

Name \_\_\_\_\_

Date \_\_\_\_\_

# Simple Machines

Use the text to answer each question below.

1. Work is the transfer of energy through motion. Whenever you make something move, you do work. When you pick up a glass of milk, put down a book or carry your backpack, you do work. Work is measured in the unit joules.

The amount of work is equal to force times distance. It can be written with this equation:

$$\text{force (in newtons)} \times \text{distance (in meters)} = \text{work (in joules)}$$

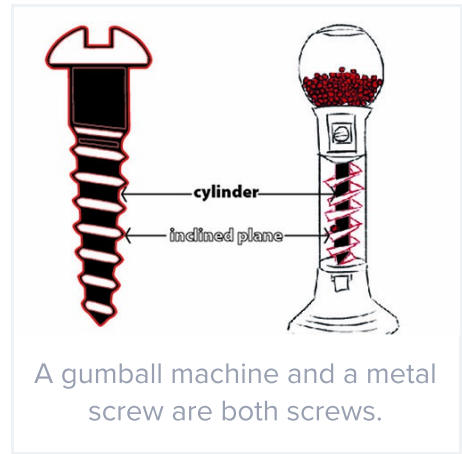
The force is the push or a pull used on an object. It is measured in newtons. The distance is how far the object moves in meters. Carrying a backpack down the hall would be less work than carrying a backpack across the country. That's because the distance the object moves is much shorter. But carrying a backpack down the hall would be more work than carrying a feather down the hall because the force, or effort, used would be greater.

Which of the following is true about work?

- |   |   |
|---|---|
| A. You never do work in your daily life.      | B. It is equal to force times distance.         |
| C. It is measured in the unit called newtons. | D. You can do work without any energy or force. |



4. A screw is an inclined plane wrapped around a cylinder—like a jar lid or light bulb. Screws have two main uses: to lift or move objects and to hold objects together. If you twist a screw through two objects, it holds them in place. There is a tradeoff between distance and force. The tighter the inclined plane is wrapped around the cylinder, the more you'll have to turn the screw. The looser the inclined plane is wrapped around the cylinder, the harder it is to turn, but the less you have to turn it.



A lever is a bar that pivots, moving back and forth, on a point called a fulcrum. Levers lift, move and change the direction of objects. Lifting objects can require less effort depending on where the fulcrum is. Less effort means a longer distance to lift the object. Some examples of levers are catapults, seesaws and your forearm (your elbow is the fulcrum)!

Which of the following must be true if an inclined plane is loosely wrapped around a cylinder on a screw?

- A. The inclined plane is made of a wedge.
- B. There is a longer distance to turn the screw.
- C. The screw requires more force to turn.
- D. You can use the screw without doing work.

5. An axle is a rod that fits through the center of a circular wheel. The axle can attach the wheel to an object. Wheels and axles can work like levers that pivot all the way around. The larger the wheel is, the easier it is to move an object. But larger wheels mean the wheel needs to be turned a greater distance. Wheels and axles may be the easiest to recognize—they're on cars, roller skates and office chairs!

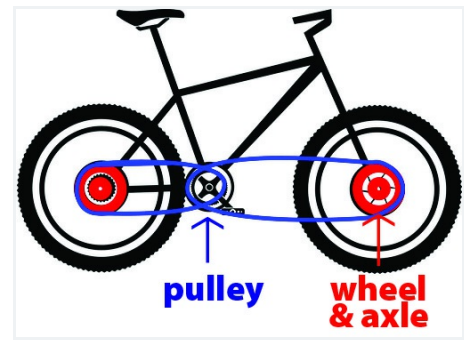


A pulley is made of a wheel with a rope or chain wrapped around it. One end of the rope is attached to an object, you pull down on the other end of the rope to raise the object. Pulleys decrease the force your muscles need to do by allowing you to use your bodyweight and gravity. The more rope you have, the easier it is to lift the object but you need to pull a greater distance. Some common pulleys are flag poles, clothes lines and cranes.

What is the role of gravity in a pulley?

- A. It increases your bodyweight to make moving the object easier.
- B. It makes the rope on the pulley float to lift the object higher.
- C. It pulls the object down to make it feel heavier when moving, increasing the amount of force.
- D. It decreases the amount of force you would use from your muscles without a simple machine.

6. A compound machine is made up of two or more simple machines put together. A compound machine uses the mechanical advantage from all of its simple machines to accomplish a task. A bicycle is a compound machine. It has two wheels and two axles that allow it to roll. The wheels are connected to the pedals with two pulleys. When you push down on the pedals, the pulleys spin the wheels. Scissors are another compound machine. The handles act as levers, and the two blades are wedges that cut through materials.



Which of the following is true about compound machines?

- A. They all have two wheels and two axles to roll.
- B. They have no mechanical advantage.
- C. They are made of more than one simple machine.
- D. They change the amount of work needed to accomplish a task.