Applications: Ratios, Proportions

Ratios and Proportions

A **ratio** is the quotient of two quantities. A ratio can be expressed in various ways.

$\frac{3}{5}$ 3 to 5 3:5

A **proportion** is a statement that two ratios are equal. $\frac{3}{5}=\frac{6}{10}$ or 3 is to 5 as 6 is to 10

Consider how $\frac{6}{10}$ was developed: $\frac{3}{5}\cdot\frac{2}{2}=\frac{6}{10}$ (Remember, $\frac{3}{5}$ and $\frac{6}{10}$ are called equivalent fractions as the value of the fraction does not change when multiplied by the value of 1.) One could rewrite this as: $\frac{3}{5}=\frac{3\cdot 2}{5\cdot 2}$

A proportion is known to be true if the **cross product**, the product of the **extremes** equals the product of the **means**. That is, $\frac{3}{5}=\frac{6}{10}$ or $\frac{3}{5}\cdot\frac{2}{2}=\frac{6}{10}$ or $\frac{3}{5}=\frac{3\cdot 2}{5\cdot 2}$ or $3\cdot 5\cdot 2=5\cdot 3\cdot 2$ or $3 \cdot 10 = 6 \cdot 5$

$extremes = means$

Rule: If $\frac{a}{b}=\frac{c}{d}$, then $ad=bc$ provided that $b\neq 0$ and $d\neq 0$.

Proportion Problems

If 5 feet of rope costs \$2.10, what would 7 feet of rope cost?

This problem can be thought of in two ways:

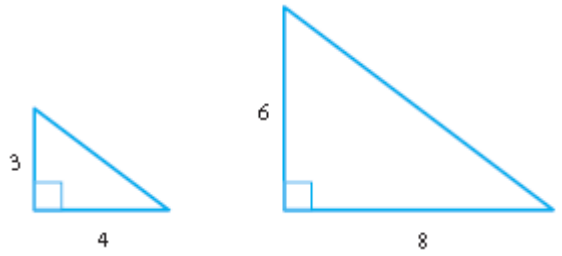
$\frac{5}{7}=\frac{2.10}{x}$ **OR** $\frac{5}{2.10}=\frac{7}{x}$ **Either way,** $5x=7(2.10)$

Seven feet of rope will cost \$2.94.

TRY: If 12 apples cost \$4.80, what would 5 apples cost?

Solve for k in: $\frac{k-4}{5}=\frac{5k-2}{10}$ Recognize a form of linear equation previously seen? $10(k-4)=5(5k-2)$

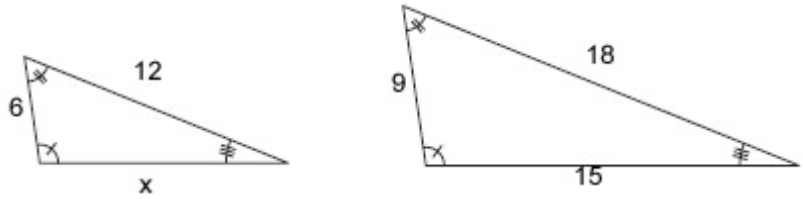
Two right triangles are similar if the ratios of corresponding sides are equivalent.



$\frac{3}{4}=\frac{6}{8}$ or 3 is to 4 as 6 is to 8

$\frac{3}{6}=\frac{4}{8}$ or 3 is to 6 as 4 is to 8

In geometry, if triangles are similar, they are proportional. $\frac{6}{9}=\frac{x}{15}$ $\frac{12}{18}=\frac{x}{15}$ or even $\frac{6}{x}=\frac{9}{15}$



TRY:
Find the length of the unknown side x, given these two similar triangles.