

1.2 Time and Length

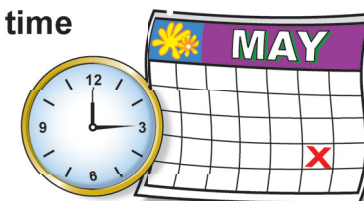
In science we often want to know what happens next based on what happened before. The concepts of *next* and *before* involve time. Time plays an essential role in science. We also need a way to describe the size of things from the tiniest bacteria to the entire solar system. In physical science, size is described by length. This section is about the way scientists measure and communicate information about time and length.

Two meanings for time

What time is it? Time has two important meanings (Figure 1.6). One meaning is to identify a particular moment in the past or in the future. For example, saying your 18th birthday party will be on January 1st, 2010 at 2:00 p.m. identifies a particular moment in the future for your party to start. This is the way “time” is usually used in everyday conversation. You may think of this meaning as *historical time*. If you ask, “What time is it?” you usually want to identify a moment in historical time. To answer the question, you would look at a calendar, clock or your watch.

How much time? The second meaning is to describe a *quantity* of time. For example, saying that a class lasts for 45 minutes is identifying a quantity of time; 45 minutes. If you ask, “How much time?” (did something take to occur, for instance), you are looking for a quantity of time. To answer, you need to measure an interval of time that has both a beginning and an end. For example, you might measure how much time has passed between the start of a race and when the first runner crosses the finish line. A quantity of time is often called a time interval. A microwave oven with a built-in clock (Figure 1.7) displays both kinds of time: historical time and time intervals. In physical science, the word “time” will usually mean a time interval instead of historical time.

What time is it?



3:00 PM (Eastern time) May 21, 2004

How much time?



3:44:25

3 hours, 44 minutes, 25 seconds

Figure 1.6: There are two different ways to understand time.



Figure 1.7: A microwave oven can understand time in either mixed units (minutes and seconds) or in a single unit (seconds). Both 1:30 and 0:90 will result in the same cooking time.