

Name _____

Period Key

Ratios & Rates

Introduction to ratios.

A ratio is: a fraction (or quotient) that compares
2 numbers (or quantities). The units being
compared are the same or can be made the same.

There are 3 ways to write a ratio:

1) $\frac{a}{b} =$ as a fraction

2) $a : b =$ with a colon

3) a to $b =$ in words using "to"

example

$\frac{2 \text{ weeks}}{3 \text{ months}}$ is the same as:

$\frac{2 \text{ weeks}}{12 \text{ weeks}}$

Example: Write the ratio 11 and 13 in the 3 ways.

fraction $\frac{11}{13}$ colon 11:13 words 11 to 13

Example:

Of the 365 days in a year, it takes 110 days to pay your taxes. What is the ratio of the days worked for taxes to the total number of days in a year?



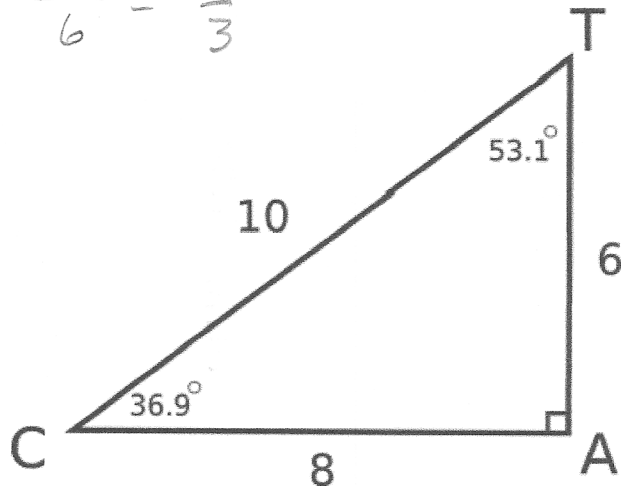
$$\frac{110}{365} = \frac{22}{73} \text{ or } \frac{30}{100} = 30\%$$

The ratio is :

Example: For the following triangle, find the ratios of :

the shortest leg to the longest leg: $\frac{6}{10} = \frac{3}{5}$

the longest leg to the shortest leg: $\frac{10}{6} = \frac{5}{3}$



To simplify a ratio, we find an equivalent fractions. Usually we are trying to find smaller numbers that have the same ratio.

Example: $\frac{12}{20} = \frac{6}{10} = \frac{3}{5}$

Try finding these ratios:

- 1) The ratio of girls in your class to boys =
- 2) The ratio of boys to the whole class =
- 3) The ratio of student musicians to the whole class =
- 4) The ratio of students who would choose movies that at comedies to students who would choose dramas to students who would choose horror =

Introduction to Rates.

A rate is a ratio of 2 quantities having different kinds of units. Examples: miles per hour,
dollars per gallon, dollars per yard.

It is important to place the correct number in the numerator and denominator when figuring out rates.

Example 1: If a car is driven 250 miles in 5 hours, what is the rate (ratio) of distance traveled to time spent traveling the distance?

We know that $d = r \cdot t$ so that $r = \frac{d}{t}$

$$\frac{250 \text{ miles}}{5 \text{ hour}} = 50 \text{ miles per hr.}$$



Example 2: Frank can eat 4 hamburgers in 20 minutes.

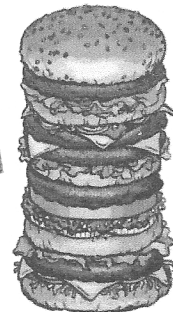
- 1) What is the rate in hamburgers per minute?
- 2) In minutes per hamburger?

$$\frac{4 \text{ hamburgers}}{20 \text{ minutes}} \text{ per}$$

$$\boxed{\frac{1 \text{ hamburger}}{5 \text{ minutes}}}$$

$$\frac{20 \text{ minutes}}{4 \text{ hamburgers}} \text{ per}$$

$$\boxed{\frac{5 \text{ minutes}}{1 \text{ hamburger}}}$$



Introduction to Unit Rates.

A unit rate is a rate that has been simplified so that the denominator is one.

We can compare rates if we use the unit rate of each item we are comparing. This allows us to find the "better buy."

Example 1: A store is having a sale on a package of 24, 12 ounce cans of soda for \$6.99. What is the unit price in cents per ounce?

$$24 \cdot 12 = 288 \text{ oz.}$$

We need to find the total ounces and cents, since the question is asking cents per ounce. Total ounces are $12 \cdot 24 = 288$ oz. Now find the unit price.



$$\frac{\$6.99}{288} \text{ per} = .024$$

$$2.4¢ \text{ per oz.}$$

Example 2: There are 2 brands of cream. Smith's is 79 cents for 12 oz. and Brown's is \$2.69 for a quart (quart = 32 oz.).

Which has the lower unit price? (Both must be in cents per oz.)

Smith's

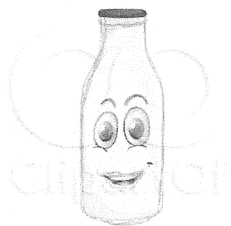
$$\frac{.79}{12 \text{ oz.}} = 0.0658\bar{3}$$

$$6.5¢$$

Brown's

$$\frac{\$2.69}{32 \text{ oz.}} = 0.0840625$$

$$8.4¢$$

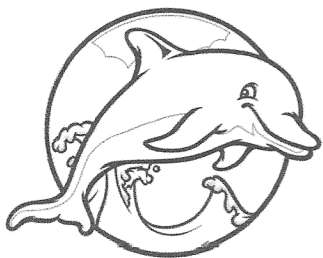


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Smith's is the lower unit price.

Lets practice Unit Rates:

- 1) Dolphins take 34 breathes in 4 hours. How many breathes per hour?



$$\frac{34 \text{ breathes}}{4 \text{ hours}} = \frac{17}{2} = \frac{8.5}{1}$$

8.5 breathes per hour.

- 2) There are 424 calories in 3 servings. How many calories per serving?

$$\frac{424 \text{ cal.}}{3 \text{ ser.}} = 141$$

- 3) The basketball player scored 240 points in 16 games. How many points were scored per game?

$$\frac{240 \text{ points}}{16 \text{ games}} = \frac{15 \text{ points}}{1 \text{ game}}$$

- 4) The recreation center has 7500 sq. ft. of space for 320 children. The local YMCA has 9500 sq. ft. for its 370 child members. Which facility has more square feet of space per child?

$$\text{Rec } \frac{7500 \text{ ft.}}{320} = 23.4375 \text{ ft/child}$$

$$\text{YMCA } \frac{9500}{370} = 25.675 \text{ ft/child}$$



Introduction to Proportions.

A proportion is 2 (or more) ratios set equal to each other.

Example: 2 is to 4 as 1 is to 2

Write as a proportion using fractions:

To check whether 2 ratios are proportional, use Cross products or equivalent fractions.

$$\frac{a}{b} = \frac{c}{d}$$

1) "a" & "d" are the extremes

"b" & "c" are the means

2) Set the 2 fractions = to each other

If the means = the extremes you have a proportion.

3) You can also check to see if the fractions are equivalent.

Equivalent fractions are proportional.

Example: $\frac{6}{14} = \frac{?}{56}$

Solve by finding a factor to make the fractions equivalent.

$$\frac{6}{14} \times \frac{4}{4} = \frac{24}{56}$$

Solve by using cross products (means = extremes)

$$\frac{6}{14} = \frac{x}{56} \quad 14x = 56 \cdot 6 \quad 14x = 336$$

$x = 24$