

Name: Key Date: _____ Period: _____

Ratios, Unit Rate, and Proportions

Notes:

A **ratio** is the comparison of two numbers that uses division

Ratios can be written **three** ways:

as a fraction	with a colon	using the word "to"
$\frac{2}{3}$	2 : 3	2 to 3
Note: Fractions and ratios are the same thing.		

When writing ratios, the order in which you write the ratio **matters**. Let's see why:

Write a ratio comparing the number of male students to female students in your class.

as a fraction	with a colon	using the word "to"
$\frac{\text{male}}{\text{female}} = \frac{7}{5}$	male : female 7 : 5	male to female 7 to 5

Write a ratio comparing the number of female students to male students in your class.

as a fraction	with a colon	using the word "to"
$\frac{5}{7}$	5 : 7	5 to 7

Notice how the ratio of male students to female students is **different** than the ratio of female students to male students.

[Guided Notes]

Ratios, like fractions can be **reduced**.

★ You can always write it as a fraction & use the **ABC button to simplify**.

Can any of your ratios in the example above be reduced? If so, reduce them.

Write the following ratios in simplest form.

5 to 15

8 : 24

6 to 16

14 to 21

3 : 9

$$\frac{5}{15} = \frac{1}{3}$$

$$\frac{8}{24} = \frac{1}{3}$$

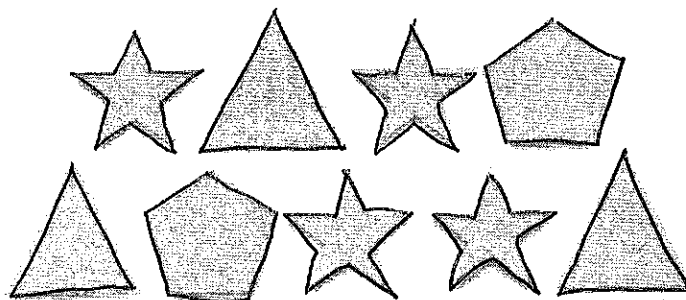
$$\frac{3}{8}$$

$$\frac{2}{3}$$

$$\frac{1}{3}$$

Guided Example:

Use the shapes below to answer the following questions. Write all ratios in simplest form.



What is the ratio of pentagons to triangles? Write this ratio three different ways.

$$2:3$$

$$\frac{2}{3}$$

$$2 \text{ to } 3$$

What is the ratio of stars to pentagons? $\frac{4}{2} = \frac{2}{1}$

2:1 ← must keep the 1 with the number

What is the ratio of triangles to all shapes? $\frac{3}{9} = \frac{1}{3}$

What is the ratio of all shapes to stars? $9:4$

★ **Note:** When writing a ratio that compares "all shapes," you must count **every** shape, even the ones being compared.

Unit rate is the rate for one unit of a given quantity.

Guided Example:

If Jenna scores 96 points in 6 games, how many points does he score, on average, per game? What is the unit rate?

The easiest way to find the unit rate is to write the ratio as a fraction:

$$\frac{\text{points}}{\text{game}} = \frac{96}{6}$$

Remember, the fraction bar represents division. To find the unit rate, or the number of points Jenna scores in **one** game, divide your numerator (96) by your denominator (6).

$$96 \div 6 =$$

Therefore, Jenna scores, on average, 16 points per game.

Guided Example:

If 8 pounds of apples cost \$8.40, how much would it cost for one pound of apples? What is the unit rate?

The easiest way to find the unit rate is to write the ratio as a fraction:

$$\frac{\text{price (\$)}}{\text{pounds}} = \frac{8.40}{8}$$

Again, the fraction bar represents division. To find the unit rate, or the cost of **one** pound of apples, divide your numerator (8.40) by your denominator (8).

$$8.40 \div 8$$

Therefore, the cost for one pound of apples is 1.50.

Note: When setting up your proportion, money amounts typically go in the numerator. The unit that you are trying to find **one** of goes in the denominator.

Find the following unit rates. Show all of your work. Label all of your answers.

150 miles in 25 days

725 calories in 8 Oreo cookies

\$4.80 for 6 pounds of carrots

$$\frac{150}{25} = 6 \text{ miles}$$

per day

[Guided Notes]

$$\frac{725}{8} = 90.625$$

calories per oreo

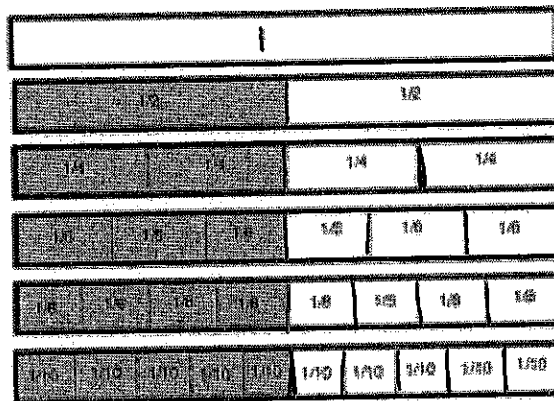
$$\frac{4.80}{6} = \$0.80/\text{lb}$$

Notes:

We can set two (or more) ratios equal to each other:

$$\frac{12}{48} = \frac{6}{24} = \frac{3}{12} = \frac{1}{4}$$

We can explore this same concept using pictures.

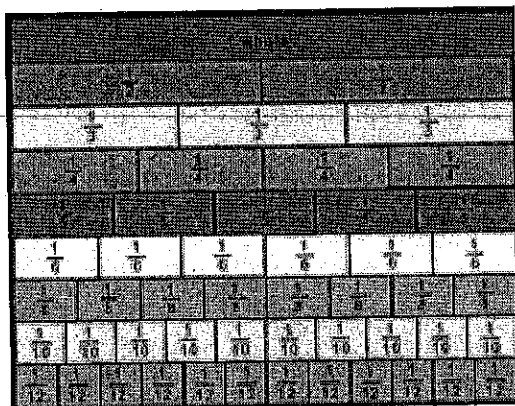


Write the equivalent ratios illustrated above:

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$$

Guided Example:

How many equivalent ratios can you find using the fraction bars below?



[Guided Notes]

Notes:

A **proportion** is an equation that states that two ratios are equal

An example of a proportion is:

$$\frac{7}{49} = \frac{1}{7}$$

(Handwritten: 7 divided by 7, 49 divided by 7)

Sometimes proportions are **false**, like the example below:

$$\frac{4}{9} = \frac{5}{8}$$

How can we tell if a proportion is true, or if two ratios are equivalent?

To determine whether or not a proportion is true cross multiply

Compare your **cross products**. If they are equal, your ratios are **equivalent**, and your proportion is **true**.

If your **cross products** are not equal, then your proportion is **false**. Also, the **greater** cross product is on the same side as the **greater** fraction.

Guided Example:

Are the following proportions true or false?

① $\frac{1}{2} = \frac{14}{28}$

(Handwritten: 28, 28)

(Crossed out: 1, 14, 2, 28)

True

② $\frac{15}{45} = \frac{3}{15}$

(Handwritten: 205, 135)

(Crossed out: 15, 3, 45, 15)

False

③ $\frac{45}{9} = \frac{10}{2}$

(Handwritten: 90, 90)

(Crossed out: 45, 10, 9, 2)

True

④ $\frac{40}{12} = \frac{160}{3}$

(Crossed out: 40, 160, 12, 3)

⑤ $\frac{12}{15} = \frac{20}{25}$

(Crossed out: 12, 20, 15, 25)

⑥ $\frac{5}{9} = \frac{15}{27}$

(Crossed out: 5, 15, 9, 27)