

## Rates

A **rate** is a special ratio that is a comparison of two quantities that have *different* units. A rate is written as a fraction.

A distance runner ran 26 miles in 4 hours. The distance-to-time rate is written:

$$\frac{26 \text{ Miles}}{4 \text{ Hours}} = \frac{13 \text{ Miles}}{2 \text{ hours}}$$

A rate is in **simplest form** when the numbers that form the rate have no common factors. Note that the units are written as part of the rate.

**Example 1:** Write 6 roof supports for every 9 feet as a rate in simplest form:

$$\text{Solution: } \frac{6 \text{ Supports}}{9 \text{ feet}} = \frac{2 \text{ supports}}{3 \text{ feet}}$$

A **unit rate** is a rate in which the number in the denominator is 1.

$$\frac{\$3.25}{1 \text{ Pound}} \text{ or } \$3.25/\text{pound is read } \$3.25 \text{ per pound}$$

To find unit rates, divide the number in the numerator of the rate by the number in the denominator of the rate.

A car traveled 344 miles on 16 gallons of gasoline. To find the miles per gallon (unit rate), divide the numerator of the rate by the denominator of the rate.

$$\frac{344 \text{ miles}}{16 \text{ Gallons}} \text{ is the rate}$$

$$344/16 = 21.5 \text{ miles / gallon is the rate.}$$

The table at the right  
Shows typical air fare  
Costs for long routes

<u>Long Routes</u>	<u>Miles</u>	<u>Fare</u>
New York LA	2475	\$683
San Fran Dallas	1464	\$536
Denver Pittsburgh	1302	\$525
Minneapolis Hartford	1050	\$483

Find the cost per mile for the four routes. Which route is the most expensive, and which is the least expensive, for each mile flown.

**Strategy:** To find the cost per mile, divide the miles flown by the fare for each route. Compare the costs per mile to determine the most expensive and least expensive routes per mile.

$$\text{Solution: New York Los Angeles: } \frac{683}{2475} = 0.28$$

$$\text{San Francisco Dallas } \frac{536}{1464} = 0.37$$

$$\text{Denver Pittsburgh } \frac{525}{1302} = 0.40$$

$$\text{Minneapolis Hartford } \frac{483}{1050} = 0.46$$

The Minneapolis Hartford route is the most expensive per mile, and the New York Los Angeles route is the least expensive per mile.