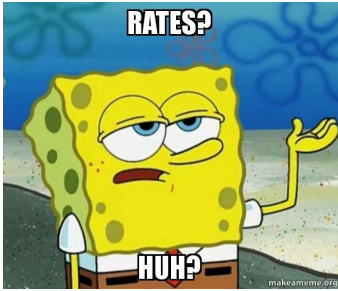


Unit 3

Rates and Ratios



What is a ratio?

A ratio is a statement of how numbers compare. It is a comparison of the size of one number to the size of others.

Ratios can be simplified in the exact same way that fractions can.

The ratio of red to blue dinosaurs is **12:18**

This ratio can be simplified. Both 12 and 18 can be divided by 2.

$$12 \div 2 = 6 \quad | \quad 18 \div 2 = 9$$

So a simpler way to write 12:18 is **6:9**

The ratio can be simpler again, if we divide by 3.

$$6 \div 3 = 2 \quad | \quad 9 \div 3 = 3$$

2:3

The infographic features a brown background with a mountain range silhouette. It uses red and blue dinosaur icons to represent the numbers in the ratio. The final simplified ratio, 2:3, is shown in large, bold, red and blue numbers.

How to write a ratio

Ratios can be written in three different ways;

- 1) With a colon. For example 3:2
- 2) With the word to. For example 3 to 2
- 3) As a fraction. For example $\frac{3}{2}$



Types of Ratios

There are two types of ratios that we will learn about.

Part to part ratios provide the relationship between two distinct groups.

Part to whole ratios provide the relationship between a particular group and the whole populations.

part-to-part ratio

a comparison of two parts of the same whole



(e.g., 2 : 4 compares the number of red tiles to the number of blue tiles)

part-to-whole ratio

a comparison of part of a whole to the whole



(e.g., 2 : 6 compares the number of red tiles to the total number of tiles) that can be written as a fraction, such as $\frac{2}{6}$

Making Ratios

Look around the room. How many people are wearing hats?

What is a part to part ratio that can represent this?

What is a whole to part ratio that can represent this?



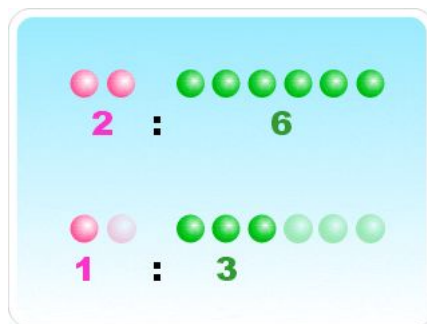
Equivalent Ratios

As stated before, ratios can be simplified just like fractions can.

To simplify a ratio find a common term and divide both parts of the ratio by it. This will create a **proportion**.

For example;

$$6 : 4 = 3 : 2$$



Simplify and write as a proportion

a) $7 : 21$

b) $12 : 52$

Making Ratios

With a partner and using the jelly beans provided, write out at least 3 ratio and proportion statements.



Review

- a) What is a ratio?
- b) What is a proportion statement?
- c) What are the two types of ratios discussed?



Ratio Tables

A **ratio table** is a structured list of equivalent ratios that helps to understand the relationship between the ratios and the numbers.

Ratio tables can be made by increasing or decreasing each number by a scale factor.

Number of Items	1	5	10	50
Cost (\$)	5	25	50	250

Fill in the missing values

	2		
3	6	9	18

4			5
24	18	60	

Fill in the missing values

1	9		8
5		50	

6	20		10
	60	42	

Fill in the missing values

Zack's Paint Mixture		
Red paint (cups)	Yellow paint (cups)	Orange paint (cups)
3	5	
	10	16
9		
	20	32
15		40

Example

Evan saves \$2 of every \$5 he earns mowing lawns.

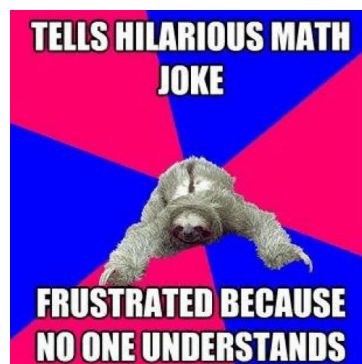
\$ Saved	2			8	10	20		
\$ Spent	3	6	9		15		60	
Total \$ Earned	5	10			25			150

How much will Evan have saved when he has earned \$150?

Review

- a) How would we determine the scale factor of the proportion $4:2 = 2:1$?

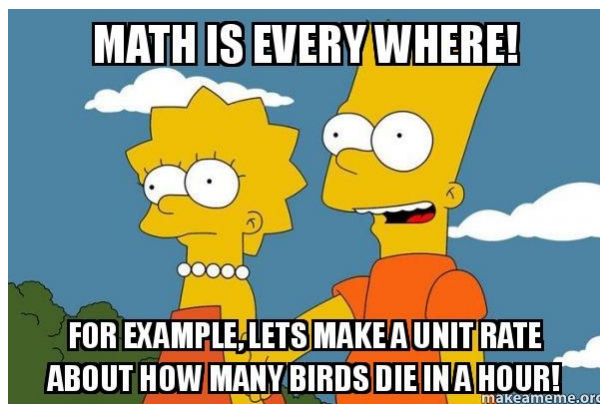
- b) What are three ways to represent ratios?



Rates

A rate is a comparison of two amounts measured in different units. Examples of rates include measurements made in;

Kilometres per hour, dollars per hour, meters per second and calories per serving.



Unit Rates

A **unit rate** is a rate where the second quantity is one unit , such as \$34 per pound, 25 miles per hour, and 0.73 cents per dollar.

To find a unit rate we must make the denominator 1 by dividing both terms by the original denominator.

Rates and Unit Rates:

$$\frac{60 \text{ miles}}{3 \text{ hours}} \quad \frac{20 \text{ miles}}{1 \text{ hour}} = 20 \text{ miles/hour}$$
$$\frac{40 \text{ words}}{2 \text{ min.}} \quad \frac{20 \text{ words}}{1 \text{ min.}} = 20$$

Miranda's Maid Service charges \$280 to clean 8 offices. What is the company's price for cleaning a single office?

A roller coaster can take 162 passengers around the track in 9 minutes. The roller coaster operates at a constant rate. How many passengers can the roller coaster take around the track per minute?

A grocery store sells a 15.5oz box of oreos for \$2.98. The same store also sells a 14 oz box of Chips Ahoy for \$2.50. Which is the better deal per ounce?

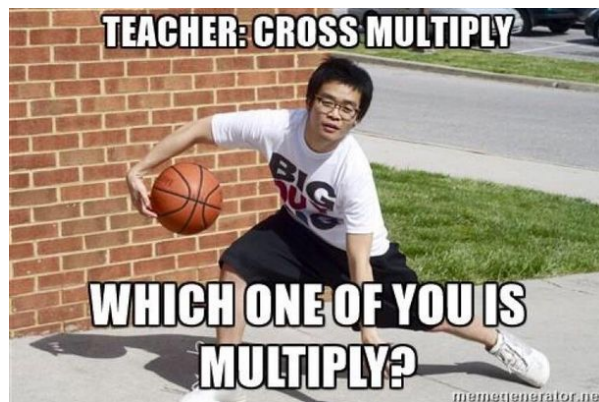
A grocery store sells Coca-Cola for \$1.29 for a 1.25L bottle. The same store sells Pepsi for \$2.49 for a 2L bottle. Which is the better deal?

Cross Multiplication

Another way to solve some rate problems is by **cross multiplying**.

To cross multiply;

- 1) Set up a proportion with the missing value denoted with a variable.
- 2) Multiply the opposite numerators and denominators by each other.
- 3) Divide to solve for the missing value.



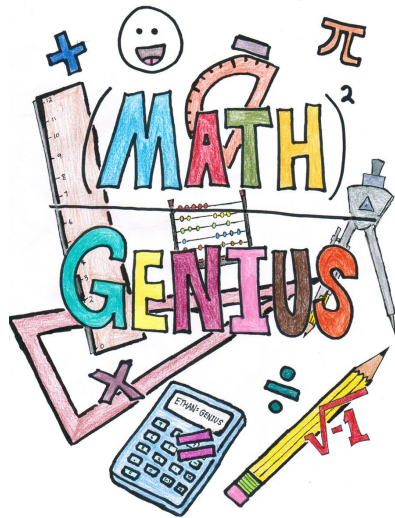
Frozen fruit bars cost \$3.95 for 5 bars. How much money would it cost to buy 12 bars?

Five lemons cost \$1.80. What is the cost for 9 lemons at this rate?

Pat wants to enter a typing contest. In order to enter, one has to be able to type 50 words per minute. Pat took 15 seconds to type 10 words. Can he enter the contest?

Review

- a) What is the difference between a ratio and a unit rate?
- b) What is a proportion?
- c) What is cross multiplying?

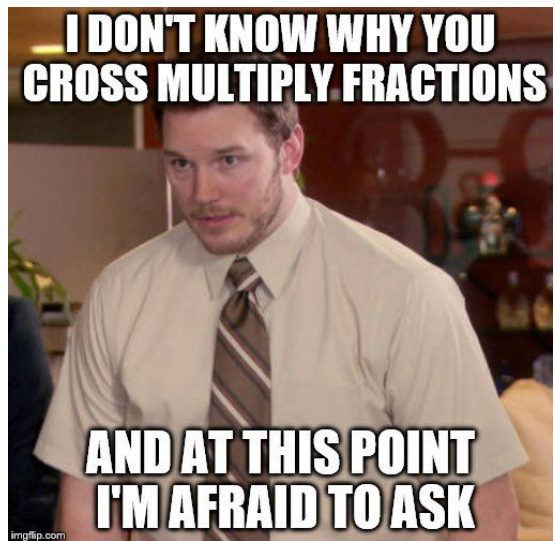


Remember!

Another way to solve some rate problems is by **cross multiplying**.

To cross multiply;

- 1) Set up a proportion with the missing value denoted with a variable.
- 2) Multiply the opposite numerators and denominators by each other.
- 3) Divide to solve for the missing value.



A recipe for oatmeal cookies calls for 2 cups of flour for every 3 cups of oatmeal. How much flour is needed for a big batch of cookies that uses 9 cups of oatmeal?

It takes 27 kg of milk to make 4 kg of butter. How much milk is needed to make 3 kg of butter?

Pamela drove her car 99km with 9 litres of fuel. Assuming that the relationship is proportionate; how far can Pamela drive with 13 litres of fuel?

Mandy works construction. She knows that a 6 meter long metal bar has a mass of 40 kg. Assuming the relationship is proportionate; how long would a 15 kg bar be?

Katherine spends 7 h each day in school, including 30 min for lunch. Write a ratio to compare the time for lunch with the total time in school each day.

If the ratio of people wearing hats to people not wearing hats is 6:20, then how many people would be wearing hats if 52 people were in the class?

John takes lego blocks in a handful that has red, blue and green blocks in a ratio of 6:4:2. One handful has 48 blocks altogether. How many of each block does he have?

Practice

Pages 110-112 Questions 4, 6, 9, 12

Page 117 Questions 2, 4, 5, 7

Page 121 Questions 2, 3, 5

Page 125 Questions 3, 4, 5, 6

Page 132 Questions 2, 3, 5, 6

Pages 134 - 136 All Questions

Are monsters good at math?



Not unless you *Count Dracula*.

