

Learning Objectives

- 1) Understand that gravity is a force that pulls all objects together. Like all forces, gravity cannot be seen.
- 2) Realize that the more matter/mass an object has, the more gravity it possesses. The earth has a very large mass; therefore, it possesses a lot of gravity, which pulls all objects close to the earth toward its center. A pencil, on the other hand, has a very small mass and gravity when compared to the earth's. Both the pencil and the earth are pulling on each other with a gravitational force, but the earth is so massive, that the pencil's gravitational force has virtually no effect on the earth. The earth's gravity, however, holds onto the pencil and keeps it from flying off into space.
- 3) Know that an object "feels" a gravitational force from another object that is inversely proportional to the distance between the two objects. The greater the distance between two objects, the less gravity is felt and vice versa.
- 4) Understand the importance of gravity in maintaining the solar system. The sun is much more massive than any of the planets in the solar system; its extremely large gravity pulls on all the planets and keeps them moving in orbit around the sun.
- 5) Realize that the moon's gravity causes changes in the tides. Though the earth's gravity keeps the oceans' waters from escaping into space, the moon's gravity also pulls on the oceans causing them to rise in

some areas and fall in other areas; this is called a tide.

- 6) Understand how mass and weight are related. The more mass an object has, the more gravity pulls on it; and the more gravity pulls on an object, the more weight it has. Though the mass of an object stays the same, the weight of an object will change if there is a change in gravity. An object on the earth, for example, weighs more than the same object on the moon, because the earth has more gravity to pull on the object.

Suggested Activities

- 1) **Objects that defy Gravity?** Challenge your students to find objects that defy gravity. Take this lesson outside. Encourage each student to bring an object (non-breakable) from the classroom or from home that they think won't be affected by gravity. Go outside and test them all. The teacher should bring some lighter objects including a feather or a blown up balloon. On a windy day these objects may float. Encourage the class to think of reasons why these objects fall more slowly, or in some cases, float (Is air resistance, or something else a factor?). Challenge them with questions like, "Birds and airplanes fly, but do they really defy gravity?"
- 2) **The effect gravity has on mass:** The more mass an object has, the stronger the pull of gravity. Divide the class into groups of two. The first partner should hold his arms out straight in front of him with palms facing up.

Have pairs talk about what is holding his arms up, and what would happen if he relaxed his arm muscles. The other student should then stack one or two books on her partner's outstretched arms. Keep adding books until the partner feels his arms being pulled toward the ground. Reverse roles and have the second partner experience the same thing.

Vocabulary

Force — A push or a pull that makes something move

Gravity — A force that pulls objects together

High Tide — When ocean water rises and moves higher on the land

Low Tide — When ocean water falls and moves lower on the land

Mass — A measure of how much matter is in an object

Matter — Anything that takes up space; it is what everything is made of

Orbit — A circular path on which a planet moves around the sun

Weight — A measure of how much gravity is pulling on an object (the force)

