

**Lesson Outline****LESSON 1****Gravity and Friction****A. Types of Forces**

1. A push or a pull is called a(n) \_\_\_\_\_.
2. A(n) \_\_\_\_\_ is a push or a pull on an object by another object that is touching it.
3. A force that one object can apply to another object without touching it is a(n) \_\_\_\_\_.
4. Gravity, \_\_\_\_\_, and electric forces are examples of noncontact forces.
5. Forces have \_\_\_\_\_ and \_\_\_\_\_.
6. An arrow can be used to show a force; the \_\_\_\_\_ shows the strength of the force, and the direction of the arrow shows the \_\_\_\_\_ of the force.
7. Forces are measured in units called \_\_\_\_\_.

**B. What is gravity?**

1. \_\_\_\_\_ is the amount of matter in an object.
2. \_\_\_\_\_ is an attractive force that exists between all objects that have mass.
3. Mass is often measured in \_\_\_\_\_.
4. According to the law of \_\_\_\_\_, all objects are attracted to one another with a gravitational force that is proportional to the mass of the objects and the distance between them.
  - a. When the mass of one or both objects increases, the gravitational force between the objects \_\_\_\_\_.
  - b. When the distance between two objects increases, the attraction between the objects \_\_\_\_\_.
5. \_\_\_\_\_ is the gravitational force exerted on an object.
  - a. Near Earth's surface, an object's weight is the gravitational force exerted on the object by \_\_\_\_\_.
  - b. The \_\_\_\_\_ of an object on Earth decreases significantly only when the object moves a great distance away from Earth.

## Lesson Outline continued

### C. Friction

1. \_\_\_\_\_ is a force that resists the motion of two surfaces that are touching.
2. \_\_\_\_\_ friction prevents surfaces from sliding past each other.
3. Up to a limit, the \_\_\_\_\_ of static friction changes to match the applied force.
4. \_\_\_\_\_ friction opposes the motion of surfaces sliding past each other.
  - a. When an object is sliding, the force of sliding friction does not \_\_\_\_\_; for this reason, increasing the applied force makes a sliding object move \_\_\_\_\_.
  - b. If you stop pushing a sliding object, the object will eventually \_\_\_\_\_ due to sliding friction.
5. \_\_\_\_\_ is friction between a surface and a fluid, such as air or water.
  - a. Fluid friction between an object and air is called \_\_\_\_\_.
  - b. Decreasing an object's surface area by changing its shape \_\_\_\_\_ the object's air resistance.
6. One reason for friction between surfaces is the \_\_\_\_\_, or the dips and bumps on one surface that catch on those of the other surface.
7. One reason for friction between surfaces is that atoms and molecules with \_\_\_\_\_ charges attract each other.
8. \_\_\_\_\_ decrease friction by causing a slight separation between solid surfaces, so they don't contact each other.