Ratios and Proportions

Ratio

- A ratio is a comparison of two quantities using division. A ratio of quantities a and b can be expressed as a to b, a:b, or a/b, where $b \neq 0$.
- Ratios are usually expressed in simplest form.

Examples

- The ratio of football players to high schools in Montgomery County is 546:26. What is the ratio of football players to high schools written as a unit ratio.

$$\frac{546}{26} \div \frac{26}{26} = \frac{21}{1}$$

Examples

- The ratio of football players to high schools in Montgomery County is 546:26. What is the ratio of football players to high schools written as a unit ratio.

- $\frac{number\ of\ football\ players}{number\ of\ high\ schools} = \frac{546}{26}$ or $\frac{21}{1}$

Extended Ratios

- Extended ratios can be used to compare three or more quantities.
- a:b:c means that the ratio of the first two quantities is a:b, the ratio of the last two quantities is b:c, and the ratio of the first and last quantities is a:c.

Examples

- In a triangle, the ratio of the measures of three sides is 4:6:9, and its perimeter is 190 inches. Find the length of the longest side of the triangle.

$4x \quad 6x \quad 9x$

$4x + 6x + 9x = 190$

$\frac{19x}{19} = \frac{190}{19}$

$x = 10$

Examples

- In a triangle, the ratio of the measures of three sides is 4:6:9, and its perimeter is 190 inches. Find the length of the longest side of the triangle.

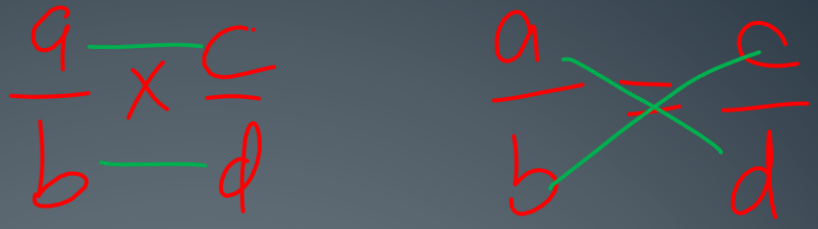
- $4x + 6x + 9x = 190$
- $19x = 190$
- $x = 10$

- $9(10) = 90$ in

Proportions

- A proportion is an equation that says two ratios are equal
- Equivalent fractions set equal to each other form a proportion
- $\frac{2}{3}$ *and* $\frac{6}{9}$ are equivalent fractions, $\frac{2}{3} = \frac{6}{9}$ is a proportion

Proportions



- Every proportion has two cross products.
- The cross products in $\frac{2}{3} = \frac{6}{9}$ are 2 times 9 and 3 times 6.
- The extremes of the proportion are 2 and 9, the means are 3 and 6.

$18 = 18$

extreme → $\frac{a}{b} = \frac{c}{d}$ ← mean

mean → $\frac{a}{b} = \frac{c}{d}$ ← extreme

extremes

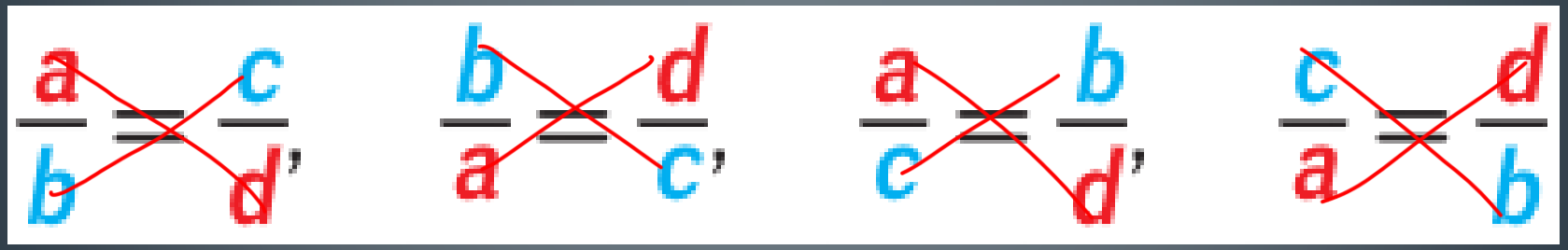
a:b = c:d

means

- Extremes are on the outside, means are on the inside; a:b = c:d
- The product of the means equals the product of the extremes.

Equivalent Proportions

- Proportions will be equivalent as long as they have identical cross products.



Examples

- Solve each proportion.

- $\frac{2}{3} = \frac{6}{9}$

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- $2(9) = 6(3)$
- $18 = 18$

Examples

PEMDAS

- Solve each proportion.

45

- $\frac{3}{5} = \frac{x}{75}$ (×5, ×15)

$\frac{225}{5} = \frac{5x}{5}$

$45 = x$

Examples

- Solve each proportion.

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

- $\frac{3}{5} = \frac{x}{75}$
- $3(75) = 5x$
- $225 = 5x$
- $45 = x$

Examples

- Solve each proportion.

- $\frac{3x-5}{4} = \frac{-13}{2}$

$(3x-5)2 = 4(-13)$

$6x - 10 = -52$

$+10 \quad +10$

$\frac{6x}{6} = \frac{-42}{6}$

$x = -7$

$3x - 5 = -26$

$+5 \quad +5$

$\frac{3x}{3} = \frac{-21}{3}$

$x = -7$

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