

Ratios and Proportions

Objective:

- Remember the Basics – Use common units, review converting
 - Understand and use Ratios
 - Understand and use Extended Ratios
 - Solve proportions (clear fractions)
 - Understand and use Proportion Rules

Ratios and Proportions

Essential Understanding You can write a *ratio* to compare two quantities.

A **ratio** is a comparison of two quantities by division. You can write the ratio of two numbers a and b , where $b \neq 0$, in three ways: $\frac{a}{b}$, $a : b$, and a to b . You usually express a and b in the same unit and write the ratio in simplest form.

$\frac{3}{4}$ or 3:4 or 3 to 4

A Practice Write the ratio of the first measurement to the second measurement.

1. length of a tennis racket: 2 ft 4 in.

length of a table tennis paddle: 10 in.

Be sure to reduce!

*Handy conversions: $1\text{m} = 100\text{ cm}$, $1\text{cm}=100\text{mm}$

Reduce these ratios

$$\frac{30}{15}$$

$$\frac{120}{6}$$

$$\frac{16}{40}$$

$$\frac{10}{25}$$

Problem 2 Dividing a Quantity Into a Given Ratio

Got It? The measures of two supplementary angles are in the ratio 1 : 4. What are the measures of the angles?

- 1) Remember what supplementary means
- 2) Think about what the ratio looked like before it was reduced and rewrite the ratio as $\frac{1x}{4x}$
- 3) $1x$ is the first angle and $4x$ is the second. They add up to 180, so we can write an equation to solve.
- 4) $1x + 4x = 180$
- 5) $5x = 180$, so $x = 36$
- 6) Be sure to plug this result into the problem to get the answers: The first angle is $1(36)$ or 36, and the second angle is $4(36)$ or 144

****Steps 2-6 are the basic steps you will use many times.**



Practice

3. **Baseball** A baseball team played 154 regular season games. The ratio of the number of games they won to the number of games they lost was $\frac{5}{2}$. How many games did they win? How many games did they lose?

Extended Ratios



Practice

5. The lengths of the sides of a triangle are in the extended ratio $6 : 7 : 9$. The perimeter of the triangle is 88 cm. What are the lengths of the sides?

Equivalent Ratios = Proportions

Problem 4 Solving a Proportion

Got It? What is the solution of each proportion?

a. $\frac{9}{2} = \frac{a}{14}$

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

Properties of Proportions

take note

Key Concept Properties of Proportions

a , b , c , and d do not equal zero.

Property

(1) $\frac{a}{b} = \frac{c}{d}$ is equivalent to $\frac{b}{a} = \frac{d}{c}$.

(2) $\frac{a}{b} = \frac{c}{d}$ is equivalent to $\frac{a}{c} = \frac{b}{d}$.

(3) $\frac{a}{b} = \frac{c}{d}$ is equivalent to $\frac{a+b}{b} = \frac{c+d}{d}$.

How to Apply It

Write the reciprocal of each ratio.

$\left(\frac{2}{3} = \frac{4}{6}\right)$ becomes $\frac{3}{2} = \frac{6}{4}$.

Switch the means.

$\frac{2}{3} \swarrow \searrow \frac{4}{6}$ becomes $\frac{2}{4} = \frac{3}{6}$.

In each ratio, add the denominator to the numerator.

$\frac{2}{3} = \frac{4}{6}$ becomes $\frac{2+3}{3} = \frac{4+6}{6}$.

Practice – Solve the following:

$$\frac{5}{4} = \frac{x}{8}$$

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

$$\frac{4}{x} = \frac{7}{3}$$

$$\frac{4}{3x} = \frac{5}{12}$$

One more practice problem: How many small, medium, and large uniforms?

A band director needs to purchase new uniforms. The ratio of small to medium to large uniforms is 3 : 4 : 6.

1. If there are 260 total uniforms to purchase, how many will be small?
2. How many of these uniforms will be medium?
3. How many will be large?

Review

Simplify: $(4b^2)^4$

Change to radical form: $(10k)^{\frac{7}{4}}$

Simplify: $-\frac{2x^{-4}}{3x^{-3}y^0}$

Assignment

Worksheet 10.1

XL10.1