

WORKSHEET

1.1 SCIENCE PROCESS SKILLS**Understanding Symbols**

In science, symbols are used to represent many concepts. Symbols make equations easier to work with. For example, it is easier to use the symbols F or v in a problem each time you mean *force* or *velocity*.

But symbols can be confusing, especially if you don't know what they stand for. To make things simpler, scientists use standard symbols to represent certain concepts. Some common symbols are given in **Table 1**.

Table 1 Symbols for Variables

Symbol	What it stands for
d or x	Distance
t	Time
v	Velocity or speed
a	Acceleration
F	Force
m	Mass
λ	Wavelength
f	Frequency

As you can see, many symbols are simply the first letter of the concept they represent. This makes it easier to remember them. In some cases, the Greek alphabet is used. For example, λ is the Greek letter *lambda*.

Variables and Constants

Each symbol in **Table 1** represents a quantity that changes, also known as a *variable*. For example, v can represent any speed: 30 km/h, 5 m/s, or 55 mi/h. Likewise, λ can stand for any wavelength, and so on.

Sometimes, symbols stand for values that do not change, called *constants*. Some constants often used in science are given in **Table 2**, along with the numbers they represent. The symbol π is a Greek letter called *pi*.

Table 2 Symbols for Constants

Symbol	What it stands for	Value
g	Free-fall acceleration	9.8 m/s ²
G	Universal gravitation	$6.7 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$
c	Speed of light in a vacuum	$3.0 \times 10^8 \text{ m/s}$
π	The ratio of the circumference of a circle to its diameter	3.14 (approximately)

How to Use Symbols

After you solve an equation with symbols, substitute the value of each symbol into the equation to find the answer. Remember to include units.

Understanding Symbols, continued

You need to know which symbols stand for constants and which stand for variables. If the symbol represents a constant, you can look up the value of the constant in a table. Usually variable values are given in a problem.

Math Skills

Use $weight = mg$ to find the weight of a 2.5 kg skateboard.

Solution

1. **Rearrange the equation if necessary.** We want to find the weight of the skateboard. Because weight is already alone on one side of the equation, we do not need to rearrange the equation in this case.
2. **Determine which symbols are constants and which are variables. Look up any constants you do not know.** As seen in **Table 1**, the symbol m is a variable that represents mass. In this case, the mass is 2.5 kg. The symbol g , in **Table 2**, represents free-fall acceleration, a constant equal to 9.8 m/s^2 .
3. **Substitute each constant and variable into the equation.**

$$weight = 2.5 \text{ kg} \times 9.8 \text{ m/s}^2$$

4. **Solve the equation to find the answer.** Remember to multiply the units together as well as the numbers.

$$2.5 \text{ kg} \times 9.8 \text{ m/s}^2 = 24.5 \text{ kg} \cdot \text{m/s}^2$$

$$weight = 24.5 \text{ kg} \cdot \text{m/s}^2$$

5. **Round the answer to the correct number of significant figures.** In this case, we must round the answer to the lowest number of significant figures in the multiplication problem, which is 2.

$$weight = 24 \text{ kg} \cdot \text{m/s}^2$$

Practice

1. Use the equation $weight = mg$ to find the weight of a 45 kg child.

2. Find the speed of a caterpillar that crawls a distance of 6.0 cm every 2.0 seconds. The equation for speed is $v = d/t$.

3. The circumference of a circle equals $2\pi r$, where r is the radius. Find the circumference of a compact disc that has a radius of 6.0 cm.
