

Ratio and Proportion

Ratios

A ratio is a comparison of two or more quantities.

$$a:b \qquad a \text{ to } b \qquad \frac{a}{b}$$

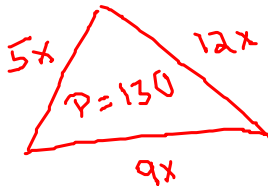
1. There are 75 girls in a junior class of 385 students. Find the ratio of boys to girls.

$$\begin{array}{r} 385 \\ - 75 \\ \hline 310 \text{ boys} \end{array}$$

$$\frac{310}{75} \div 5 = \frac{62}{15}$$

$62:15$
 $62 \text{ to } 15$

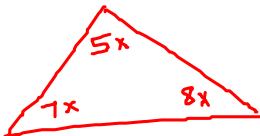
2. In a triangle, the ratio of the measures of three sides is 5:12:9, and its perimeter is 130 inches. Find the length of each side of the triangle.



$$\begin{aligned} 5x + 12x + 9x &= 130 \\ 26x &= 130 \\ \frac{26x}{26} &= \frac{130}{26} \\ x &= 5 \end{aligned}$$

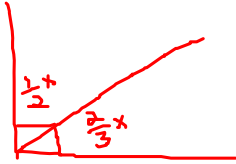
$$\begin{aligned} 5x &= 5(5) = 25 \text{ inches} \\ 12x &= 12(5) = 60 \text{ inches} \\ 9x &= 9(5) = 45 \text{ inches} \end{aligned}$$

3. The ratio of the measure of the angles of a triangle is 7:5:8. Find the measure of each angle.



$$\begin{aligned} 7x + 5x + 8x &= 180 \\ 20x &= 180 \\ \frac{20x}{20} &= \frac{180}{20} \\ x &= 9 \\ 7x &= 7(9) = 63^\circ \\ 5x &= 5(9) = 45^\circ \\ 8x &= 8(9) = 72^\circ \end{aligned}$$

4. The ratio of two complementary angles is $\frac{1}{2} : \frac{2}{3}$. Find the measure of each angle.



$$\frac{1}{2} \cdot \frac{1}{2} x + \frac{2}{3} \cdot \frac{2}{3} x = \frac{90}{1} \cdot \frac{6}{6} \quad \text{LCD} = 6$$

$$\frac{3}{6} x + \frac{4}{6} x = \frac{540}{6}$$

$$3x + 4x = 540$$

$$\frac{7x}{7} = \frac{540}{7}$$

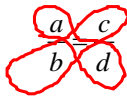
$$x = \frac{540}{7}$$

$$\frac{1}{2} x = \frac{1}{2} \cdot \frac{540}{7} = \frac{270}{7}$$

$$\frac{2}{3} x = \frac{2}{3} \cdot \frac{540}{7} = \frac{360}{7}$$

Proportions

An equal sign in between two fractions is called a proportion.



To solve a proportion, cross-multiply.

$$a \cdot d = c \cdot b$$

extremes means

Step 1: Use cross-multiplication to remove the fractions.

Step 2: Use algebra to solve for the variable.

Directions: Solve each proportion.

5. $\frac{2}{5} = \frac{x}{75}$

$$\frac{5x}{5} = \frac{150}{5}$$

$$x = 30$$

6. $\frac{2y+3}{512} = \frac{5}{4}$

$$4(2y+3) = -60$$

$$8y + 12 = -60$$

$$-12 \quad -12$$

$$\frac{8y}{8} = \frac{-72}{8}$$

$$y = -9$$

$$7. \frac{x+1}{x-1} = \frac{6}{7}$$

$$7(x+1) = 6(x-1)$$

$$7x+7 = 6x-6$$

$$-6x \quad -6x$$

$$x+7 = -6$$

$$-7 \quad -7$$

$$\boxed{x = -13}$$

$$8. \frac{x-2}{2} = \frac{5}{x+1}$$

$$(x-2)(x+1) = 10$$

FOIL

$$x^2 + \underline{1x} - 2x - 2 = 10$$

$$x^2 - 1x - 2 = 10$$

$$-10 \quad -10$$

$$x^2 - 1x - 12 = 0$$

$$\underline{1 \cdot 2}$$

$$\underline{2 \cdot 6}$$

$$\boxed{3 \cdot 4}$$

$$(x+3)(x-4) = 0$$

$$x+3=0$$

$$-3 \quad -3$$

$$\boxed{x = -3}$$

$$x-4=0$$

$$+4 \quad +4$$

$$\boxed{x = 4}$$