



## Ratios, Proportions and Rates

Suggested Time: 45 minutes

### What's important in this lesson:

In this lesson, you will use ratios and rates to solve proportional reasoning problems.

### Complete the following steps:

1. Read through the lessons on your own.
2. Complete all questions provided.
3. If you have any questions, ask your teacher.
4. Check your answers with the teacher.

### Hand in the following:

1. Practice Problems
2. Ratio, Proportions and Rates Evaluation

### Questions for the teacher:



## Ratios, Proportions and Rates

### Part A: Ratios
































A **ratio** compares quantities measured in the same units.

For example the ratio of width : length of this page is  $8\frac{1}{2}$  inches:11 inches.

1. Write ratios to compare the contents of a vending machine.

The cans and bottles are all the same size: 500 mL.

a) pop : juice
= _____ : _____
b) waters : colas
= _____ : _____
c) cans : bottles
= _____ : _____
d) juice : waters
= _____ : _____
e) no taste : flavours
= _____ : _____

Flavoured Water	Cola	Diet Cola	Water	Juice
				
				
				
				
				
				
				
				
				
				
				

2. The mixing instructions on a can of frozen lemonade state that 1 can frozen juice should be mixed with 3 cans of water.

a) What is the ratio of frozen juice : water ? \_\_\_\_\_ : \_\_\_\_\_

b) Add to find the Total number of parts of the mixture. \_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_ .

c) So there are 4 cans of mixture, and each can is 500mL ( $\frac{1}{2}$  L).

Then, the mixture makes  $500\text{mL} \times 4 =$  \_\_\_\_\_ mL, or  $\frac{1}{2} \text{ L} \times 4 =$  \_\_\_\_\_ L of lemonade.



Part B: Proportions

A **proportion** is a statement that two ratios are equal.

To create an equal ratio, multiply both terms by the same number.

Example: Write three equivalent ratios for  $1 : 3 = \boxed{?} : \boxed{?}$

Multiply each term in the ratio by the same number.

$1 \times 2 = 2$	$1 \times 3 = 3$	$1 \times 4 = 4$
$1 : 3 = \boxed{2} : \boxed{6}$	$1 : 3 = \boxed{3} : \boxed{9}$	$1 : 3 = \boxed{4} : \boxed{12}$
$3 \times 2 = 6$	$3 \times 3 = 9$	$3 \times 4 = 12$

3. Let's use the lemonade case. What if you want to make **10L** of lemonade?  
 The ratio of juice : water must always be the same, so the lemonade will be drinkable.  
 The recipe ingredients must be multiplied "**in proportion**".

You know the juice to water ratio "recipe" is      :     .  
 There are four parts (1 + 3) in each original recipe, and that makes 2L.  
 You now need 10L =            *times* the 2L made by the original recipe.

So you need four parts multiplied by          to make the larger recipe.  
 Therefore, each term of the ratio is multiplied by         .

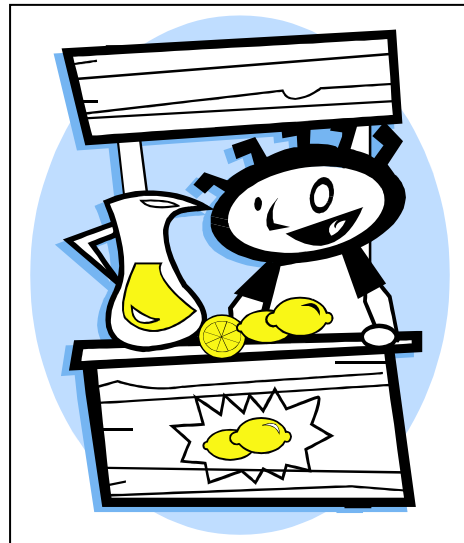
Therefore, frozen juice : water proportion is:

$1 \times \underline{\quad} = \underline{\quad}$

$1 : 3 = \boxed{\quad} : \boxed{\quad}$

$3 \times \underline{\quad} = \underline{\quad}$

<p>1 + 3 = 4 parts for 2L</p>	<p><b>These are proportional</b></p>	<p><u>    </u> + <u>    </u> = 20 parts for 10L</p>
---------------------------------------	--	---



Therefore, for 10L of lemonade, you need  
         cans of frozen juice, and          cans of water.



4. You know the juice to water ratio “recipe” is  $\underline{\quad} : \underline{\quad}$ .

You are making lemonade, and added **2** cups of water to the frozen juice, and then the phone rang.

When you came back to the lemonade container, you poured a glass of the mixture. What would the drink taste like? \_\_\_\_\_



or



What would the ratio look like? This mixture’s ratio of juice : water =  $\underline{\quad} : \underline{\quad}$

Circle the correct answer.

**Would the proportion be equal?**

1 : 3  
recipe

equal or not equal to  $\underline{\quad} : \underline{\quad}$   
this mixture

5. What if you added 3 cups of water to the can of frozen juice, *twice*?

What would the drink taste like? \_\_\_\_\_



or



What would the ratio look like? This mixture’s ratio of juice : water =  $\underline{\quad} : \underline{\quad}$

Circle the correct answer.

**Would the proportion be equal?**

1 : 3  
recipe

equal or not equal to  $\underline{\quad} : \underline{\quad}$   
this mixture



Part C: Rates

A **rate** is a comparison of two measurements of different units (include units with “per” sign “ / “). For example, 80 km /h , 60 beats /min , \$3.95 /kg.

An exchange rate compares two money values of different countries. The exchange rate between United States and Canada changes daily. Here, use a rate of \$1 US = \$1.22 CDN.

6. You are traveling to the States and want to know the cost of a restaurant meal in Canadian money. Multiply by the exchange rate; round to the nearest cent.

Restaurant	Price on Menu (\$ US)	Price in Canadian dollars
Wendy's	\$4.59	$4.59 \times 1.22 = \$$ _____
Pizza Hut	\$7.99	
Baskin Robbins	\$3.79	
Dunkin' Donuts	\$ 0.98	

7. The rate of water slowly dripping from a bathroom tap is 750 mL every hour.

a) Write this as a rate, with units: \_\_\_\_\_

b) From one tap, how much water, in mL, will be wasted in one full day?

$$= \text{_____ mL/h} \times \text{_____ h/day} = \text{_____ mL/day}$$

c) From one tap, how much water, in L, will be wasted in one day? 1000mL = 1L

$$= \frac{\text{_____ mL/day}}{1000 \text{ mL/L}} = \text{_____ L/day wasted by one dripping tap.}$$

d) There are 30 bathroom taps in a school. If they all slowly dripped at the same rate, how much water would be wasted in one day?

$$\text{_____ L/day/tap} \times \text{_____ taps} = \text{_____ L/day wasted by 30 taps}$$

e) The only source of water, for people in a small village in a developing country, is a community well. Each person is allowed 2L of water per day, because the well only produces a small amount of water.

The dripping taps in a Canadian school waste \_\_\_\_\_ Litres of water per day. How many people could be given their water allowance, instead of water DRIPPING?

$$\text{_____ L wasted} \div \text{_____ L allowed daily / person}$$

$$= \text{_____ people that could have water.}$$



## Evaluation: Ratios, Proportions and Rates

1. Write the following as **ratios**. [3]

a) At a World soccer party, 27 Italian flags and 19 French flags are waved by fans.  
Flag Ratio is Italian : French, \_\_\_\_\_ : \_\_\_\_\_

b) In a parade, some floats are pulled by 15 transports and 9 tractors.  
Float ratio is Transports : Tractors, \_\_\_\_\_ : \_\_\_\_\_

c) A team has twice as many members who are girls as boys. There are 15 team members (parts). Ratio of Girls : Boys = \_\_\_\_\_ : 5

2. Find the missing term in each **proportion**. [3]

a)  $2 : 5 = 6 : \underline{\hspace{1cm}}$       b)  $3 : 7 = 9 : \underline{\hspace{1cm}}$       c)  $4 : 5 = 12 : \underline{\hspace{1cm}}$

d) You are painting in art class, and need to make a Dark Blue colour.  
The proportion is 6 parts Black to 4 parts Blue. That makes 10 parts.

You need 30 parts = \_\_\_\_\_ times 10 in the original recipe. Write the proportion required:

Black : Blue = \_\_\_\_\_ : \_\_\_\_\_ = \_\_\_\_\_ : \_\_\_\_\_

3. Solve these **rate** problems.

a) Find each person's hourly rate of pay. (dollars per one hour) [2]

i) Belle earns \$40 for 5 hours of work.

ii) Denny earns \$39 for 3 hours of work.

b) While visiting England, the exchange rate is £1 British Pound = \$2.12 CDN.  
Calculate how much these tourist essentials cost in Canadian money. [4]

Tourist Essential	Price in British Pounds	Price in Canadian dollars
Hotel Thames	£ 68	
Bangers and Mash (food)	£ 7	
Taxi to airport	£ 19	
Rail ticket to France	£ 4	