

CHAPTER OVERVIEW

5: Units

The phenomena of Nature have been found to obey certain physical laws; one of the primary goals of physics research is to discover those laws. It has been known for several centuries that the laws of physics are appropriately expressed in the language of *mathematics*, so physics and mathematics have enjoyed a close connection for quite a long time.

In order to connect the physical world to the mathematical world, we need to make *measurements* of the real world. In making a measurement, we compare a physical quantity with some agreed-upon standard, and determine how many such standard units are present. For example, we have a precise definition of a unit of length called a *mile*, and have determined that there are about 92,000,000 such miles between the Earth and the Sun.

It is important that we have very precise definitions of physical units — not only for scientific use, but also for trade and commerce. In practice, we define a few *base units*, and derive other units from combinations of those base units. For example, if we define units for length and time, then we can define a unit for speed as the length divided by time (e.g. miles/hour).

How many base units do we need to define? There is no magic number; in fact it is possible to define a system of units using only *one* base unit (and this is in fact done for so-called *natural units*). For most systems of units, it is convenient to define base units for length, mass, and time; a base electrical unit may also be defined, along with a few lesser-used base units.

[5.1: Systems of Units](#)

[5.2: SI Units](#)

[5.3: Other Systems of Units](#)

[5.4: Units as an Error-Checking Technique](#)

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