Name:_____ Regents Physics

Objects Thrown Upward

Rather than an object dropped or thrown downward, some situations involve objects being thrown straight up into the air. The important thing to remember is that these objects are still considered in **free fall** and the acceleration due to gravity on Earth will still be **9.8 m/s^2**.

Important Reminders:

1.) Since we consider acceleration during free fall to be directed towards the center of the Earth (and positive), objects thrown upward (the opposite direction of gravity) will have a **negative** initial velocity. For example, if I toss a tennis ball into the air at 10 m/s, we will list our initial velocity as **-10 m/s**.

2.) Objects will have a velocity of **zero** at their **maximum height**. Using this fact, we are able to find the time that it takes an object to reach its maximum height.

3.) The time it takes an object to reach its maximum height is the **same time** it will take the object to fall back to its original height. To find the total time an object is in the air, simply double the time it takes to reach the maximum height.

4.) Objects will return to an original height with the **same speed** that they left the original height.

For Example:

1.) Erin throws a baseball into the air at 20 m/s.
   a. Determine the time it takes the ball to reach its maximum height.

   b. What is the ball's maximum height?

   c. How long is the baseball's total trip back to Erin's hand? (Assuming she kept it in the same place.)

2.) Dan wants to hit a bird with a water balloon. The bird is flying above Dan at a height of 40 meters. What's the minimum velocity Dan should throw the water balloon in order to hit the bird?

3.) Justin takes out his slingshot and shoots a rock into the air at 35 m/s.

a. What is the **total time** that the rock will be in the air?

b. How high will the rock go?

c. At what velocity will the rock return to where it started from?