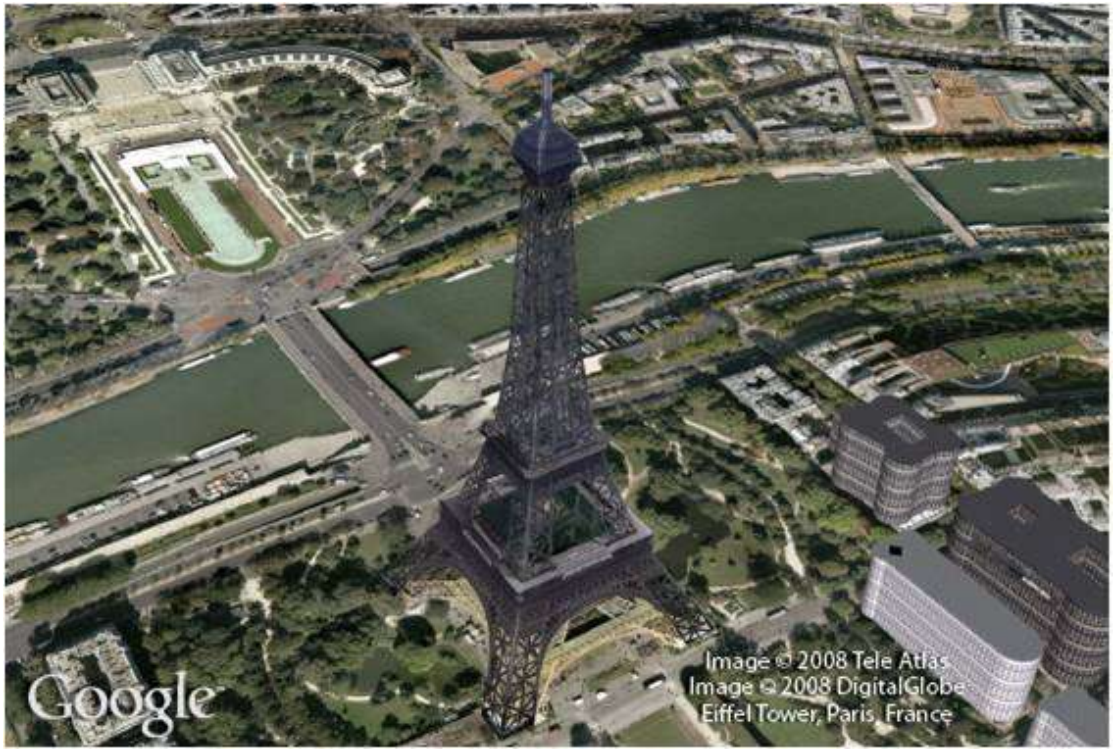
Ratio and Proportion

6



SECTION 6.2

Rates and Unit Pricing

Objectives

A Express rates as ratios.

B Use ratios to write a unit price.

A Rates

Rates

Whenever a ratio compares two quantities that have different units (and neither unit can be converted to the other), then the ratio is called a *rate*.

For example, if we were to travel 120 miles in 3 hours, then our average rate of speed expressed as the ratio of miles to hours would be

$$\frac{120 \text{ miles}}{3 \text{ hours}} = \frac{40 \text{ miles}}{1 \text{ hour}}$$

Divide the numerator and the denominator by 3 to reduce to lowest terms.

Rates

The ratio $\frac{40 \text{ miles}}{1 \text{ hour}}$ can be expressed as

$40 \frac{\text{miles}}{\text{hour}}$ or 40 miles/hour or 40 miles per hour

A rate is expressed in simplest form when the numerical part of the denominator is 1.

To accomplish this we use division.

Example 1

A train travels 125 miles in 2 hours. What is the train's rate in miles per hour?

Solution:

The ratio of miles to hours is

$$\frac{125 \text{ miles}}{2 \text{ hours}} = 62.5 \frac{\text{miles}}{\text{hour}}$$

Divide 125 by 2.

$$= 62.5 \text{ miles per hour}$$

If the train travels 125 miles in 2 hours, then its average rate of speed is 62.5 miles per hour.

B Unit Pricing

Unit Pricing

One kind of rate that is very common is *unit pricing*.

Unit pricing is the ratio of price to quantity when the quantity is one unit.

Suppose a 1-liter bottle of a certain soft drink costs $1.19, whereas a 2-liter bottle of the same drink costs $1.39.

Which is the better buy?

That is, which has the lower price per liter?

Unit Pricing

$$\frac{\$1.19}{1 \text{ liter}} = \$1.19 \text{ per liter}$$

$$\frac{\$1.39}{2 \text{ liters}} = \$0.695 \text{ per liter}$$

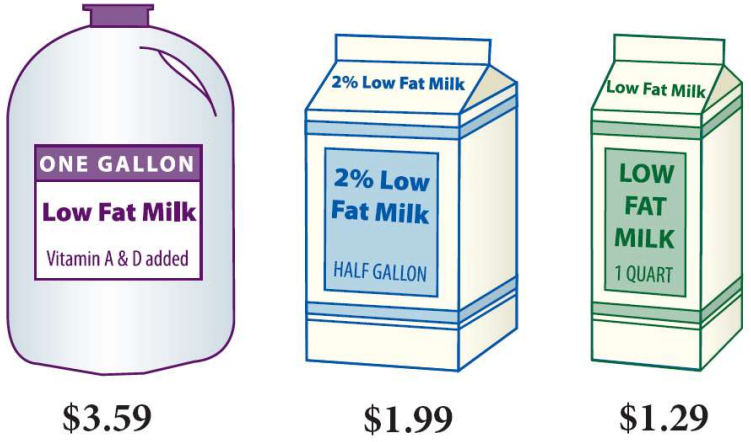
The unit price for the 1-liter bottle is $1.19 per liter, whereas the unit price for the 2-liter bottle is 69.5¢ per liter.

The 2-liter bottle is a better buy.

Example 3

A supermarket sells low-fat milk in three different containers at the following prices:

1 gallon	$3.59
$\frac{1}{2}$ gallon	$1.99
1 quart	$1.29



Give the unit price in dollars per gallon for each one.

Example 3 – *Solution*

Because 1 quart = $\frac{1}{4}$ gallon, we have

1-gallon container $\quad \frac{\$3.59}{1 \text{ gallon}} = \frac{\$3.59}{1 \text{ gallon}} = \$3.59 \text{ per gallon}$

$\frac{1}{2}$-gallon container $\quad \frac{\$1.99}{\frac{1}{2} \text{ gallon}} = \frac{\$1.99}{0.5 \text{ gallon}} = \$3.98 \text{ per gallon}$

1-quart container $\quad \frac{\$1.29}{1 \text{ quart}} = \frac{\$1.29}{0.25 \text{ gallon}} = \$5.16 \text{ per gallon}$

The 1-gallon container has the lowest unit price, whereas the 1-quart container has the highest unit price.