James Madison
HIGH SCHOOL

Proportions

James Madison HIGH SCHOOL

What are proportions?

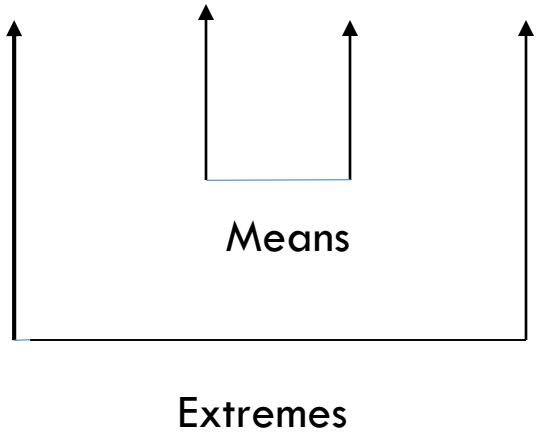
- An equation in which two ratios are equal is called a ***proportion***
- A proportion can be written using colon notation like this
  - a : b :: c : d
- or as the more recognizable (and useable) equivalence of two fractions.
  - $\frac{a}{b} = \frac{c}{d}$

James Madison HIGH SCHOOL

Proportions

- In a proportion the product of the means is equal to product of the extremes.

$$3 : 5 = 6 : 10$$



James Madison HIGH SCHOOL

Proportions

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

Means Extremes

$$6 \times 5 = 3 \times 10$$

$$30 = 30$$

James Madison HIGH SCHOOL

Proportions

Determine if the following are proportions.

1) $\frac{5}{3} = \frac{60}{36}$

2) $\frac{8}{15} = \frac{4}{8}$

James Madison HIGH SCHOOL

Proportions

$$\frac{5}{3} = \frac{60}{36}$$

$3 \times 60 = 5 \times 36$

$180 = 180$

Yes, it is a proportion.

$$\frac{8}{15} = \frac{4}{8}$$

$4 \times 15 = 8 \times 8$

$60 \neq 64$

No, it is not a proportion.

James Madison HIGH SCHOOL

Solving Proportions

- $\frac{4}{y} = \frac{24}{30}$

$4(30) = 24y$

$120 = 24y$

$\frac{120}{24} = \frac{24y}{24}$

$5 = y$

- 1. Cross Multiply
- 2. Solve for the variable.

James Madison HIGH SCHOOL

Solving Proportions

☐ $\frac{10}{y} = \frac{5}{8}$

$8(10) = 5y$

$80 = 5y$

$\frac{80}{5} = \frac{5y}{5}$

$16 = y$

☐1. Cross Multiply

☐2. Solve for the variable

Try one on your own...

- $\frac{3}{y} = \frac{12}{28}$

James Madison HIGH SCHOOL

Try one on your own...

- $\frac{3}{y} = \frac{12}{28}$

$3(28) = 12y$

$84 = 12y$

$\frac{84}{12} = \frac{12y}{12}$

$Y = 7$

James Madison HIGH SCHOOL

And another…

- $\frac{6}{n} = \frac{12}{24}$

James Madison HIGH SCHOOL

And another…

- $\frac{6}{n} = \frac{12}{24}$

$6(24) = 12n$

$144 = 12n$

$\frac{144}{12} = \frac{12n}{12}$

$n = 12$

James Madison HIGH SCHOOL

Proportions

- Recall that a fraction is always used for part-to-whole comparison, but a ratio can be used for
  - part-to-part comparison
  - part-to-whole comparison
  - other comparisons such as length-to-width.

James Madison HIGH SCHOOL

Practical Examples

- *A **proportion** is a statement that two given ratios are equal*

- Practical examples:
  - If a cocktail recipe calls for 1 part of 7-up and 2 parts of orange juice, then you need to use the same ratio (no matter how much of cocktail want) in order to keep the taste consistent.

  - If you are mixing paint to paint your house, you need to keep the ratio (of color pigments to white paint) constant to ensure that the color will remain exactly the same.

James Madison HIGH SCHOOL

Practical Examples

- If city tax rate is $7.75 to every $100 of purchase, then you have to use the same ratio no matter how much your purchase is (because it is the law).

- Why babies can crawl on their knees for a long time?
  - If a baby is only 1/3 of our height, then the pressure on its knees will only be 1/3 of ours, and such small pressure will not cause pain in the knees.

James Madison HIGH SCHOOL

Proportion Word Problems

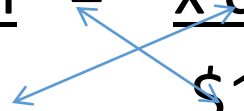
- If you can buy one can of pineapple chunks

for $2 then how many can you buy with $10?

  - First set up a proportion then solve for your variable.
  - Remember proportions are two equivalent ratios set equal to each other.
  - $\frac{1 \text{ can}}{\$2} = \frac{x}{\$10}$

Solving the proportion

- $\frac{1 \text{ can}}{\$2} = \frac{x \text{ cans}}{\$10}$



- $1(10) = 2x$
- $10 = 2x$
- $\frac{10}{2} = \frac{2x}{2}$
- $5 = x$: *You can buy 5 cans with $10.*

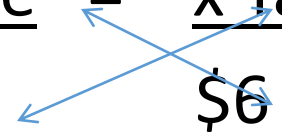
James Madison HIGH SCHOOL

Proportion Word Problems

- Ming was planning a trip to Western Samoa. Before going, she did some research and learned that the exchange rate is 6 Tala for $2. How many Tala would she get if she exchanged $6?
  - First set up a proportion then solve for your variable.
  - Remember proportions are two equivalent ratios set equal to each other.
  - $\frac{6 \text{ Tala}}{\$2} = \frac{x \text{ Tala}}{\$6}$

Solving the proportion

- $\frac{6 \text{ Tale}}{\$2} = \frac{x \text{ Tala}}{\$6}$



- $6(6) = 2x$
- $36 = 2x$
- $\frac{36}{2} = \frac{2x}{2}$
- $18 = x$: *She would get 18 Tala.*