

## Newton's First Law of Motion

According to Newton's First Law of Motion, if the net force on an object is zero, it maintains its state of motion. This means an object in motion will remain in motion at the same speed and in the same direction, while an object at rest will remain at rest. People did not always realize this. Since moving objects eventually come to a stop, people thought the natural state for an object was to be at rest. In order to be in motion, people thought an object had to have a force applied to it. This is because they did not know about friction. A force only needs to be applied to keep a moving object in motion in order to overcome friction. Friction is a force that acts to resist sliding between touching surfaces. There are three main types: Static friction – the force that prevents an object at rest from moving when a force is applied; Sliding friction – the force that resists the movement of one surface past another (usually less than static friction); and Rolling friction – friction that results when an object rolls across a surface (usually less than sliding friction). Friction is caused by molecular adhesion, surface roughness, and the plowing effect. Molecular adhesion is a force of attraction between molecules resulting when two materials are brought into close contact with each other. Greater surface roughness increases friction, especially when the materials are rough enough to cause serious abrasion. The plowing effect results when one or more of the materials is relatively soft, and becomes deformed, getting in the way of movement.



**Answer the questions below based on your reading above and your knowledge of Newton's First Law.**

1. What is the net force on an object that is traveling in a straight line at a constant speed of 50 m/s? \_\_\_\_\_
2. Two 5 kg weights are each pushed with a force of 60 N along a horizontal surface. One weight is on ice. The other is on gravel. Which will move further. Why? \_\_\_\_\_  
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3. A force of 30 N east is needed to slide a box at a constant speed.
  - a. What is the force of friction? \_\_\_\_\_
  - b. If the box was not moving to begin with, how does the force needed to make the box move compare to the force needed to slide it at a constant speed? \_\_\_\_\_
4. An asteroid is moving in a straight line through an isolated, empty part of space at 200 km/s. If there are no external forces on it, how long will it continue to travel at this speed? \_\_\_\_\_  
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