

Ratio – Comparison of two numbers. $a : b$ a to b $\frac{a}{b}$

Proportion – Two equal ratios.

This uses the concepts of equivalent fractions:

$$\frac{a}{b} \cdot \frac{n}{n} = \frac{a \cdot n}{b \cdot n} \quad \text{and} \quad \frac{a}{b} = \frac{c}{d} \quad \text{if and only if} \quad a \cdot d = b \cdot c$$

Proportions can be useful in solving a variety of “everyday” problems. It helps to write words with the ratios to make sure the proportion is setup correctly.

Examples:

Create orange paint by mixing red and yellow paint. The shade of orange will be different depending on the ratio of red and yellow used.

Mental Math: “scale up” – just multiply to make an equivalent fraction.

$$\frac{2 \text{ parts red}}{3 \text{ parts yellow}} = \frac{x \text{ parts red}}{12 \text{ parts yellow}}$$

$$\frac{2}{3} = \frac{x}{12}$$

$$\frac{2}{3} \cdot \frac{4}{4} = \frac{8}{12}$$

In using a **map**: 1 inch = 35 miles

Thus 2 inches = 70 miles or solve $\frac{1}{35} = \frac{4}{x}$

and 4 inches = 140 miles

Unit pricing:

$$\frac{32 \text{ cents}}{8 \text{ ounces}} = \frac{48 \text{ cents}}{12 \text{ ounces}} \quad \text{Are these equal? Yes, they both simplify to } \frac{4 \text{ cents}}{1 \text{ ounce}}$$

Science problem: (Effects of gravity differences on the earth vs. moon.)

A man who weighs 175 pounds on earth would weigh 28 pounds on the moon. How much would his 30 pound dog weigh on the moon?

$$\frac{175 \text{ weight of man on earth}}{28 \text{ weight of man on moon}} = \frac{30 \text{ weight of dog on earth}}{x \text{ weight of dog on moon}}$$

$$\text{Thus } \frac{175}{28} = \frac{30}{x} \quad \text{and}$$

$$175 \cdot x = 28 \cdot 30$$

$$x = \frac{28 \cdot 30}{175} \quad \text{so} \quad x = 4.8 \text{ pounds}$$