

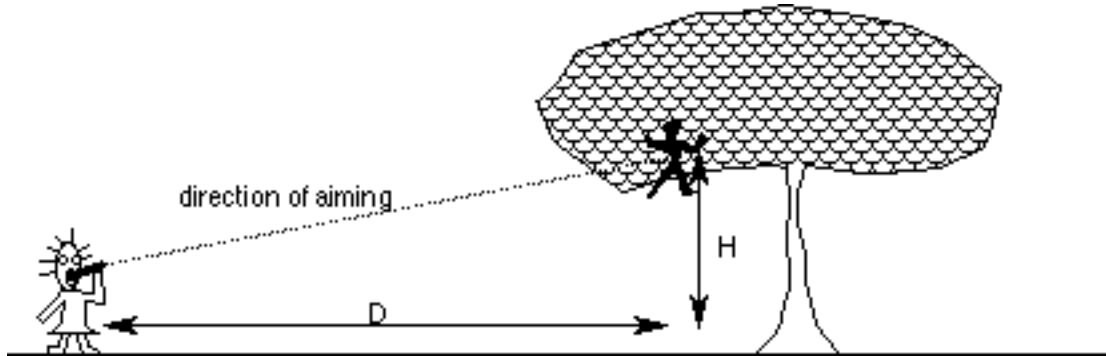
WHITEBOARD SET 10

For your solutions to these problems, show the force diagram for the object of interest in each problem, and sketch a motion map, including acceleration, for the entire trajectory of the object in question. Also show the general mathematical relationships you may use in your solutions in algebraic form (no numbers substituted, just letters) before putting any numbers into them. We will neglect any air resistance.

1. A girl runs at a speed of 3.9 m/s off a high dive and hits the water 1.8 seconds later.
 - a. How high was the diving board?
 - b. How far horizontally was she from the board when she hit the water?
 - c. How long would it have taken her to hit the water if she had simply stepped off the board with no significant horizontal velocity, less time, more time, or the same amount of time?
2. A rock is thrown horizontally from a building at 15 m/s. It hits the ground 45 m from the base of the building. Just how high was this building?
3. A football is kicked from ground level at a speed of 20 m/s at an angle of 42° .
 - a. How long does it take to hit the ground?
 - b. How far from does it land from where it was kicked?
4. The crossbar of a football goalpost is about 3.5 m above the ground. A fieldgoal kicker kicks a football with a speed of 20 m/s toward the goalpost at an angle of 37° above the horizontal. He is 32 m away from the goalpost. Is the attempt good? If not, by how much does he miss? If so, by how much does the football clear the crossbar?
5. In track and field a shotputter puts the shot with a velocity of 10 m/s at an angle of 37° . The height of release was 2.0 m. The mass of the shot at the high school level is 7.27 kg. Find the distance traveled by the shot in this effort.

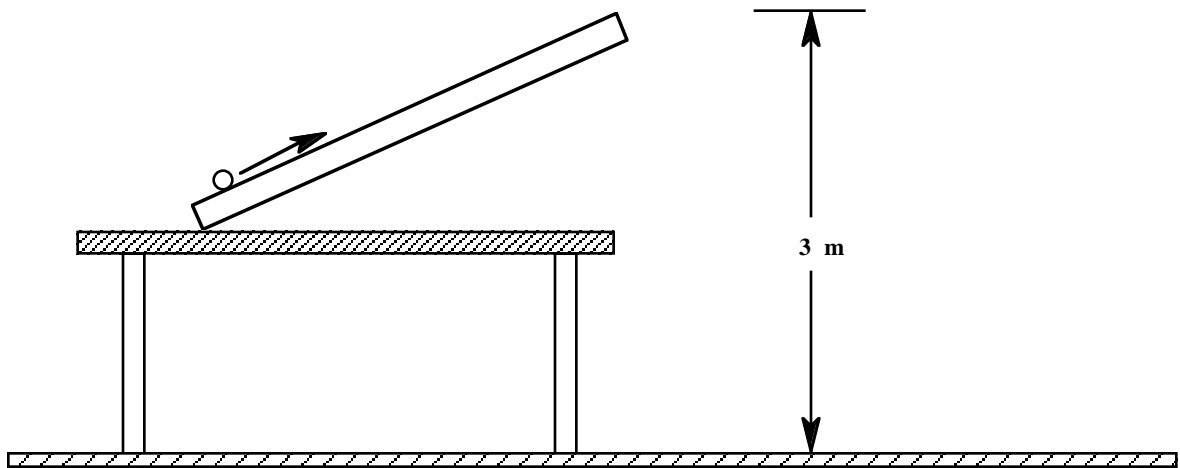
THE MONKEY AND THE HUNTER

A monkey is hanging from a limb high up in the canopy of a rain forest. Call the height of the monkey above the ground H . A hunter with a tranquilizing dart in a blow gun aims directly at the monkey. The horizontal distance from the hunter to the tree we shall call D . At the exact moment that the hunter blows the dart out of the gun the monkey sees it and lets go of the branch. Find out where the monkey and the dart are at the moment the dart reaches the tree, i.e. after it has covered the horizontal distance D .



UP THE RAMP AND AWAY

A ball is rolled up a 30° incline that is 2.0 m long with an initial speed of 10.0 m/s . The magnitude of the acceleration of the ball while on the incline is 6.00 m/s^2 .



1. Sketch a motion map for the entire path of the ball.
2. Sketch a force diagram for the ball for each of the two segments of its entire trajectory.
3. Determine the range (i.e. the horizontal displacement) of the ball from the moment it leaves the incline.

