Vertical Motion

1. A helicopter is ascending vertically with a speed of 5.50m/s. At a height of 105m above the earth, a package is released from the window. How much time does it take for the package to reach the ground?

2. A stone is thrown upwards with a speed of 12.0m/s from the edge of a 75.0m high cliff. (a) how much later does it reach the ground? (b) what is its speed as it hits the ground? (c) what total **_distance_** did it travel?

3. A stone is thrown upwards with a speed of 20.0m/s (a) How fast is it moving when it reaches a height of 12.0m? (b) How long is required to reach this height? (c) why are there 2 answers to part *b*?

4. Suppose you adjust your garden hose nozzle for a hard stream of water. You point the nozzle vertically upward at a height of 1.5m above the ground. When you quickly move the nozzle away from the vertical, you hear the water striking the ground next to you for another 2.0s. What is the water speed as it leaves the nozzle?

5. Batman is testing the physics ability of Robin. So, Batman takes a toy bat while standing on a 75m cliff. He throws the toy up with a velocity of 15m/s. Find the following:

    a. The time to reach the bottom of the cliff
    b. The velocity at the bottom of the cliff
    c. The time it takes to reach the top of its path
    d. The maximum height above the **ground** the toy reaches

6. Determine which will reach the ground first while standing on a 45m building; **1)** A toy thrown up at 10m/s **2)** A ball dropped 2 seconds later **3)** A sink thrown down at a velocity of 5m/s 2 seconds after the ball.

7. A constructor worker wants to throw a tool up onto a 15m roof. However, there is a 1.5m railing on the edge of the roof.

    a. What velocity must he minimally throw up the tool?
    b. How long does it take to reach the top of its path
    c. How long is it in the air in total
    d. What velocity does it hit the roof?