

## 1.1: Taking Measurements- Numbers and Units

### Learning Objectives

- Express quantities properly, using a number and a unit.

A coffee maker's instructions tell you to fill the coffee pot with 4 cups of water and to use 3 scoops of coffee. When you follow these instructions, you are measuring. When you visit a doctor's office, a nurse checks your temperature, height, weight, and perhaps blood pressure (Figure 1.1.1); the nurse is also measuring.



Figure 1.1.1: Measuring Blood Pressure. A nurse or a doctor measuring a patient's blood pressure is taking a measurement. (GFDL; Pia von Lützu).

Chemists measure the properties of matter and express these measurements as quantities. A quantity is an amount of something and consists of a number and a unit. The number tells us how many (or how much), and the unit tells us what the scale of measurement is. For example, when a distance is reported as "5 kilometers," we know that the quantity has been expressed in units of kilometers and that the number of kilometers is 5. If you ask a friend how far they walk from home to school, and the friend answers "12" without specifying a unit, you do not know whether your friend walks 12 kilometers, 12 miles, 12 furlongs, or 12 yards. *Both a number and a unit must be included to express a quantity properly.*

To understand chemistry, we need a clear understanding of the units chemists work with and the rules they follow for expressing numbers. The next two sections examine the rules for expressing numbers.

### ✓ Example 1.1.1

Identify the number and the unit in each quantity.

- one dozen eggs
- 2.54 centimeters
- a box of pencils
- 88 meters per second

### Solution

- The number is one, and the unit is a dozen eggs.
- The number is 2.54, and the unit is centimeter.
- The number 1 is implied because the quantity is only *a* box. The unit is box of pencils.
- The number is 88, and the unit is meters per second. Note that in this case the unit is actually a combination of two units: meters and seconds.

### Key Take Away

- Identify a quantity properly with a number and a unit.

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