Slides from Using Rates and Proportions (Tutorial 17)

Using Rates and Proportions

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This handout contains selected slides to use when reviewing this tutorial topic with or without the video. To access all slides, open thumbnail link on the tutorial interface.

Ratio

a comparison of two quantities

Ratios can be written in several ways.

using "to" 3 dogs to 2 cats

fraction form $\frac{3 \text{ dogs}}{2 \text{ cats}}$ or $\frac{3}{2}$

colon form 3 : 2

Each is read as "3 to 2"

Do not read the ratio $\frac{3}{2}$ as "three halves" as it is not a fraction.

Rate

a ratio comparing two different units

Example: **exchange rate**

$4.63 US dollars is equal to £2.50 in British pounds

$ 4.63 to £2.50

speed: 35 mph

35 miles per hour

35 miles traveled to 1 hour

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air pressure: 34 psi

34 pounds per square inch

34 pounds to one square inch

Unit Rate

a rate in which the second term is one

mph and psi are examples of unit rates

Equivalent Ratios

$$\frac{34}{48} = \frac{17}{24} = \frac{51}{72}$$

Equivalent Ratios

$$\frac{\$\ 12}{2\ \text{books}} = \frac{\$\ 6}{1\ \text{book}}$$

unit rate

Odds

the ratio of number of favorable outcomes (successes) to the number of unfavorable outcomes (failures)

Odds

Example: 30% chance of contracting a disease

Odds of contracting the disease:

30 to 70

3 to 7

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Using Ratios to Compare

There are 16 rabbits with white fur in a group of 34 rabbits.

16 rabbits with white fur out of a group of 34 rabbits

part-to-whole

16 white rabbits to 34 total rabbits

16 : 34 $\quad \frac{\text{16 white rabbits}}{\text{34 total rabbits}}$

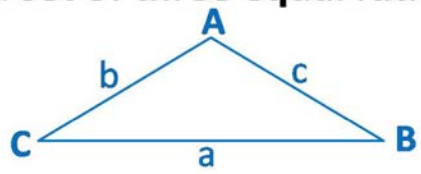
16 rabbits with white fur out of a group of 34 rabbits

part-to-part

16 white to 18 non-white

16 : 18 $\quad \frac{\text{16 white}}{\text{18 non-white}}$

The ***Law of Sines*** can be written as a **set of three equal ratios.**



$$\frac{\text{Sin A}}{a} = \frac{\text{Sin B}}{b} = \frac{\text{Sin C}}{c}$$

Proportion

two equal ratios

3 : 2 = 6 : 4

$$\frac{3}{2} = \frac{6}{4}$$

"3 is to 2 as 6 is to 4"

$$\frac{3}{2} = \frac{6}{4}$$

It is not proper to say three halves equals six fourths

These are not fractions!

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Using Proportions to Solve Problems

Example: Exchange Rate

$4.63 (US dollars) equals £2.50 (British pounds)

How many pounds are exchanged for $100?

$$\frac{\$4.63}{£2.50} = \frac{\$100}{x}$$ two equal ratios comparing dollars to pounds

$$\frac{\$4.63}{£2.50} = \frac{\$100}{x}$$ two equal ratios comparing dollars to pounds

x = number of pounds equal to $100

$$\frac{\$4.63}{£2.50} \cdot £2.50x = \frac{\$100}{x} \cdot £2.50x$$

multiply both sides by $£2.50x$

$$\frac{\$4.63}{£2.50} \cdot \frac{£2.50x}{1} = \frac{\$100}{x} \cdot \frac{£2.50x}{1}$$

$$\frac{\$4.63}{1} \cdot \frac{£2.50x}{£2.50} = \frac{\$100}{1} \cdot \frac{£2.50x}{x}$$

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$$\frac{\$4.63}{£2.50} \cdot \frac{£2.50x}{1} = \frac{\$100}{x} \cdot \frac{£2.50x}{1}$$

$$\frac{\$4.63}{1} \cdot \frac{\cancel{£2.50}x}{\cancel{£2.50}} = \frac{\$100}{1} \cdot \frac{£2.50\cancel{x}}{\cancel{x}}$$

$$4.63x = 100 \cdot 2.50$$

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$$4.63x = 250$$

$$x = \frac{250}{4.63}$$

$$x \approx 53.995678$$

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$$x = \frac{250}{4.63}$$

$$x \approx 53.995678$$

$$x \approx 54 \text{ pounds}$$

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$100 US dollars can be exchanged for approximately £54.00 pounds

Five of every nine people have type O^+ blood.

In a population of 634,000 people, how many would be expected to have type O^+ blood?

$$\frac{5}{9} = \frac{t}{634{,}000}$$

t = people expected to have type O^+

$$9t = 5 \cdot 634{,}000$$

$$t = 352222.2\overline{2}$$

$$t \approx 352{,}222 \text{ people}$$

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$t \approx 352{,}222$

About 352,222 people have type O^+ blood

Direct Variation

$$\frac{y}{x} = \frac{k}{1}$$

Demonstrates a proportional relationship between *x* and *y* and a constant, k, the constant of proportionality

Direct Variation

$$\frac{y}{x} = \frac{k}{1} \longrightarrow y = kx$$

The graph of this equation is a line with slope k passing through the origin.

Summary

- **How to use unit rates**
- **How to set up a ratio**
- **How to set up and solve a proportion**