Quantity	Unit	Symbol
mass	kilogram	kg
distance	meter	m
time	second	s
charge	coulomb	C

Figure 1.33 Basic SI units.

1×10^3	kilo	1×10^{-3}	milli
1×10^6	mega	1×10^{-6}	micro
1×10^9	giga	1×10^{-9}	nano
1×10^{12}	tera	1×10^{-12}	pico

Figure 1.34 Common metric prefixes.

1.5 SI UNITS

In this book we use the SI (Système Internationale) unit system, as is customary in technical work. The SI unit of mass is the kilogram (kg), the unit of distance is the meter (m), and the unit of time is the second (s) (Figure 1.33). In later chapters we will encounter other SI units, such as the newton (N), which is a unit of force. Many quantities combine SI units (for example, velocity, which has units of m/s).

It is essential to use SI units in physics equations; this may require that you convert from some other unit system to SI units. Common metric prefixes are shown in Figure 1.34. If mass is known in grams, you need to divide by 1000 and use the mass in kilograms. If a distance is given in centimeters, you need to divide by 100 to convert the distance to meters. If the time is measured in minutes, you need to multiply by 60 to use a time in seconds. A convenient way to do such conversions is to multiply by factors that are equal to 1, such as (1 min)/(60 s) or (100 cm)/(1 m). As an example, consider converting 60 miles per hour to SI units, meters per second. Start with the 60 mi/h and multiply by factors of 1:

$$\left(60\frac{\cancel{\text{mi}}}{\cancel{\text{h}}}\right)\left(\frac{1\,\cancel{\text{h}}}{60\,\cancel{\text{min}}}\right)\left(\frac{1\,\cancel{\text{min}}}{60\,\text{s}}\right)\left(\frac{5280\,\cancel{\text{ft}}}{1\,\cancel{\text{mi}}}\right)\left(\frac{12\,\cancel{\text{in}}}{1\,\cancel{\text{ft}}}\right)\left(\frac{2.54\,\cancel{\text{cm}}}{1\,\cancel{\text{in}}}\right)\left(\frac{1\,\text{m}}{100\,\cancel{\text{cm}}}\right)=26.8\frac{\text{m}}{\text{s}}$$

Observe how most of the units cancel, leaving final units of m/s.

Checkpoint 10 A snail moved 80 cm (80 centimeters) in 5 min. What was its average speed in SI units? Write out the factors as was done above.