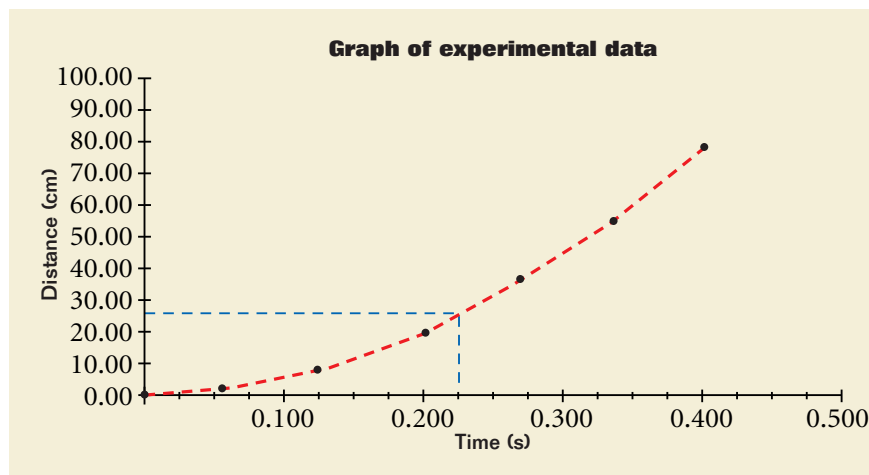


**Figure 14**

The graph of these data provides a convenient way to summarize the data and indicate the relationship between the time an object has been falling and the distance it has fallen.



We can also use the following equation to describe the relationship between the variables in the experiment:

$$(\text{change in position in meters}) = 4.9 \times (\text{time of fall in seconds})^2$$

This equation allows you to reproduce the graph and make predictions about the change in position for any arbitrary time during the fall.

### Physics equations describe relationships

While mathematicians use equations to describe relationships between variables, physicists use the tools of mathematics to describe measured or predicted relationships between physical quantities in a situation. For example, one or more variables may affect the outcome of an experiment. In the case of a prediction, the physical equation is a compact statement based on a model of the situation. It shows how two or more variables are thought to be related. Many of the equations in physics represent a simple description of the relationship between physical quantities.

To make expressions as simple as possible, physicists often use letters to describe specific quantities in an equation. For example, the letter  $v$  is used to denote speed. Sometimes, Greek letters are used to describe mathematical operations. For example, the Greek letter  $\Delta$  (delta) is often used to mean “difference or change in,” and the Greek letter  $\Sigma$  (sigma) is used to mean “sum” or “total.”

With these conventions, the word equation above can be written as follows:

$$\Delta y = 4.9(\Delta t)^2$$

The abbreviation  $\Delta y$  indicates the vertical change in a ball’s position from its starting point, and  $\Delta t$  indicates the time elapsed.

As you saw in Section 2, the units in which these quantities are measured are also often abbreviated with symbols consisting of a letter or two. Most physics books provide some clues to help you keep track of which letters refer to quantities and variables and which letters are used to indicate units. Typically, variables and other specific quantities are abbreviated with letters that are

