

**INTEGRATING PHYSICS****● Observing and Experimenting to Find Relationships**

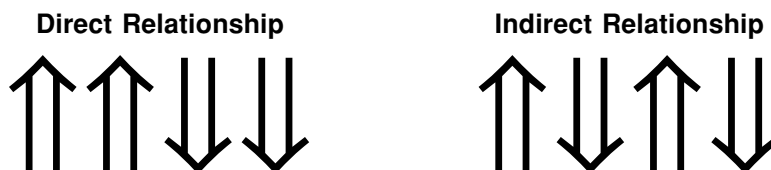
Physicists often carry out experiments to learn what relationships exist between two or more factors. During a typical experiment, physicists change only one factor, called the independent variable. They then measure how each change in the independent variable causes a change in another factor, called the dependent variable.

**Direct Relationships**

Charles's law relates the volume of a gas with the temperature of the gas. This law states that for a given amount of gas at a constant pressure, the volume will increase or decrease directly (in the same manner) with the temperature. In other words, when the temperature goes up, the volume goes up. When the temperature goes down, the volume goes down. This kind of relationship is called a direct relationship.

**Inverse Relationships**

Boyle's law relates the volume of a gas with the pressure of the gas. Boyle's law states that the volume of a gas at a constant temperature varies inversely (in an opposite manner) with the pressure of the gas. In other words, when the pressure goes up, the volume goes down. When the pressure goes down, the volume goes up. This kind of relationship is called an inverse relationship.

**Your Turn to Think**

1. The speed of sound depends on the temperature of the material through which the sound passes. In general, speed increases as temperature increases. The reverse is also true. What kind of relationship exists between sound and the temperature of material?
2. The loudness of a sound depends on the distance between the person hearing it and the source of the sound. As distance increases, loudness decreases. The reverse is also true. What kind of relationship exists between distance from the source and loudness?
3. In a container of liquid, the pressure of the liquid increases as the depth increases. Describe the relationship between the pressure of liquid at any point in a container of liquid and the depth of the point.