

**Lesson Outline****LESSON 3****Simple Machines****A. What is a simple machine?**

1. A(n) \_\_\_\_\_ is a machine that does work using only one movement.
2. These machines do work in a(n) \_\_\_\_\_ motion.

**B. Levers**

1. A(n) \_\_\_\_\_ is a simple machine made of a bar that pivots or rotates about a fixed point.
2. The point that a lever pivots on is called a(n) \_\_\_\_\_.
3. The distance from the fulcrum to the input force is the \_\_\_\_\_; the distance from the fulcrum to the output force is the \_\_\_\_\_.
4. With a first-class lever, the fulcrum is \_\_\_\_\_ the input force and the output force.
5. With a second-class lever, the \_\_\_\_\_ force is between the \_\_\_\_\_ force and the fulcrum.
6. With a third-class lever, the \_\_\_\_\_ force is between the \_\_\_\_\_ force and the fulcrum.
7. The ideal \_\_\_\_\_ of a lever equals the length of the input arm divided by the length of the output arm.
  - a. The mechanical advantage of a(n) \_\_\_\_\_-class lever can vary, depending on the location of the fulcrum.
  - b. In a second-class lever, the \_\_\_\_\_ arm is always longer than the \_\_\_\_\_ arm.
  - c. In a third-class lever, the \_\_\_\_\_ arm is always shorter than the \_\_\_\_\_ arm.
8. In the human body, \_\_\_\_\_ provide force for the levers.
  - a. The neck is a(n) \_\_\_\_\_-class lever, with the neck muscles providing the \_\_\_\_\_ force.
  - b. The foot is a(n) \_\_\_\_\_-class lever, and the arm is a(n) \_\_\_\_\_-class lever.

**Lesson Outline continued****C. Wheel and Axle**

1. A(n) \_\_\_\_\_ is an axle attached to the center of a wheel and both rotate together.
2. For a wheel and axle, the length of the input arm is the \_\_\_\_\_ of the wheel; the length of the output arm is the \_\_\_\_\_ of the axle.

**D. Inclined Planes**

1. A(n) \_\_\_\_\_ is a flat, sloped surface.
2. The ideal mechanical advantage of an inclined plane is the \_\_\_\_\_ of the inclined plane divided by its \_\_\_\_\_.
3. A sloped surface that moves is called a(n) \_\_\_\_\_.
4. A(n) \_\_\_\_\_ is an inclined plane wrapped around a cylinder.
5. A(n) \_\_\_\_\_ is a simple machine that is a grooved wheel with a rope or cable wrapped around it.
6. A(n) \_\_\_\_\_ pulley only changes the direction of the force.
7. A(n) \_\_\_\_\_ pulley decreases the force but increases the distance over which the force acts.
8. The ideal mechanical advantage of a pulley is equal to the number of \_\_\_\_\_ of rope pulling up on the object.

**E. What is a compound machine?**

1. Two or more simple machines that operate together form a(n) \_\_\_\_\_ machine.
2. A(n) \_\_\_\_\_ is a wheel and axle that has teeth around the wheel.
3. When the teeth of two or more gears \_\_\_\_\_, the turning of one gear makes the other(s) turn.
4. The speed and force of gears is affected by the \_\_\_\_\_ of the gears.
5. The efficiency of a compound machine is determined by \_\_\_\_\_ the efficiency of each component machine together.