



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 .

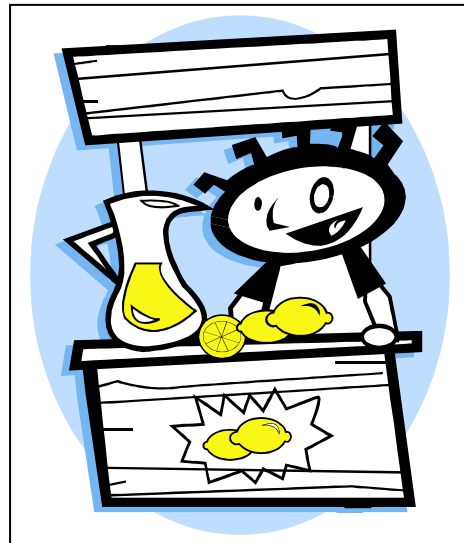
Therefore, frozen juice : water proportion is:

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

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

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

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