

Section Overview



Ratios, Rates, and Unit Rates

Lessons 5-1, 5-2

Why? You can use unit rates to express speed and density.

A **rate** is a ratio of two quantities with different units.

$$\frac{66 \text{ mi}}{3 \text{ gal}}$$

A **unit rate** is a rate with a denominator of 1.

$$\frac{22 \text{ mi}}{1 \text{ gal}}, \text{ or } 22 \text{ miles per gallon}$$

Calculating Unit Rates

Judith read 135 pages of her book in 3 hours. How many pages can she read in one hour?

$$\frac{135 \text{ pages}}{3 \text{ hours}} = \frac{135 \text{ pages} \div 3}{3 \text{ hours} \div 3} = \frac{45 \text{ pages}}{1 \text{ hour}}$$

Judith can read 45 pages in 1 hour.

Proportions

Lesson 5-3

Why? Proportions can be used to solve problems involving mixtures, such as mixing cement and sand in a given ratio.

Proportions

A **proportion** is a statement that two ratios are equivalent.

$$\frac{2}{8} = \frac{5}{20} \text{ is a proportion.}$$

$\frac{2}{8}$ and $\frac{5}{20}$ are **proportional** because $\frac{2}{8} = \frac{1}{4}$ and $\frac{5}{20} = \frac{1}{4}$.

In a proportion, **cross products are equal.**

$$\frac{2}{8} = \frac{5}{20}$$

$$2 \times 20 = 8 \times 5 \\ 40 = 40$$

Dimensional Analysis

Lesson 5-4

Why? To convert rates to equivalent rates using different units, use dimensional analysis.

A **conversion factor** is a ratio of equal quantities.

$$\frac{1 \text{ ft}}{12 \text{ in.}}$$

Using Conversion Factors

If a car travels 1800 feet in one minute on a residential street, is it going too fast?

$$\frac{1800 \text{ ft}}{1 \text{ min.}} = \frac{1800 \cancel{\text{ft}}}{1 \cancel{\text{min.}}} \cdot \frac{1 \text{ mi}}{5280 \cancel{\text{ft}}} \cdot \frac{60 \cancel{\text{min}}}{1 \text{ h}} = \frac{1800 \cdot 60 \text{ mi}}{5280 \text{ h}} \approx 20 \text{ mi/h}$$

The car is traveling about 20 miles per hour, which is probably not too fast.