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.

7 5

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.

5 7

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 [A b/c] button to simplify.

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

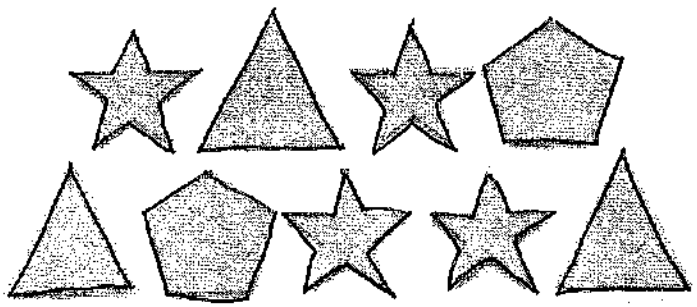
Write the following ratios in simplest form.

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 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? $\frac{3}{9}$ 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.

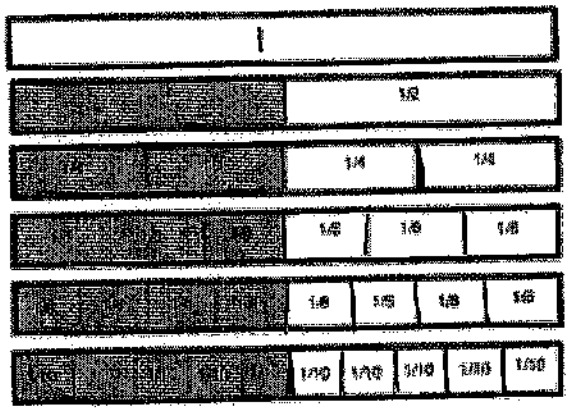
150 miles in 25 days	725 calories in 8 Oreo cookies	$4.80 for 6 pounds of carrots
$\frac{150}{25} = 6$ miles per day	$\frac{725}{8} = 90.625$ calories per oreo	$\frac{480}{6} = \$1.80/\text{lb}$

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.

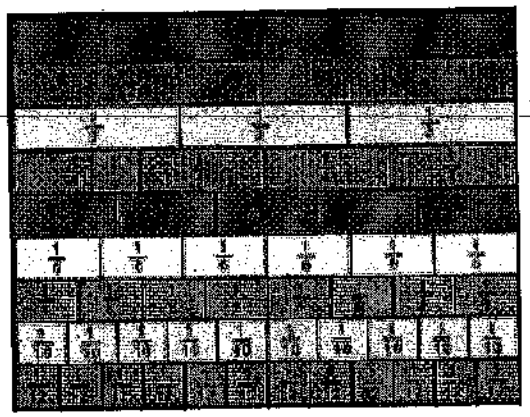


Write the equivalent ratios illustrated above:

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

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:

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

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) $\frac{1}{2} \times \frac{14}{28}$ 28 28 True

(2) $\frac{15}{45} \times \frac{3}{15}$ 135 225 False

(3) $\frac{45}{9} \times \frac{10}{2}$ 90 90 True

(4) $\frac{40}{12} \times \frac{160}{3}$

(5) $\frac{12}{15} \times \frac{20}{25}$

(6) $\frac{5}{9} \times \frac{15}{27}$