which is 2.70 g/cm^3 at 20°C. Notice also that the plotted line passes through the origin. All directly proportional relationships produce linear graphs that pass through the origin.

Inverse Proportions

Two quantities are **inversely proportional** *to each other if their product is constant*. An example of an inversely proportional relationship is that between speed of travel and the time required to cover a fixed distance. The greater the speed, the less time that is needed to go a certain fixed distance. Doubling the speed cuts the required time in half. Halving the speed doubles the required time.

When two variables, x and y, are inversely proportional to each other, the relationship can be expressed as follows.

$$y \propto \frac{1}{x}$$

This is read "y is *proportional* to 1 divided by x." The general equation for an inversely proportional relationship between the two variables can be written in the following form.

$$xy = k$$

In the equation, k is the proportionality constant. If x increases, y must decrease by the same factor to keep the product constant.

A graph of variables that are inversely proportional produces a curve called a hyperbola. Such a graph is illustrated in **Figure 12.** When the temperature of the gas is kept constant, the volume (V) of the gas sample decreases as the pressure (P) increases. Look at the data shown in **Table 8.** Note that $P \times V$ gives a reasonably constant value. The graph of this data is shown in **Figure 12.**

TABLE 8 ***Pressure-Volume Data for Nitrogen at Constant Temperature***

Pressure (kPa)	Volume (cm^3)	$P \times V$
100	500	50 000
150	333	50 000
200	250	50 000
250	200	50 000
300	166	49 800
350	143	50 100
400	125	50 000
450	110	49 500