

## Ratios and Proportions

**Ratio** – A comparison of 2 numbers or measures.

Example: Joseph has 2 base drums and 4 snare drums.

2 to 4      2:4       $\frac{2}{4}$       0.5

**Fundraising** Members of the school band are buying pots of tulips and pots of daffodils to sell at their fundraiser. They plan to buy 120 pots of flowers. The ratio  $\frac{\text{number of tulip pots}}{\text{number of daffodil pots}}$  will be  $\frac{2}{3}$ . How many pots of each type of flower should they buy?

Let  $2x =$  the number of tulip pots.

Let  $3x =$  the number of daffodil pots.

$$2x + 3x = 120$$

$$5x = 120$$

$$x = 24$$

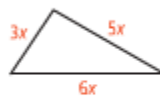
$$2x = 2(24) = 48$$

$$3x = 3(24) = 72$$

The band members should buy 48 tulip pots and 72 daffodil pots.

The lengths of the sides of a triangle are in the extended ratio 3 : 5 : 6. The perimeter of the triangle is 98 in. What is the length of the longest side?

Sketch the triangle. Use the extended ratio to label the sides with expressions for their lengths.



$$3x + 5x + 6x = 98$$

The perimeter is 98 in.

$$14x = 98$$

Simplify.

$$x = 7$$

Divide each side by 14.

The expression that represents the length of the longest side is  $6x$ .  $6(7) = 42$ , so the length of the longest side is 42 in.

**Proportion** – An equation showing that 2 ratios are equal.

Example:

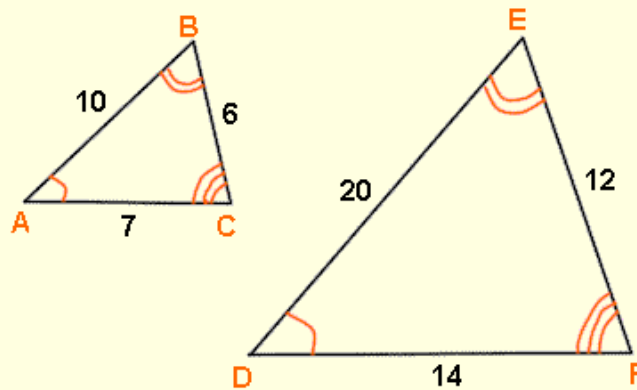
If  $\frac{a}{b} = \frac{c}{d}$ , where  $b \neq 0$  and  $d \neq 0$ , then  $ad = bc$ .

## Solving a proportion

$$\begin{aligned} \frac{6}{x} &= \frac{5}{4} \\ 6(4) &= 5x \\ 24 &= 5x \\ x &= \frac{24}{5} \end{aligned}$$

**Definition:** In mathematics, polygons are **similar** if their corresponding (matching) angles are congruent (equal in measure) and the ratio of their corresponding sides are in proportion.

(This definition allows for congruent figures to also be "similar", where the ratio of the corresponding sides is 1:1.)



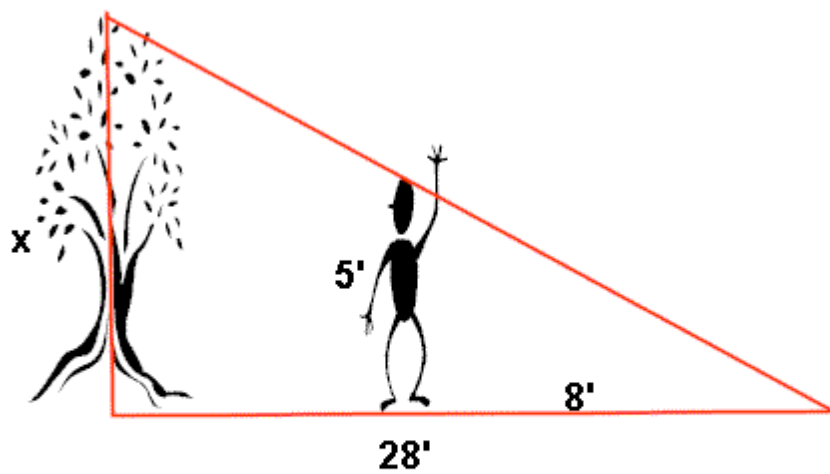
$$\triangle ABC \sim \triangle DEF$$

### Facts about similar triangles:

$\angle A \cong \angle D$	$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$
$\angle B \cong \angle E$	
$\angle C \cong \angle F$	

$$\frac{6}{12} = \frac{7}{14} = \frac{10}{20}$$

- 1 The ratio of the corresponding sides is called the **ratio of similitude** or **scale factor**.
- 2



At a certain time of the day, the shadow of a 5' boy is 8' long. The shadow of a tree at this same time is 28' long. How tall is the tree?

x