

SECTION 2-1

SECTION SUMMARY

The Nature of Force

Guide for Reading

- ◆ How are balanced and unbalanced forces related to motion?
- ◆ What is Newton's first law of motion?

2

A force is a push or a pull. Forces are described not only by how strong they are, but also by the *direction* in which they act. When two forces are exerted in the same direction, they add together. When forces are exerted in opposite directions, a force exerted in one direction is assigned a positive number and a force exerted in the other direction is assigned a negative number. The overall force on an object, called the **net force**, is found by adding the forces together. There can be any number of forces exerted on an object.

When there is a net force acting on an object, the force is said to be unbalanced. An **unbalanced force** can cause an object to start moving, stop moving, or change direction. **An unbalanced force acting on an object will change the object's motion.**

Equal forces acting on an object in opposite directions are called **balanced forces**. **Balanced forces acting on an object will not change the object's motion.** When you add equal forces exerted in opposite directions, the net force is zero.

In the 1600s, the Italian thinker Galileo Galilei stated that, whether in motion or at rest, every object resists any change to its motion. This resistance is called **inertia**. Inertia is the tendency of an object to resist any change in its motion.

The English mathematician Sir Isaac Newton restated Galileo's idea in the first of his three laws of motion. **Newton's first law of motion states that an object at rest will remain at rest. And an object moving at constant speed will continue moving at constant speed unless acted upon by an unbalanced force.** Newton's first law of motion is also called the law of inertia.

Mass is the amount of matter in an object. The SI unit of mass is the kilogram (kg). The mass of smaller objects is described in terms of grams (1 kilogram = 1,000 grams).

The amount of inertia an object has depends on its mass. The greater the mass of an object, the greater its inertia. Mass, then, can also be defined as a measure of the inertia of an object.

SECTION 2-1

REVIEW AND REINFORCE

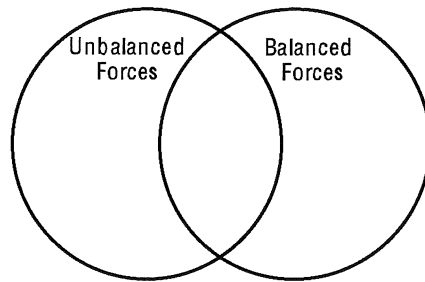
The Nature of Force

◆ Understanding Main Ideas

Write the phrases listed below in the Venn diagram. Write the characteristics shared by unbalanced and balanced forces in the area of overlap.

- | | |
|----------------------------------|-------------------|
| change an object's motion | push or pull |
| do not change an object's motion | have direction |
| net force = 0 | net force not = 0 |

1.



Answer the following question in the space below.

2. Summarize Newton's first law of motion for a younger student. Give an example to show this student how the law works.

◆ Building Vocabulary Skills

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

- | | |
|----------------------------|--|
| _____ 3. inertia | a. amount of matter in an object |
| _____ 4. mass | b. sum of all forces acting on an object |
| _____ 5. force | c. tendency to resist a change in motion |
| _____ 6. unbalanced forces | d. push or pull |
| _____ 7. balanced forces | e. can change an object's motion |
| _____ 8. net force | f. will not change an object's motion |