

# Forces and Motion

Force can change the state of an object. If an object is stationary, force can get it to move. Once it is moving, force can make the object accelerate or pick up speed. It can also stop a moving object. A stationary object cannot move without force, nor can a moving object stop without force.

## Quick Q's:

### 1. What is net force?

When more than one force acts on an object, the total of all forces acting on that object is called the net force. When more than one force acts on an object in the same direction, the object moves faster. If the forces act in opposing directions, they cancel each other out to a certain extent.

### 2. What is lateral deflection?

It is a force that makes a bullet spin to one side, or a football curl through the air. During the Soccer World Cup in France in 1998, Brazilian Roberto Carlos scored a free kick with a perfect lateral deflection. He kicked the ball to the far right of the defenders and made it suddenly curve round and zoom into the goal.



**Q** Where is force used?

**A** Force is used in all our activities from brushing our teeth to walking, lifting and writing. Every one of our actions requires some force. You need energy to create force. Machines use force to move something or to build something.

**Q** What is inertia?

**A** An object tends to carry on doing the same thing, whether it is at rest or moving, unless a force acts on it to change that. This is called inertia. Your pencil box lies on the table until you push it. This state of rest is called inertia of rest. Then, with the force of your finger, it moves on until it meets another force that stops it. This movement is called inertia of motion. If the force you push the object with is too much, it will go beyond the point where you wanted it to go.

**Q** What is gravitational force?

**A** Gravity is the force that Sir Isaac Newton discovered, as he watched an apple fall off a tree onto the ground. It is a force that draws everything in the Earth's atmosphere and beyond toward the center of the Earth and it keeps us on the ground. Gravity does not just act on the Earth; it is the force of attraction between all bodies (things) in the universe.



### ◀ The science of a kick

The force of the kick makes the ball move. The force used by someone else's foot makes it stop.



### ▲ The discoverer of gravity

Sir Isaac Newton (1643–1727) is supposed to have discovered gravity after seeing an apple fall from a tree.

As bodies get closer together, the force of gravity gets stronger, and as they move apart, gravity gets weaker. Bigger, heavier bodies are affected more by gravitational force. They also exert a greater force of gravity themselves. Gravity holds the solar system together and keeps the Earth close enough to the Sun for us to get the warmth we need.

**Q** How do I stay on a merry-go-round without flying off?

**A** You stay on a merry-go-round because of centripetal force. When you feel you are going to fly off into the air, it is because your body wants to keep moving in the same direction all the time. This feeling is the inertia of motion. But the centripetal force keeps attracting you to the center of the merry-go-round, making sure you stay on board! Objects set in motion normally move in a straight line because of inertia of motion, unless some other force acts upon them and changes their path. When a ball tied to a piece of string is swung round, the centripetal force acts upon the ball, attracting it to the center of the circle. The centripetal force from the string pulls the ball to keep it on its circular path.

**Q** What is the difference between speed and velocity?

**A** Speed is the rate of change of position of an object in a particular direction. If a train is moving in a train that is moving at 60 kilometers per hour, you would say it is moving at 60 kilometers per hour while its velocity is 60 kilometers per hour (37 miles per hour).

**Q** What is friction?

**A** Friction is the force that opposes the movement of an object. It comes into effect when two surfaces are in contact, and for example, a ball on the floor after traveling a distance stops because of friction by the floor acting on the ball. The new shoes probably have grooves or cuts in them to increase friction on an uneven surface.

