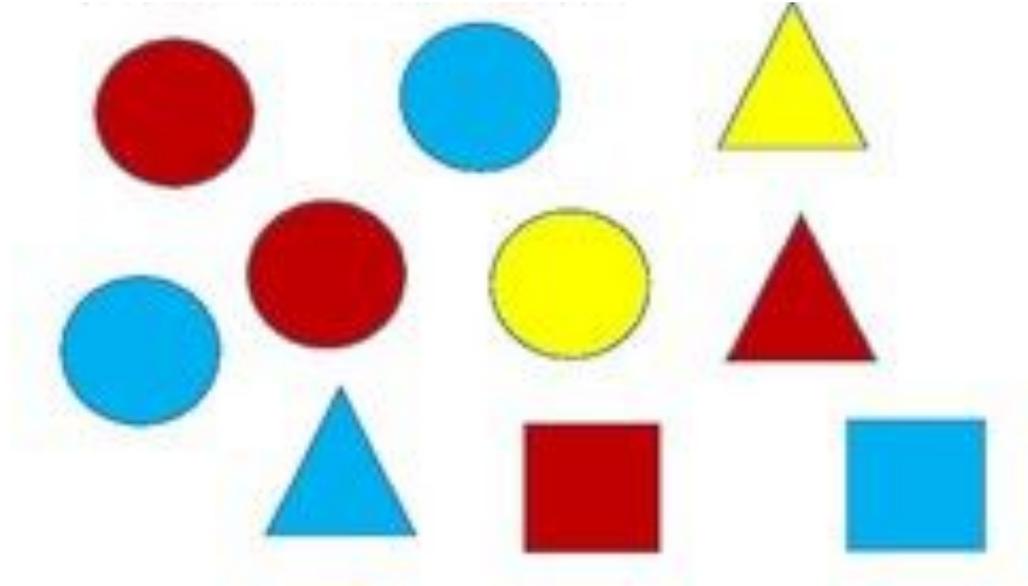


Unit 3

Rates and Ratios

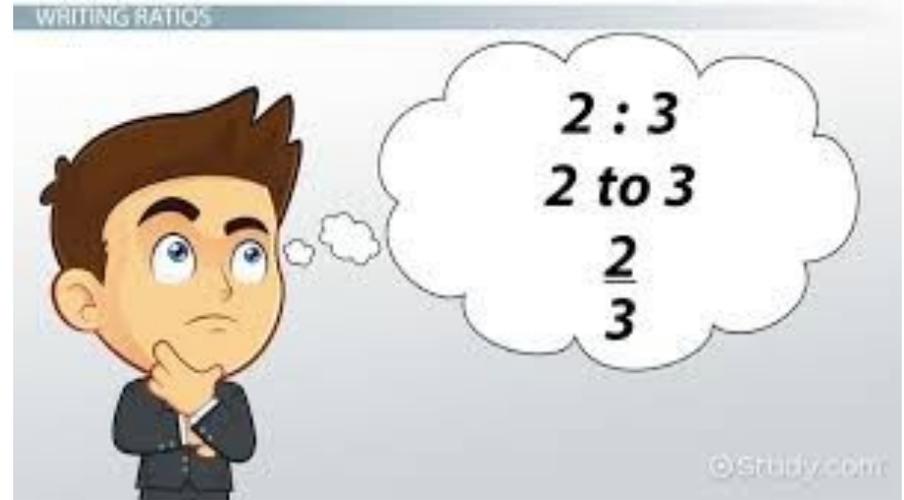


DO NOW! - What Do You Notice? (At least 3)



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.



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?

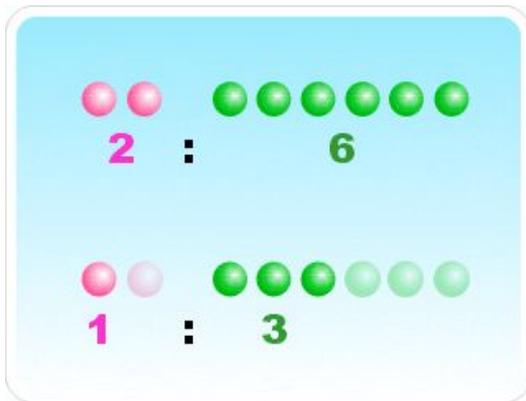
What is a whole to part ratio that can represent this?



Equivalent Ratios

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

To simplify a ratio find a common term and divide both parts of the ratio by it.



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.

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



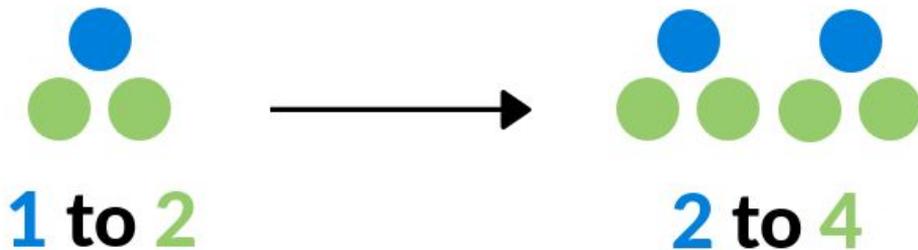
Ratio

A comparison of **two** amounts that can be expressed **three** ways.



Equivalent ratios

Ratios that have the **same** value.



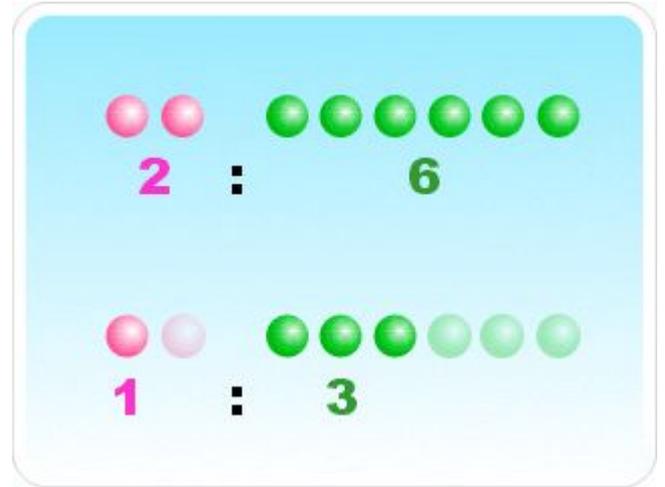
Proportion

Simplifying ratios creates a **proportion**.

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

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.



Making Ratios

If there were 20 jelly beans in your bag, how many would be:

- Yellow
- Green
- Purple
- Pink
- Red

Review

- a) What is a ratio?

- b) What is a proportion statement?

- c) What are the two types of ratios discussed?



Exit Task

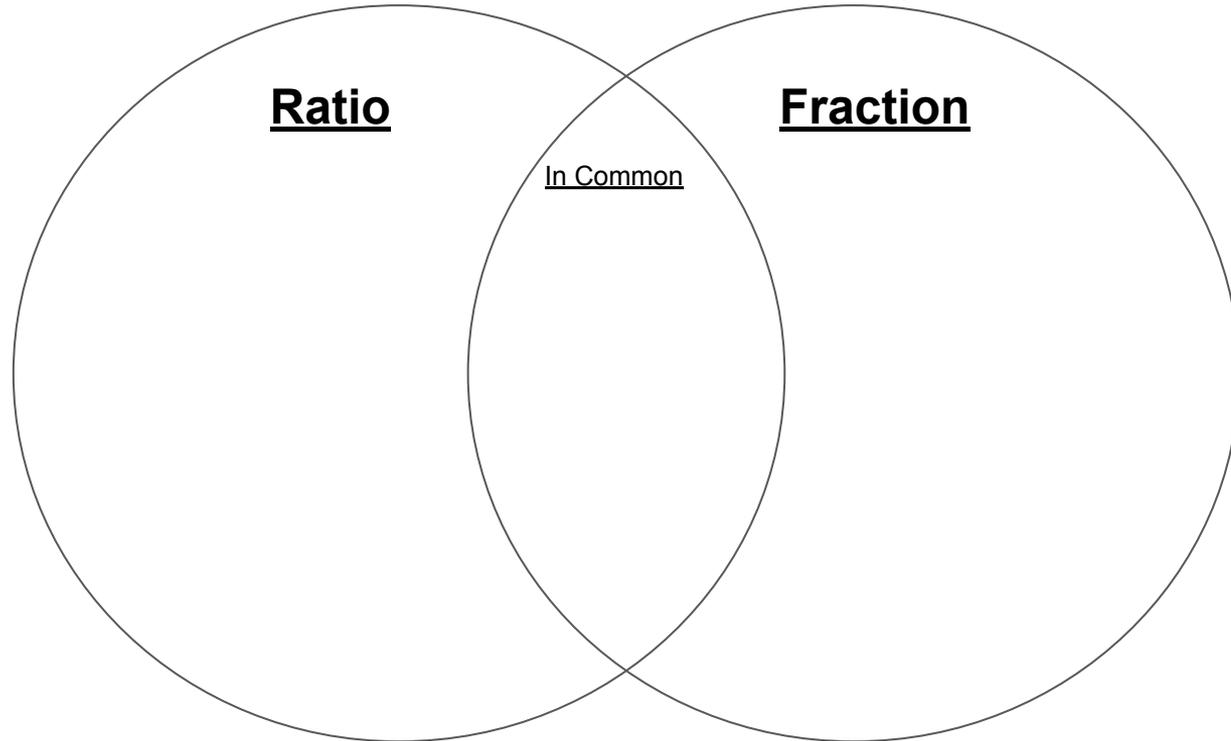
Move your magnet to either number 1, 2 or 3.

1 - I understand ratios, I can move on

2 - I think I get it, but I'd like another quick review

3 - I want some extra help

Do NOW! - Ratio vs. Fraction



Ratio vs. Fraction

What's the big difference?

Fractions VS. Ratios

What are Ratios?
A comparison of two quantities expressed as a quotient.

Part to Part: Representing part of a whole compared to part of a whole.

Part to whole: representing part of a whole and comparing it to the whole itself.

Whole to part: representing a whole and comparing it to a part of that whole

What are Fractions?
A numerical quantity that is not a whole number.

Can only represent a part to whole relationship.

Ratios can be written in fraction form.

Ratios and fractions are simplified the same way.

4:3



Sources
https://www.eduplace.com/math/mw/background/5/11/te_5_11_fractions_ask.html
Math Notebook

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**.

A **scale factor** is a number which scales, or **multiplies**, some quantity.

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

Find Equivalent Ratios

Ratio of Boys to Girls: 3 to 5 or $\frac{3}{5}$

Boys	3	6	9	
Girls	5	10	15	

Mult. by 2:

$$\frac{3}{5} \cdot \frac{2}{2} = \frac{6}{10}$$

Mult. by 3:

$$\frac{3}{5} \cdot \frac{3}{3} = \frac{9}{15}$$

Mult. by 4:

$$\frac{3}{5} \cdot \frac{4}{4} = \frac{12}{20}$$

Find Equivalent Ratios

Cards	2		
Dice	4		
		X	X

Fill in the missing values

1	9		8
5		50	

Finding Equivalent Ratios with Missing Data

Step 1: Look at any two ratios in a proportion sentence

Step 2: Find the scale factor by DIVIDING a larger 'known' by smaller 'known' (**numerator by numerator OR denominator by denominator**)

Step 3: Multiply the 'Known' to find the 'UNKNOWN'

1	9		8
5		50	

Step 1:

Step 2:

Step 3:

Fill in the missing values

	2		
3	6	9	18

4			5
24	18	60	

Fill in the missing values

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.

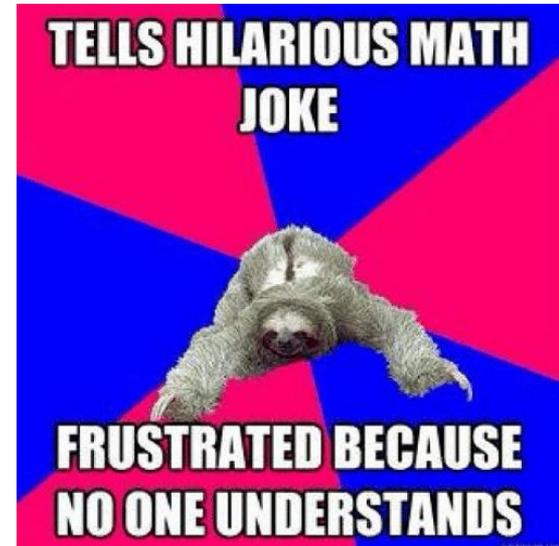
\$ Saved	2			8	10	20		
\$ Spent	3	6	9		15		60	
Total \$ Earned	5	10			25			150

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?



Do Now!

FINDING EQUIVALENT RATIOS

Directions: Use the digits 1-9 to create 3 equivalent ratios.
Each digit can only be used once.

__ : __ = __ : __ = __ : __

Answer



$$6:3 = 18:9 = 54:27$$

Finding Ratios in Word Problems

Step 1: Identify your 'parts' or 'wholes'

Step 2: Identify what you are comparing

Step 3: Write as a ratio

Step 4: Solve what the question is asking.

Ratio Word Problems

A banana bread recipe that makes 4 loaves calls for 12 bananas. If you are making 24 loaves, how many bananas do you need?

Step 1: Identify your 'parts' or 'wholes'

Step 2: Identify what you are comparing

Step 3: Write the ratio(s)

Step 4: Solve what the question is asking.

- 1) Harry reads 32 pages of a 52-page comic book before he falls asleep. What is the ratio of the pages that Harry read to the pages that remain to be read?

- 2) An electric pole is 16 m tall and it casts a shadow that is 24 m long. What is the ratio of the height of the electric pole to the length of the shadow cast by it?

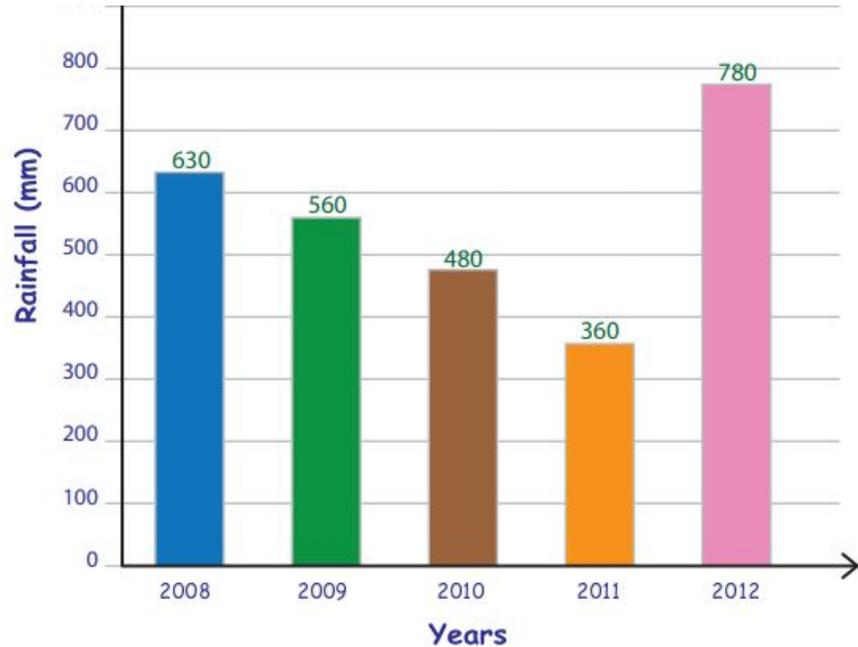
- 3) Ben and Jude get a weekly allowance of \$44 and \$36 respectively. Find the ratio of the allowance that Ben receives to the allowance that Jude gets.

- 4) Light travels at a speed of 186,200 mi/s in air and at a speed of 120,000 mi/s in glass. Compare the ratio of the speed of light in air to its speed in glass.

- 5) Duralumin, an alloy consists of 94% aluminium, 4% copper and 1% magnesium. What is the ratio of copper to aluminium in Duralumin?

DO NOW!

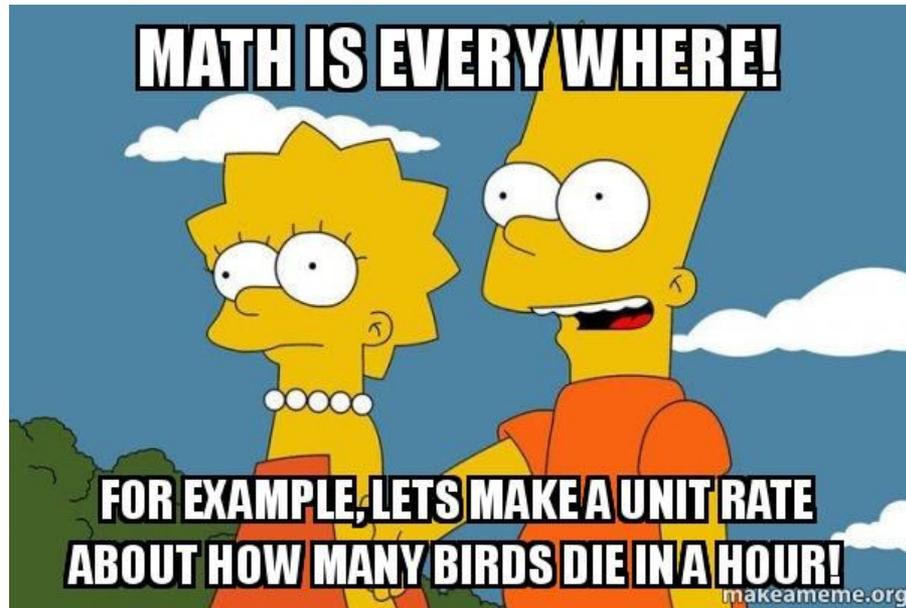
- 1) What is the ratio of the rainfall recorded in the year 2010 to the rainfall recorded in 2011?
- 2) Identify the years in which rainfall recorded was in the ratio of 7 : 4.
- 3) What is the ratio of the maximum rainfall to the minimum rainfall recorded between 2008 and 2012?
- 4) If the rainfall recorded in 2010 shows an increase of 40mm of rain, what will be the ratio of rainfall recorded in 2009 to 2010?
- 5) What is the ratio of the rainfall recorded in 2008 to the total rainfall recorded from 2008 to 2012?



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:

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

Rate and Unit Rate Terminology

- Rate - \$10 for every 4 packs of Pepsi is a rate
- Unit Rate – The unit rate is 2.5 because it is the value of the ratio
- Rate Unit (Label) – The rate unit is dollars/packs of Pepsi because it costs 2.5 dollars for every 1 pack of Pepsi

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?

DO NOW!!

Miss McKechnie loves Starbucks coffee. Today, while waiting to place her order for her Americano with cream, she noticed the prices for the three sizes that were available.

She could order:



Tall
12 oz
\$3.55



Grande
16 oz
\$4.25



Venti
20 oz
\$4.55

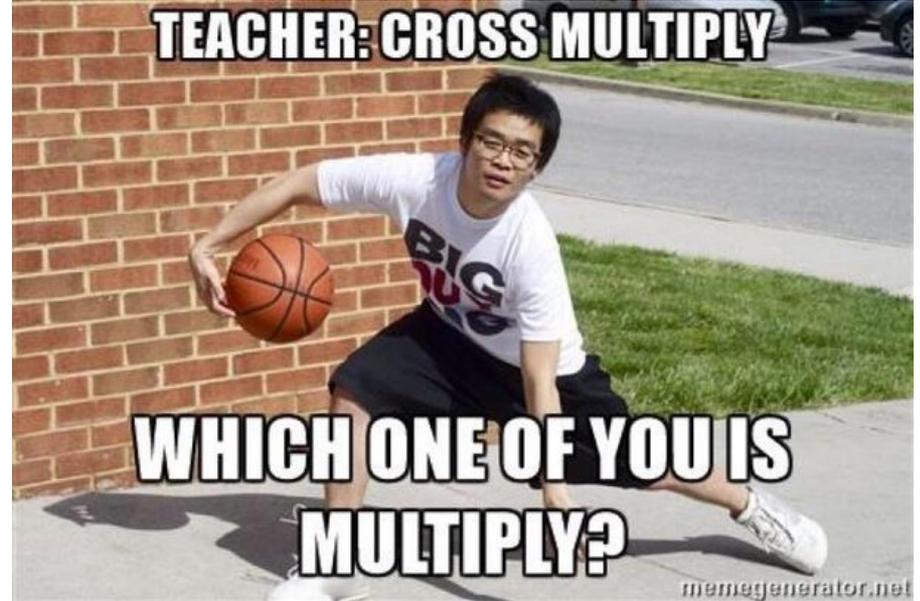
Which size is the better unit rate? _____ Why? _____

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?

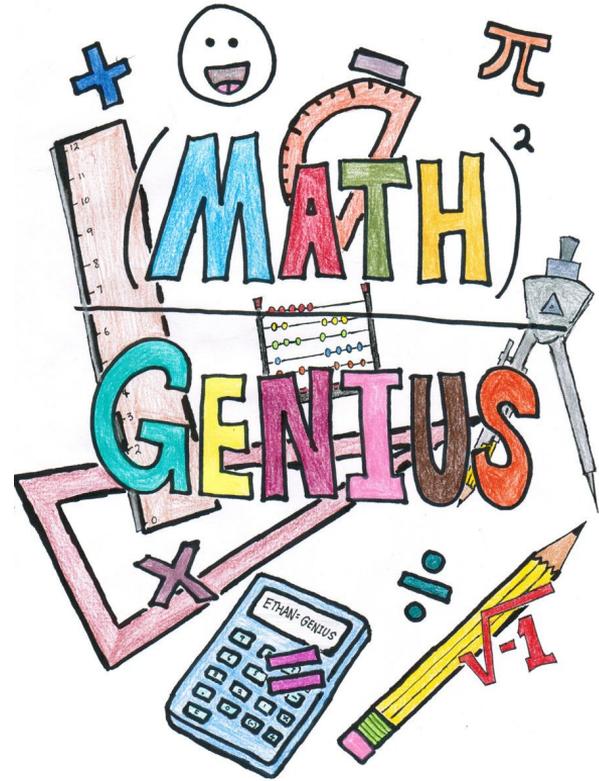
Pat wants to enter a typing contest. In order to enter, one has to be able to type 50 words per minute. Pat took 15 seconds to type 10 words. Can he enter the contest?

Review

- a) What is the difference between a ratio and a unit rate?

- b) What is a proportion?

- c) What is cross multiplying?

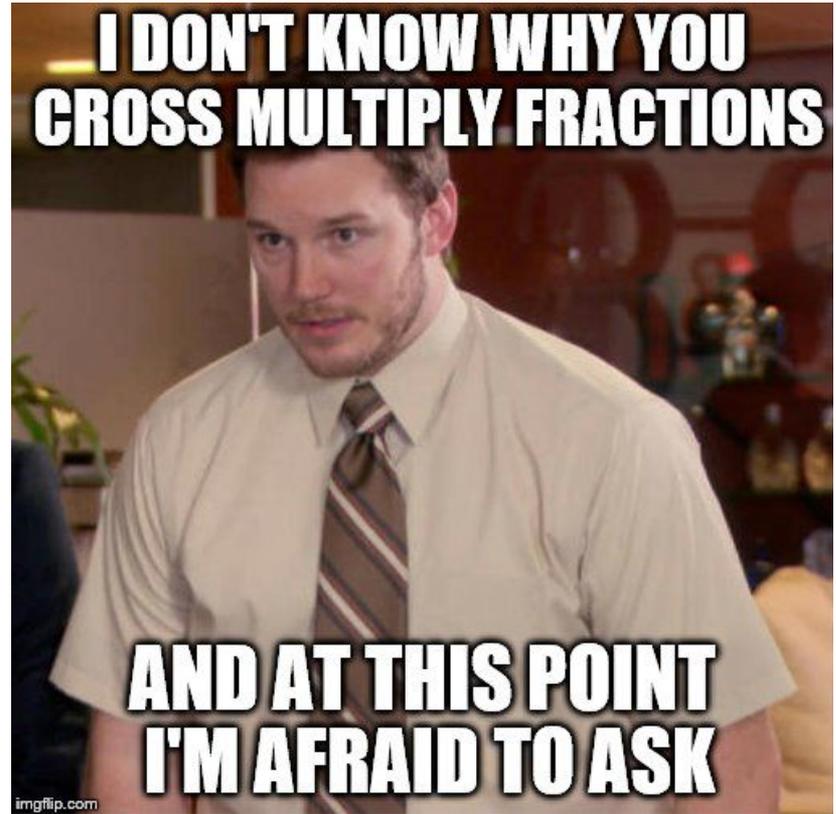


Remember!

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

