

**Lesson Outline****LESSON 4****Newton's Third Law****A. Opposite Forces**

1. When an object applies a force on another object, the second object applies a force of the same \_\_\_\_\_ on the first object.
2. When an object exerts a force on another object, the second object exerts a force on the first object in the \_\_\_\_\_ direction.

**B. Newton's Third Law of Motion**

1. According to \_\_\_\_\_, when one object applies a force on a second object, the second object applies an equal force in the opposite direction on the first object.
2. Any time a person \_\_\_\_\_ against a stationary object, the object exerts an equal and opposite force on the person.
3. A(n) \_\_\_\_\_ is the forces that two objects apply to each other.
  - a. The forces in a force pair are equal in strength and act in \_\_\_\_\_ directions. They do not cancel each other out because each acts on a different \_\_\_\_\_.
  - b. For every action force, there is a reaction force that is equal in \_\_\_\_\_ but opposite in \_\_\_\_\_ of the action force.

**C. Using Newton's Third Law of Motion**

1. When you push against an object, the force you apply is called the \_\_\_\_\_ force.
2. Newton's third law establishes that the object you push on applies an equal and opposite \_\_\_\_\_ force against you.
3. According to Newton's second law of motion, when the reaction force results in an unbalanced force, there is a(n) \_\_\_\_\_ force, and the object accelerates.

**D. Momentum**

1. \_\_\_\_\_ is a measure of how hard it is to stop a moving object.
2. Momentum is the product of an object's \_\_\_\_\_ and its \_\_\_\_\_.

## Lesson Outline continued

3. According to Newton's second law of motion, the force on an object is equal to the mass of the object multiplied by the acceleration, or the \_\_\_\_\_ in the object's velocity.
4. Because momentum is the product of mass and velocity, the force on an object equals its change in \_\_\_\_\_.

### E. Conservation of Momentum

1. In any collision, one object transfers \_\_\_\_\_ to another object.
2. According to the \_\_\_\_\_, the total momentum of a group of objects remains the same unless outside forces act on the objects.
3. One outside force is \_\_\_\_\_, which decreases the velocities of billiard balls and most other moving objects, and they lose momentum.
4. In a(n) \_\_\_\_\_ collision, the colliding objects bounce off each other.
5. In a(n) \_\_\_\_\_ collision, the colliding objects stick together.
6. In elastic and inelastic collisions, the total \_\_\_\_\_ of all the objects is always the same before and after any collision.