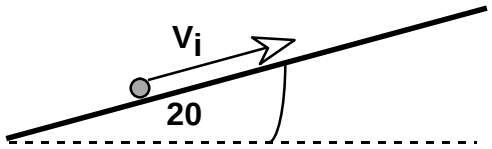
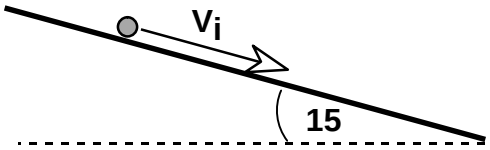
(These next 2 are a little tougher!)

7. Suppose a metal sphere is launched up a ramp with V_i = 1.5 m/s. The end of the ramp is 1.20 m above the floor. Calculate the range of the sphere.



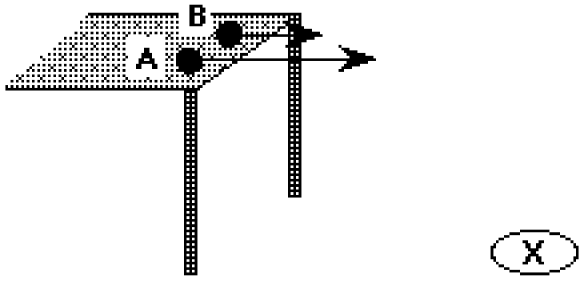
8. Now suppose that the ramp is tilted downwards as shown below.



Suppose that the sphere leaves the ramp at 1.5 m/s. The bottom of the ramp is 0.90 m above the floor. Calculate the range of the sphere.

Review

Questions 1 and 2 refer to the situation and diagram described below.



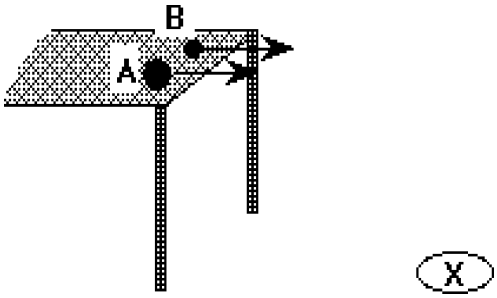
Two spheres **of equal mass**, A and B, are projected off the edge of a 2.0 m bench.

Sphere A has a horizontal velocity of 5.0 m/s and sphere B has a horizontal velocity of 2.5 m/s.

__ 1. If both spheres leave the edge of the table at the same instant, sphere A will land
   a. at some time before sphere B.
   b. at some time after sphere B.
   c. at the same time as sphere B.
   d. There is not enough information to decide.

__ 2. If both spheres leave the edge of the table at the same instant, sphere A hits the floor at the spot marked X. Sphere B will hit the floor
   a. at some point between the edge of the table and X.
   b. at the same distance from the table as X.
   c. at some point past X.
   d. There is not enough information to decide.

Questions 3 & 4 refer to the diagram and situation below:



Two spheres A & B are projected off the edge of a 2.0 m high table with the **same horizontal velocity.** Sphere A has a mass of 10. g and sphere B has a mass of 5 g.

__ 3 If both spheres leave the edge of the table at the same instant, sphere A will land
   a. at some time before sphere B.
   b. at some time after sphere B.
   c. at the same time as sphere B.
   d. There is not enough information to decide.

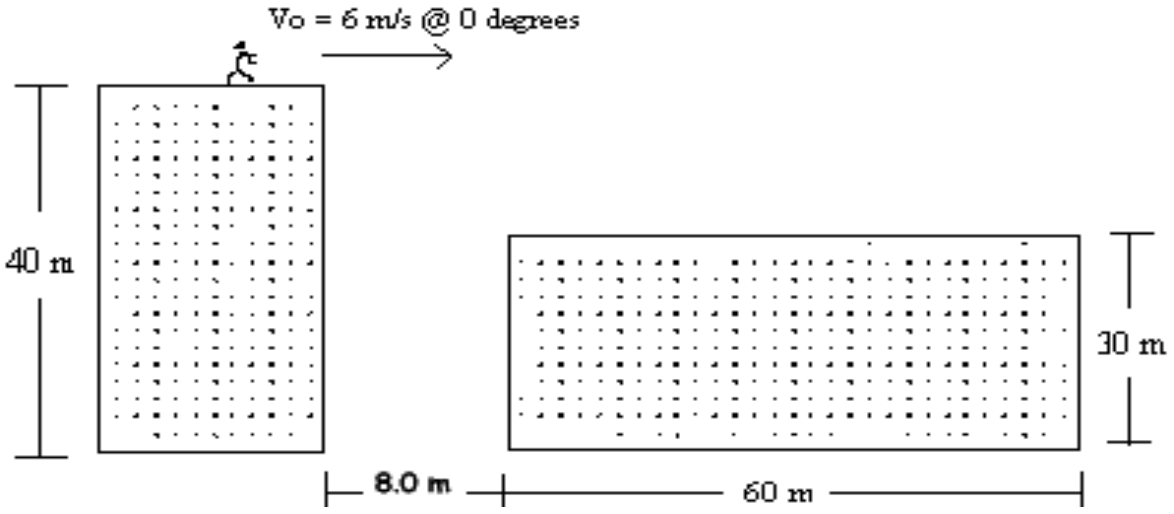
__4. If both spheres leave the edge of the table at the same instant, sphere A hits the floor at the spot marked X. Sphere B will hit the floor

a. at some point between the edge of the table and X.
b. at the same distance from the table as X.
c. at some point past X.
d. There is not enough information to decide.

5. Nike ® is doing a commercial with professional tennis players Roger Federer and Serena Williams. The commercial calls for the two of them to be playing tennis on the roof of a 40 m tall building. Serena's supposed to hit a top spin lob and Roger is to chase it and run right off the roof without jumping. Roger's initial velocity will be 6.0 m/s horizontally and he will land on a 30 m tall building 8.0 m away and keep running. You are the physics adviser for the two tennis players. Roger comes to you and says "Will I make the jump?"

What do you say?

A. Predict whether Roger makes the jump. Write out a full solution.
B. Draw Displacement, Velocity and Acceleration Graphs for both "x" and "y" directions.



6. Alice Springs, an Olympic high jumper, accelerates towards the high jumper's bar during a practice run in Sydney, Australia. She jumps with an initial velocity of 6.8 m/s at an angle of 60^{o} above the horizontal. Assume her total vertical displacement is zero.

A. What is the high jumpers total time in flight?
B. What is the maximum height the high jumper reaches?
C. What is the range of the high jumper?
D. What is the high jumper's velocity at the apex?
E. What is the acceleration of the high jumper 0.05 s before the apex?
F. What is the final velocity of the high jumper just before hitting the pad?
G. Draw Displacement, Velocity and Acceleration graphs of her 2D motion.

7. An archer stands ready to shoot his arrow at a target 40.0 meters away. The initial height of the arrow and the target is 5.9 meters above the ground and the arrow is aimed horizontally straight at the center of the bull's-eye.

A. If the initial speed of the arrow is 40 m/s, how far below the center of the bull's-eye does the arrow land?
B. Draw Displacement, Velocity and Acceleration graphs of the arrow's 2D motion.

8. A child chucks a rock through a window that is located on a wall 3 meters away from her. If she threw the rock at an initial velocity of 12 m/s at 40^{o}, how high is the window located above the ground?

9. An Alaskan rescue plane needs to drop a package of emergency rations to a stranded party of explorers. The explorers are 350 m below and 600 m ahead of the point at which the plane drops the package.

A. Predict the speed of the plane in order for the package to land on the explorer's camp.
B. Predict the final velocity of the package just before it hits the ground.