

Launched Things

1. In a movie stunt, a motorcyclist is trying to jump from one building to another without the use of a ramp. The first building is 5 meters taller than the second building. Assuming that she can get her motorcycle up to 20 m/s immediately before the jump, what is the longest horizontal separation between buildings for which she can be successful?
2. Shaik, the human cannonball is launched from the ground with a velocity that has an x-component of 10 m/s. He lands softly 40 meters from the launch point in the safety net.
 - a. What was his initial vertical velocity?
 - b. Sketch Shaik's path. For each second, show the x and y components of velocity and acceleration. (This is a 2-d motion diagram.)
3. Lev kicks a soccer ball towards the goal from 15 meters away. The initial velocity of the ball is 25 m/s at 15 degrees above the ground.
 - a. How long does the goalkeeper have to react and move to the ball?
 - b. How high above the ground will the ball be when it passes the goalkeeper?
4. Many guns can fire a bullet with an initial speed of 400 m/s.
 - a. How high would the bullet go if it is fired directly up in the air?
 - b. How fast would the bullet be traveling when it reaches the ground?
 - c. How far could the bullet travel horizontally if the gun is fired at 45° above the horizontal?
 - d. How high would the bullet travel to its highest point if fired at 45° ?
 - e. What is the speed of the bullet at the top of its path if fired at 45° ?
5. Kirk throws a baseball 25 meters horizontally to Katie. He releases the ball with a speed of 30 m/s at an angle of 7 degrees above the horizontal.
 - a. What are the initial horizontal and vertical velocities of the ball?
 - b. How long is the ball in the air?
 - c. Where is the ball compared to the release height when it is caught?
 - d. What was the final velocity vector of the ball?
6. A golfer hits a 7 iron to a green (platform) that is 10.0 meters above and 130 meters horizontally away from the launch position. The initial direction of the ball is 40 degrees above the horizontal.
 - a. What is the initial velocity of the ball?
 - b. What is the "flat" distance for the shot? (How far horizontally would the ball have traveled if it had returned to the launch height?)