1. What is the density of a block of marble that occupies 310 cm³ and has a mass of 853 g?

Answer
2.75 g/cm³

2. Diamond has a density of 3.26 g/cm³. What is the mass of a diamond that has a volume of 0.350 cm³?

Answer
1.14 g

3. What is the volume of a sample of liquid mercury that has a mass of 76.2 g, given that the density of mercury is 13.6 g/mL?

Answer
5.60 mL

Conversion Factors

A **conversion factor** *is a ratio derived from the equality between two different units that can be used to convert from one unit to the other.* For example, suppose you want to know how many quarters there are in a certain number of dollars. To figure out the answer, you need to know how quarters and dollars are related. There are four quarters per dollar and one dollar for every four quarters. Those facts can be expressed as ratios in three conversion factors.

$$\frac{4 \text{ quarters}}{1 \text{ dollar}} = 1 \qquad \frac{1 \text{ dollar}}{4 \text{ quarters}} = 1 \qquad \frac{0.25 \text{ dollar}}{1 \text{ quarter}} = 1$$

Notice that each conversion factor equals 1. That is because the two quantities divided in any conversion factor are equivalent to each other—as in this case, where 4 quarters equal 1 dollar. Because conversion factors are equal to 1, they can be multiplied by other factors in equations without changing the validity of the equations. When you want to use a conversion factor to change a unit in a problem, you can set up the problem in the following way.

quantity sought = quantity given × conversion factor

For example, to determine the number of quarters in 12 dollars, you would carry out the unit conversion that allows you to change from dollars to quarters.

number of quarters = 12 dollars × conversion factor

Next you would have to decide which conversion factor gives you an answer in the desired unit. In this case, you have dollars and you want quarters. To obtain quarters, you must divide the quantity by dollars. Therefore, the conversion factor in this case must have dollars in the denominator. That factor is 4 quarters/1 dollar. Thus, you would set up the calculation as follows.

? quarters = 12 dollars × conversion factor

$$= 12 \text{ dollars} \times \frac{4 \text{ quarters}}{1 \text{ dollar}} = 48 \text{ quarters}$$