7-1 Ratios and Proportions

Ratio - Comparison of 2 quantities by division.

Example $\frac{a}{b}$ or a:b or a to b

Example 1 - Real-World Connection

A scale model of a car is 4 in. long. The actual car is 15 ft long. What is the ratio of the length of the model to the length of the car?

Write both measurements in the same units.

$$\frac{\text{length of scale model in inches}}{\text{actual length in inches}} = \frac{4\text{ in}}{180\text{ in.}}$$

15 ft. x 12 in

Simplify: $\frac{4}{180} = \frac{1}{45}$ in. 1:45 in 1 to 45 in.

1 model in. = 45 car in.

Proportion - A statement that 2 ratios are equal.

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

Properties of Proportions

$\frac{a}{b} = \frac{c}{d}$ is equivalent to

1) $ad = bc$ (Cross Multiply)

2) $\frac{b}{a} = \frac{d}{c}$ (Reciprocal / flipped)

3) $\frac{a}{c} = \frac{b}{d}$ (switched) [Example 4]

4) $\frac{a+b}{b} = \frac{c+d}{d}$

Example 2 - Properties of Proportions

Complete: If $\frac{n}{m} = \frac{3}{4}$, then:

a) $3m = 4n$ b) $\frac{m}{n} = \frac{4}{3}$ c) $\frac{n}{3} = \frac{m}{4}$ d) $\frac{n+m}{m} = \frac{3+4}{4} = \frac{7}{4}$

Complete: If $\frac{a}{4} = \frac{12}{b}$, then:

a) $ab =$ 48 (12 × 4) b) $\frac{4}{a} = \frac{b}{12}$ c) $\frac{a}{12} = \frac{4}{b}$ d) $\frac{a+4}{4} = \frac{12+b}{b}$

Example 4 – Real-World Connection

Two cities are $3\frac{1}{2}$ (3.5) in. apart on a map with the scale $1\frac{1}{4}$ (1.25) in. = 50mi.

Find the actual distance.

(Write the correct proportion before solving)

Proportion 1

$\frac{3.5 \text{ in.}}{1.25 \text{ in.}} = \frac{x \text{ miles}}{50 \text{ miles}}$

Units in same ratio/fraction.

Scale in same part of fraction

Proportion 2

$\frac{3.5 \text{ in.}}{x \text{ miles}} = \frac{1.25 \text{ in.}}{50 \text{ miles}}$

Units are in same part of fractions.

Scale written as a ratio/fraction.

$\frac{1.25x}{1.25} = \frac{175}{1.25}$

$x = 140$ miles