

# Algebra I

## 3-5

### Solving Proportions

Proportion - Equal ratios.

Means and Extremes Theorem of Proportionality:

Given the following proportion:

$$\frac{a}{b} = \frac{c}{d}$$

extremes  $\swarrow$   $\searrow$  means  
means  $\swarrow$   $\searrow$  extremes

Write 3 equivalent forms of the above proportion:

1)  $\frac{a}{b} = \frac{c}{d} \Rightarrow$  Flip  $\Rightarrow \frac{b}{a} = \frac{d}{c}$

2)  $\frac{a}{b} = \frac{c}{d} \Rightarrow$  Exchange the means  $\Rightarrow \frac{a}{c} = \frac{b}{d}$

3)  $\frac{a}{b} = \frac{c}{d} \Rightarrow$  Exchange the extremes  $\Rightarrow \frac{d}{b} = \frac{c}{a}$

Solve.

1)  $\frac{21}{8x} = \frac{7}{4}$

(Flip the fraction)  $\frac{21}{8x} = \left(\frac{4}{7}\right)$  or (swap means)  $\frac{21}{7} = \frac{8x}{4}$   
 multiply by the common denominator. reduce both sides.

$$\frac{8x}{8} = \frac{12}{8}$$

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

$$\left\{\frac{3}{2}\right\}$$

2)  $\frac{6}{x} = \frac{3}{x-2}$

Flip!  $6\left(\frac{x}{6}\right) = \left(\frac{x-2}{3}\right)6$

$$x = 2(x-2)$$

$$x = 2x - 4$$

$$-x = -4$$

$$x = 4$$

$$\{4\}$$

Solve.

$$3) \frac{4x+5}{2x+7} = \frac{5}{7}$$

Swap Means

$$35 \left( \frac{4x+5}{5} \right) = \left( \frac{2x+7}{7} \right) 35 \quad \leftarrow \text{Common denominator.}$$

$$7(4x+5) = 5(2x+7)$$

$$28x+35 = 10x+35$$

$$\begin{array}{r} 28x+35 = 10x+35 \\ -10x \quad -10x \\ \hline 18x+35 = 35 \\ -35 \quad -35 \\ \hline 18x = 0 \\ \frac{18x}{18} = \frac{0}{18} \\ x = 0 \end{array}$$

$$x = 0$$

$$\{0\}$$

Solve.

$$5) \frac{5}{8} = \frac{1-y}{3+2y}$$

Swap extremes

$$40 \left( \frac{3+2y}{8} \right) = \left( \frac{1-y}{5} \right) 40 \quad \leftarrow \text{Common Denominator.}$$

$$5(3+2y) = 8(1-y)$$

$$15+10y = 8-8y$$

$$\begin{array}{r} 15+10y = 8-8y \\ +8y \quad +8y \\ \hline 15+18y = 8 \\ -15 \quad -15 \\ \hline 18y = -7 \\ \frac{18y}{18} = \frac{-7}{18} \end{array}$$

$$y = -\frac{7}{18}$$

$$\left\{ -\frac{7}{18} \right\}$$

- 6) An architect creates a scale model of a school. The school is 50 ft high.  
The ratio of the model to the actual school is 1 foot to 75 feet. Estimate the height of the model.

Let  $x = \text{model}$

$$\frac{\text{model}}{\text{actual}} = \frac{1 \text{ ft}}{75 \text{ ft}} = \frac{x}{50 \text{ ft}}$$

Swap extremes

$$\frac{50}{75} = \frac{x}{1}$$

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

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

Assignment:

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1, 4-14 even,

15-18,

19-29 odd,

32-43 all