Free Fall

MHS

Objectives

- Use kinematic equations to solve problems for objects moving at a constant acceleration in free fall.

Air Resistance

- If we drop a ball and a sheet of paper, it is obvious they don't fall at the same rate.
- If we could remove all the air from the room, however, we would find that they fall at the same rate.
- We will analyze the motion of the objects by neglecting air resistance (a form of friction) for the time being.

Acceleration Due to Gravity

- Near the surface of Eaarth, objects accelerate downward at a rate of 9.81 $m/s^{2.}$
- We call this acceleration the acceleration due to gravity (g).
- More accurately, it is called the gravitational field strength.
- As you move further away from Earth, g decreases.

Objects Falling From Rest

- Objects starting from rest have an initial velocity (v_i) of 0.
- Since the object's initial motion is down, call down the negative direction.
- Acceleration is -g.

Sample Problem - Falling

- How far will a brick starting from rest fall freely in 3.0 seconds? [Neglect air resistance.]

Objects Launched Upward

- Must examine the motion of the object on the way up and down.
- Since the object's initial motion is up, call up the positive direction.
- Acceleration is –g.
- At highest point, the object has a velocity of 0.
- Symmetry of motion.

Sample Problem

- A ball thrown vertically upward reaches a maximum height of 30 meters above the surface of the Earth. At its maximum height, the speed of the ball is _____.

Sample Problem

- A basketball player jumped straight up to grab a rebound. If she was in the air for 0.80 seconds, how high did she jump?