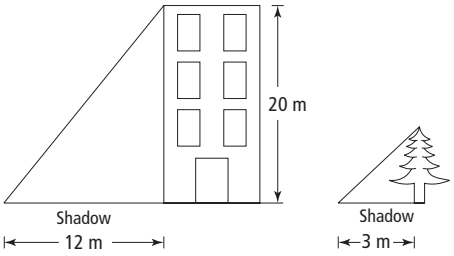
_____

_____

Name: _____ Date: _____

13. Compare the heights of objects to their shadows.

a) A 20-m building casts a 12-m shadow.
What is the height of a tree with a shadow that is 3 m long?



$$\frac{\text{building height}}{\text{shadow height}} = \frac{\text{tree height}}{\text{shadow height}}$$

$$\frac{\square}{\square} = \frac{\square}{\square}$$

Sentence: _____

b) A building with a height of 25 m has a shadow 8 m long.
What is the height of a pole with a shadow 4 m long?

Draw a diagram:

Proportion:

Sentence: _____

Name: _____ Date: _____

2 Practice Test

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

1. The ratio of Jared's stamps to Paulo's stamps is 4 : 7.
Jared has 36 stamps.
How many stamps does Paulo have?

Set up a proportion:
$\frac{\text{Jared's stamps}}{\text{Paulo's stamps}}$

A 21 **B** 63
C 84 **D** 99

2. A robot can make 27 toy cars in 9 min.
Which is the unit rate?

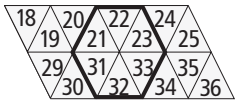
A 27 cars/9 min **B** 3 cars
C 3 cars per min **D** $\frac{1}{3}$ car/min

3. In the school choir, the ratio of girls to boys is 17 : 8.
What percent of the choir are boys?

First, find the total number of students.

A 17% **B** 25%
C 32% **D** 47%

4. Look at the figure. What is the ratio of 2-digit numbers in the black hexagon compared to the total number of 2-digit numbers? Write your answer in lowest terms.



A 3 : 8 **B** 8 : 3
C 6 : 16 **D** 16 : 6

Complete the sentences in #5 and #6.

5. There are 30 g of sugar in 200 mL of pop.

There is 300 g of sugar in _____ L of pop.

$$\frac{\square \text{ g sugar}}{\square \text{ mL pop}} = \frac{\square \text{ g sugar}}{\square \text{ pop}}$$

Change your answer to litres.

Name: _____ Date: _____

6. Canadians buy 5 loaves of brown bread for every 2 loaves of white bread.
A bakery makes 200 loaves of brown bread.

$\frac{\text{brown loaves}}{\text{white loaves}}$

The bakery should make _____ loaves of white bread.

Short Answer

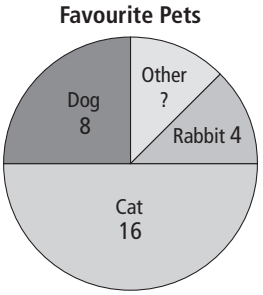
7. Randi makes 9 scarves from 4 m of fabric.
How many scarves can she make from 28 m of fabric?

Proportion:

Solve:

Sentence: _____

8. The circle graph shows the favourite pets for a class of 32 grade 8 students.



a) How many students chose a pet other than a dog, cat, or rabbit?

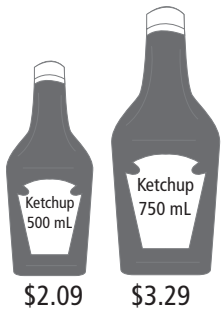
Sentence: _____

b) Write a ratio to show the number of students who chose a cat compared to the number who chose a rabbit. _____

c) Write an equivalent ratio for your answer in part b).

Name: _____ Date: _____

9. Kyra is shopping for ketchup.
Her favourite brand is available in 2 sizes.



a) Estimate which is the better buy. Show your work.

Small bottle:

$2.09 is about _____

$\text{Unit price} = \frac{\text{cost}}{\text{\# of mL}}$

Large bottle:

$3.29 is about _____

Sentence: _____

b) Calculate to find the better buy. Show your work.

Small bottle:

$\text{Unit price} = \frac{\text{cost}}{\text{\# of mL}}$

Large bottle:

Sentence: _____

10. Karen earns $420 for working 35 h at a factory.
Liam makes $40 for working 4 h at a store.

a) What is Karen's hourly rate of pay?

b) What is Liam's hourly rate of pay?

c) Who has the greatest rate of hourly pay? _____

d) How much does Liam earn in an 8-h shift?

Sentence: _____

Name: _____ Date: _____

WRAP IT UP!

Plan an international meal that will serve 10 people.
Include 1 dish from each of the following categories:

- soup, salad, or appetizer
- main course
- dessert

WWW Web Link
To discover some international food recipes go to **www.mathlinks8.ca** and follow the links.

Create your meal plan.

a) Complete your invitation to the meal on the grid on page 68.
Make sure your logo design has an area of 36 cm^2 and shows each ratio:

- 4 : 3
- 2 : 3 : 4

b) On a separate sheet of paper, write your recipe for a main course or a dessert.
Include information on how to make the recipe.

c) Write the following information for the main course or the dessert on a separate sheet of paper:

- the name and category of your recipe
- the number of people your recipe serves
- the list of ingredients
- the amount of each ingredient
- the amount of each ingredient needed to serve 10 people

You have already recorded this information for the soup, salad, or appetizer on page 86 for Math Link 2.3.

d) For the recipe in part b), research the cost of each ingredient by visiting a grocery store, looking at grocery store flyers, or talking with someone who shops for groceries. Fill in the chart.

Ingredients	Amount needed to serve 10 people	Cost for 10 people

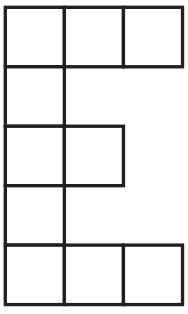
Name: _____ Date: _____

Key Word Builder

Match each example in column A with the correct term in column B.

A	B
1. $\frac{\$85}{3 \text{ plants}} = \frac{\square}{15 \text{ plants}}$ (× 3 above, × 3 below)	_____ **part-to-part ratio:** compares different parts of a group to each other within the same group
2. 12 km/h	_____ **part-to-whole ratio:** compares 1 part of a group to the whole group
3. 33¢/1	_____ **proportion:** 2 ratios or 2 rates that are equal
4. 3 red balloons to 4 blue balloons	_____ **rate:** compares 2 quantities measured in different units
5. 3 red balloons to a total of 16 balloons	_____ **3-term ratio:** compares 3 quantities with the same units
6. 2 : 3	_____ **2-term ratio:** compares 2 quantities with the same units
7. 3 : 4 : 6	_____ **unit price:** price for 1 article
8. 45 km in 3 h	_____ **unit rate:** a rate in which the second term is 1

In the E below, shade the squares to show the ratio of black squares to white squares as 2 : 3.



Name: _____ Date: _____

Math Games

Rolling Ratios

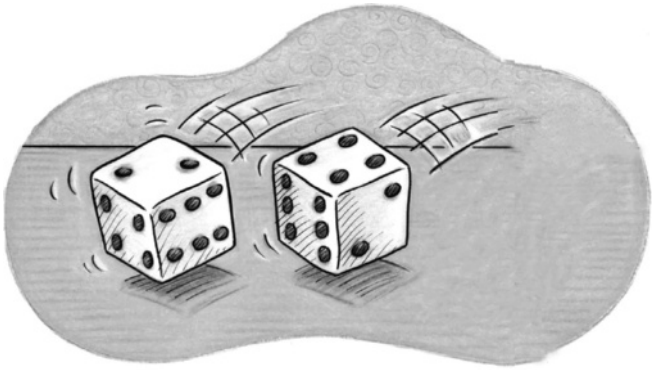
Play Rolling Ratios with a partner.

Materials
- 2 dice per pair of students
- calculator per student
- Recording Chart BLM

Rules:
- Each player rolls 1 die to decide who will play first. If there is a tie, roll again.
- Each partner takes a turn rolling the dice in each round.
- Write the values rolled on the Recording Chart.
- Write the ratio of the smaller value to the sum of the rolled values in fraction form.

I rolled a 2 and a 4. The sum of the rolled values is 2 + 4 = 6.

$$\frac{\text{smaller value}}{\text{sum of values}} = \frac{2}{6}$$



- Write the fraction as a decimal. Round to the nearest hundredth (2 decimal places).
- Add the decimals from your turns.
- The first player to reach a total of 2.5 or higher wins the game.
  - If both players reach 2.5 in the same round, the player with the higher total wins.
  - If the totals are tied, keep playing until 1 player wins.

Example:

Rolled Values	Ratio (fraction form)	Decimal (to the nearest hundredth)	Total
2 and 4	$\frac{\text{smaller value}}{\text{sum of values}} = \frac{2}{6}$	$2 \div 6 = 0.3333\ldots$ ≈ 0.33	0.33
1 and 3	$\frac{1}{1+3} = \frac{1}{4}$	$1 \div 4 = 0.25$	$0.33 + 0.25 = 0.58$
3 and 3	$\frac{3}{3+3} = \frac{3}{6}$	$3 \div 6 = 0.5$	$0.58 + 0.5 = 1.08$

Name: _____ Date: _____

Challenge in Real Life

Life of a Bush Pilot

Materials
- ruler
- calculator
- map of Northwest Territories BLM

Doug is a bush pilot.
He flies medical supplies and medical workers to the Northwest Territories.
You be the flight planner.
Calculate the distances and times for Doug's next trip using the map of Northwest Territories BLM.

1. Use a ruler to measure the distances to the nearest tenth of a centimetre.

Round to 1 decimal place.

Example: Hay River to Tuktoyaktuk = 7.6 cm

a) Tuktoyaktuk to Paulatuk = _____ cm **b)** Paulatuk to Hay River = _____ cm

2. Use a proportion to calculate the actual flying distances.

a) Hay River to Tuktoyaktuk

On the map, 1 cm represents 180 km.

$$\frac{1 \text{ cm on map}}{180 \text{ km}} \overset{\times 7.6}{=} \frac{7.6 \text{ cm}}{\square \text{ km}} \quad (\times 7.6)$$

The distance from Hay River to Tuktoyaktuk is _____ km.

b) Tuktoyaktuk to Paulatuk **c)** Paulatuk to Hay River

Name: _____ Date: _____

3. Doug needs to fly emergency materials from Yellowknife to Inuvik.

a) Measure the distance in centimetres between the 2 communities: _____ cm

b) Calculate the actual distance between the communities.

$$\frac{1 \text{ cm}}{180 \text{ km}} = \frac{\square \text{ cm}}{\square \text{ km}}$$

Sentence: _____

c) Doug needs to get to Inuvik in 4.5 h.
What will Doug's average speed in km/h need to be?

$$\frac{\text{actual distance}}{4.5 \text{ h}} = \frac{\square \text{ km}}{1 \text{ h}}$$

Use your answer from part b) for the actual distance.

$$\frac{\square}{4.5 \text{ h}} = \frac{\square \text{ km}}{1 \text{ h}}$$

Sentence: _____

Answers

Get Ready, pages 54–55

1. a) three to six, or 3 to 6; 3 : 6; $\frac{3}{6}$ **b)** six to nine, or 6 to 9; 6 : 9; $\frac{6}{9}$

2. a) 3; 15 **b)** 5; 15

3. a) 10; 10 : 1 or $\frac{10}{1}$ **b)** 3; 3 : 1; $\frac{3}{1}$

Math Link

a) Answers may vary. Example: Mexico, because I have always wanted to travel to Mexico.

b) Answers may vary. Example: 12 500.

c) Answers may vary. Example: $0.40, It will cost 40 cents per person.

d) Answers may vary. Example: 3125

e) Answers may vary. Example: $1250

f) Answers may vary. Example: one to four, or 1 to 4; 1 : 4; $\frac{1}{4}$

2.1 Warm Up, page 57

1. a) five to seven, or 5 to 7; 5 : 7; $\frac{5}{7}$ **b)** seven to twelve, or 7 to 12; 7 : 12; $\frac{7}{12}$

2. a) $\frac{5}{6}$ **b)** $\frac{1}{3}$

3. a) 0.8 **b)** 0.75 **c)** 0.625 **d)** 0.5

4. a) 89 **b)** 90% **c)** 48% **d)** 50%

2.1 Two-Term and Three-Term Ratios, pages 58–67

Working Example 1: Show You Know

a) 4 to 21; 4 : 21; $\frac{4}{21}$ **b)** grey, black **c)** 4 : 6 : 11 **d)** 4 : 11 : 21

Working Example 2: Show You Know

a) 3 : 1, 3 to 1 **b)** $\frac{3}{7}$; 0.43; 43%

Communicate the Ideas

1. 4 : 3; Janine wants to know the number of oranges to apples, so she has to put the number of oranges first.

2. Answers may vary. Example:

Practise

3. a) 3 : 9; 1 : 3 **b)** Answers may vary. Example: 13 : 28

4. a) $\frac{12}{15}$ **b)** $\frac{3}{9}$

5. a) 4 **b)** 1

6. a)

b) 11 **c)** 9 **d)** 1 : 4 : 6 **e)** $\frac{3}{10}$, 0.3, 30%

Apply

7. a) 8 **b)** $\frac{8}{32}$; 25% **c)** 24 : 8

8. a) 24 cm **b)** 2 m

9. a) 100 g, 250 g, 300 g **b)** 100 : 250 : 300 **c)** 2 : 5 : 6

d) 300 g **e)** 750 g

Math Link

a) 8 : 6 or 4 : 3; 2 : 3 : 4 **b)** Answers will vary. Example: I will draw a rectangle that is 8 cm by 6 cm. **c)** Answers will vary. Example: I will draw a rectangle that is divided into 9 squares with 2 red squares, 3 blue squares, and 4 green squares. **d)** Answers will vary.

2.2 Warm Up, page 68

1. a) 20 **b)** 50

2. a) 500 **b)** 600

3. a) 0.908 **b)** 0.504¢

4. a) $\frac{6}{1}$ **b)** $\frac{3}{1}$

5. a) $\frac{0.73}{100}$ **b)** $\frac{1.05}{100}$

2.2 Rates, pages 69–76

Working Example 1: Show You Know

a) 6 m/s **b)** $11/h

Working Example 2: Show You Know

400 mL = 0.86; 700 mL = 0.95¢/mL; 1.7 L = 1.01¢/mL

The best buy is the 400-mL bottle.

Communicate the Ideas

1. a) Answers may vary. Example: The birth mass of black bears to polar bears is 0.3 : 0.7. **b)** Answers may vary. Example: Divide the mass gained (6.2 kg) by 60.

2. a) Answers may vary. Example: speed limit, temperature **b)** Answers may vary. Example: km, h, °C

Practise

3. a) 55 km/h **b)** 64 km/h **c)** 2 daffodils/min **d)** 4 t/d **e)** 19.3 km/h **f)** 6 roars/h

4. a) $13/h **b)** $13.75/h **c)** Asad

5. a) Package 1: $0.73/100 g; Package 2: $0.62/100 g; Package 3: $0.69/100 g **b)** Package 2 is the best buy because the cost per 100 g is the least.

6. a) small jar: $0.0067/mL; large jar: $0.01/mL **b)** small size: $0.996¢; large size: $0.956¢; LARGE JAR

Apply

7. They both rode 28 km/h.

8. a) $0.83 **b)** Rate; it compares different units

9. a) Joe's car: 0.070 L/km; Sarah's car: 0.0714 L/km

b) Joes' car

Math Link

125 mL rice × 2.5 = 312.5 mL; 1 L milk × 2.5 = 2.5 L;
50 mL raisins × 2.5 = 125 mL; 250 mL sugar × 2.5 = 625 mL;
5 mL cardamom × 2.5 = 12.5 mL; 50 mL almonds × 2.5 = 125 mL

2.3 Warm Up, page 77

1. a) 84¢ **b)** 40¢ **c)** 173¢ **d)** 76¢

2. a) $0.58 **b)** $1.85

3. a) 2 **b)** 15 **c)** 12 **d)** 30

2.3 Proportional Reasoning, pages 78–86

Working Example 1: Show You Know

a) 18 players

b) Answers may vary. Example: I like Method 2 better because it involves fewer steps.

Working Example 2: Show You Know

$3.00

Communicate the Ideas

1. Answers may vary. Example: Ratio: 20 cm : 25 cm; Rate: 20 m/5 s; Proportion: $\frac{\$2}{5} = \frac{\$6}{15}$

2. Answers may vary. Example: Use $\frac{\$1.29}{3} = \frac{c}{12}$. Then, multiply the numerator and denominator by 4 to find the cost.

Practise

3. a) 10 **b)** 2 **c)** 9 **d)** 9

4. a) 33¢/roll **b)** 2 kg/box **c)** 42¢/pen **d)** 6 cm/block

5. a) 120 km **b)** 20 cans

6. a) $7/hour **b)** $21

7. $18

8. a) $\frac{17 \text{ g}}{10 \text{ beans}} = \frac{51 \text{ g}}{30 \text{ beans}}$ **b)** $\frac{15 \text{ boys}}{13 \text{ girls}} = \frac{75 \text{ boys}}{65 \text{ girls}}$ **c)** $\frac{1 \text{ cm}}{25 \text{ km}} = \frac{6.4 \text{ cm}}{160 \text{ km}}$

9. a) $\frac{150}{50} = \frac{300}{v}$ **b)** $\frac{3}{17} = \frac{h}{51}$

Apply

10. $\frac{2 \text{ squares}}{\text{Figure 1}} = \frac{x \text{ squares}}{\text{Figure 7}}$

11. $50

12. a) $2.50/ride **b)** $45

13. $30

14. $52.80

Math Link

a) 63¢/person **b)** Answers will vary.

Chapter Review, pages 87–92

1. $\frac{7}{50} = \frac{14}{100}$

2. $\frac{3}{5}$

3. 4 : 3 : 2

4. $2.75 per tin

5. 27 km/h

6. a) 6 : 12; $\frac{18}{36}$; 18 : 36; $\frac{3}{6}$; 3 : 6 **b)** 50%

7. a) 1 : 2 : 5 **b)** 12 silver, blue, red, and yellow vehicles **c)** 8 **d)** the ratio of blue cars to total cars **e)** $\frac{5}{20}$, 0.25, 25% **f)** $\frac{1}{4}$

8. a) 50 steps/min **b)** $0.90/L

9. a) computer: 3.6¢/h; television: 1.9¢/h

10. a) $4.98 : $13.95 **b)** $4.98/3 kg **c)** $1.66/kg **d)** $4.65/kg **e)** $2.99/kg

11. a) 10 kg **b)** $840

12. a) $8.82 **b)** 4 cm

13. a) 5 m **b)** 12.5 m

Practice Test, pages 93–95

1. B **2.** C **3.** C **4.** A

5. 2 L

6. 80

7. 63

8. a) 4 **b)** 16 : 4 **c)** Answers may vary. Example: 8 : 2

9. a) Answers may vary. Example: small size: 40¢/100 mL; large size: 38¢/100 mL

b) small size: 0.418¢/mL; large size: 0.439¢/mL; The small size is the better buy.

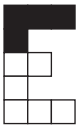
10. a) $12/h **b)** $10/h **c)** Karen **d)** $80

Wrap It Up!, page 96

Answers will vary.

Key Word Builder, page 97

1. proportion **2.** unit rate **3.** unit price **4.** part-to-part ratio **5.** part-to-whole ratio **6.** two-term ratio **7.** three-term ratio **8.** rate



Challenge in Real Life, pages 99–100

1. a) 2 cm **b)** 6.4 cm

2. a) 1368 km **b)** 360 km **c)** 1152 km

3. a) 6.9 cm **b)** 1242 km **c)** 276 km/h