Fred is playing volleyball by himself by hitting the ball over the net, running to the other side, hitting it back, and so on. If he must run 10 m every time at a constant speed of 1 m/s, what is the minimum vertical speed the ball must have after Fred hits it? How high above its initial position is the ball as Fred runs past the net? What is the average vertical velocity of the ball during this time? If Fred were to run twice as fast, what would be the effect on the ball’s minimum speed after impact?

**49.05 m/s, 122.625 m**

If two balls are thrown upward with different velocities—one faster than the other—which one will hit the ground first?

A ball slides with an acceleration given by a(t) = -3t. If the ball’s velocity at t = 10 s is 5 m/s, what is the velocity at t = 5 s? If the ball’s position at t = 2 s is 1 m, what is its position at t = 3 s?

**117.5 m/s, -8.5 m**

A ball is dropped from a helicopter hovering at 100 m off the ground. Ignore air resistance. How many seconds later does it hit the ground? What is the average speed of the ball as it falls?

**4.52 s, 22.1 m/s**

A flowerpot falls off a windowsill and falls past the window below. You may ignore air resistance. It takes the pot 0.420 seconds to pass this window, which is 1.90m high. How far is the top of the window below the windowsill from which the flowerpot fell?

**.309 m**



