

## Section 7.1 - Ratios and Proportions

**Goals:** write and simplify ratios, solve proportions and problems involving proportions, use the properties of proportions

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**Ratio:** a comparison of two quantities by division

Example:  $2/3$  or  $2:3$  or 2 to 3

- numbers in a ratio should be same units
- ratios should be written in simplest form

There are 16 girls and 4 boys in a class. What is the ratio of girls to boys?

$$\frac{16}{4} = \boxed{\frac{4}{1}}$$

A salad plate is 8 inches wide. A dinner plate is 1 ft wide. What is the ratio of the salad plate's width to the dinner plate's width?

$$1 \text{ ft} = 12 \text{ in} \quad \frac{8 \text{ in}}{12 \text{ in}} = \boxed{\frac{2}{3}}$$

## Solving a Problem with Ratios

The horticulture club is planning to sell potted tulips and daffodils as a fundraiser. The plan to buy 120 pots of flowers. The ratio of tulip pots to daffodil pots will be 2/3. How many of each type of flower should they buy?

x is standing for the number that was divided out when the ratio was simplified

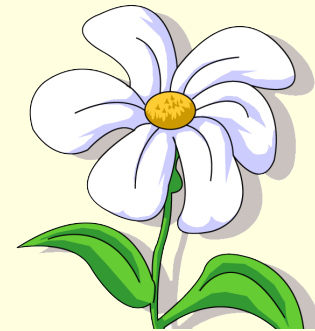
$$2x + 3x = 120$$

$$5x = 120$$

$$x = 24$$

$$\text{Tulips} = 2(24) = 48$$

$$\text{Daffodils} = 3(24) = 72$$



# Extended Ratios

**Extended Ratio:** a ratio that compares 3 or more numbers

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

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

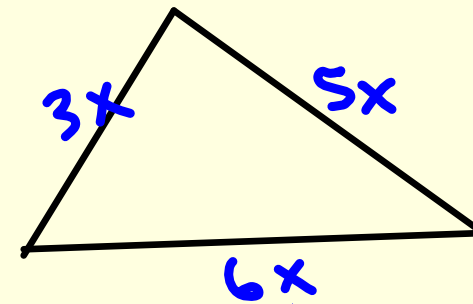
$$14x = 98$$

$$x = 7$$

Sides  $3(7) = 21$

$$5(7) = 35$$

$$6(7) = 42$$



x stands for the number that was divided out when the ratio was simplified

**Proportion:** an equation stating that two ratios are equal

**Example:**  $\frac{a}{b} = \frac{c}{d}$

**Parts of a Proportion**

**Extremes:** the first and last numbers in a proportion

**Means:** the middle two numbers in a proportion

$$\frac{3}{4} = \frac{6}{8}$$

## Cross-Products Property

$$\text{If } \frac{a}{b} = \frac{c}{d}, \text{ then } \underline{a \cdot d = b \cdot c}$$

### Cross-Multiplying

Use the cross-products property to find the value of x.

$$\frac{3}{5} = \frac{x}{75}$$

$$3(75) = 5x$$

$$225 = 5x$$

$$\boxed{45 = x}$$

$$\frac{4}{6} = \frac{x}{18}$$

$$4(18) = 6x$$

$$72 = 6x$$

$$\boxed{12 = x}$$

# Solve by Cross Multiplying

- cross multiply
- use distributive property when one of the means or extremes has two terms

$$\frac{x+1}{x-1} = \frac{3}{4}$$

$$4(x+1) = 3(x-1)$$

$$4x+4 = 3x-3$$

$$x+4 = -3$$

$$x = 1$$

$$\frac{x+1}{3} = \frac{2x-3}{5}$$

$$5(x+1) = 3(2x-3)$$

$$5x+5 = 6x-9$$

$$5 = x-9$$

$$14 = x$$

In your notes...

SOLVE EACH PROPORTION.

$$\frac{9}{2} = \frac{x}{14}$$

$$126 = 2x$$

$$63 = x$$

$$\frac{15}{m+1} = \frac{3}{m}$$

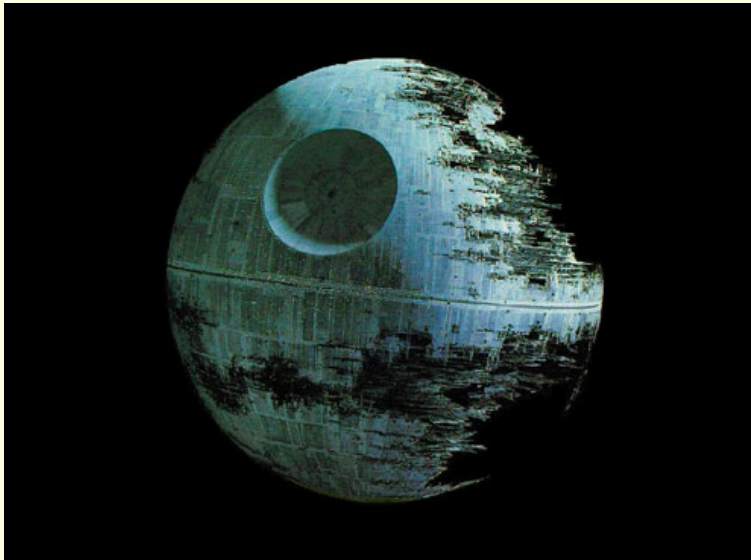
$$3m + 3 = 15m$$

$$3 = 12m$$

$$1/4 = m$$

# Write and Solve a Proportion

When making the movie *Star Wars: Return of the Jedi*, a model was used to film the external scenes of the 2nd Death Star. A life-sized Death Star would have a diameter of 160 km. The model was built using about a 7 cm to 8 km scale. What was the size of the model?



$$\frac{7 \text{ cm}}{8 \text{ km}} = \frac{x}{160 \text{ km}}$$
$$1120 = 8x$$
$$\boxed{140 = x}$$

cm



# Assignment:

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Must show your work!