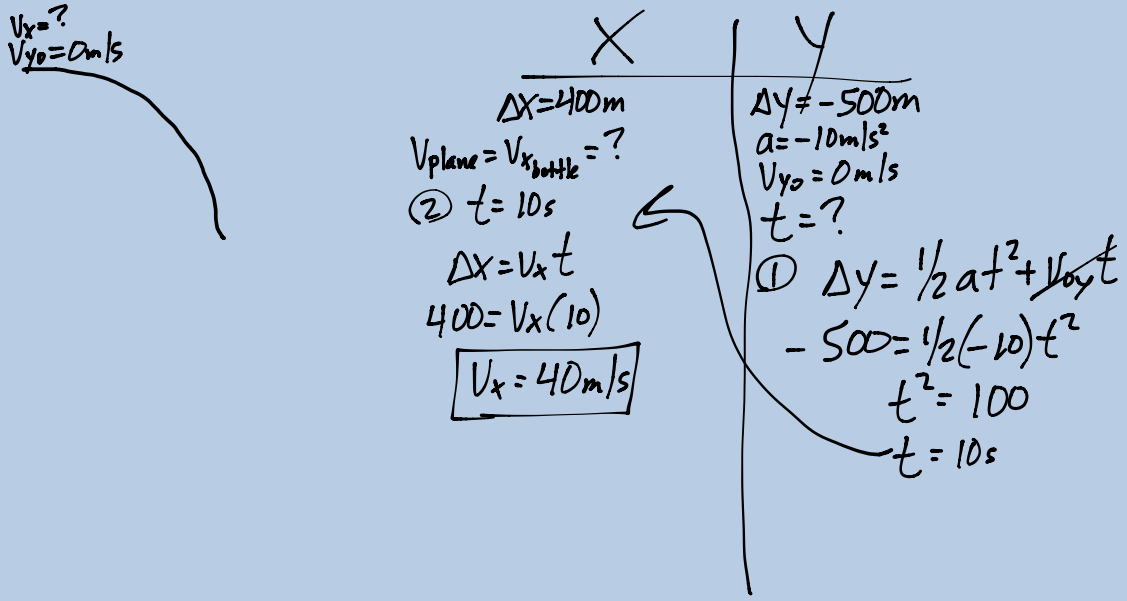
Unit 2 Worksheet 2: Projectile Motion Problems

In all the problems below, identify the knowns and unknowns using an x & y chart as done in class. All work should be completed in the chart on the correct side.

1. The movie "The Gods Must Be Crazy" begins with a pilot dropping a bottle out of an airplane. It is recovered by a surprised native below, who thinks it is a message from the gods. If the plane from which the bottle was dropped was flying at a height of 500m, and the bottle lands 400m horizontally from the initial dropping point, how fast was the plane flying when the bottle was released?



2. Suppose that an airplane flying 60 m/s, at a height of 300m, dropped a sack of flour. How far, horizontally, from the point of release would the sack have traveled when it struck the ground?

3. In many locations, old abandoned stone quarries have become filled with water once excavating has been completed. While standing on a quarry wall, a boy tosses a ball into the water below. If he throws the ball horizontally with a velocity of 3.0 m/s, and it strikes the water 4.5 m away, how high above the water is the wall?

4. Tad drops a cherry pit out the car window 1.0 m above the ground while traveling down the road at 18 m/s. How far, horizontally, from the initial dropping point will the pit hit the ground (assume no air resistance)? If the car continues to travel at the same speed, where will the car be in relation to the pit when it lands?

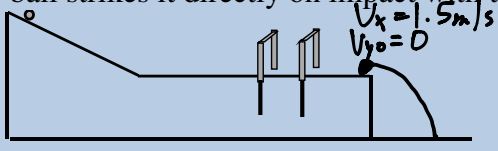
X	Y
$V_x = 18 m/s$	$\Delta y = -1.0 m$
$\Delta x = ?$	$a = -10 m/s^2$
	$V_{y0} = 0 m/s$
	① $t = ?$

5. A student finds that it takes 0.20s for a ball to pass through photogates placed 30 cm apart on a level ramp. The end of the ramp is 92 cm above the floor.
Where should a coin be placed so that the ball strikes it directly on impact with the ground?

① $\Delta x_{table} = v_{x\,table}(t_{table})$

$.3 = v_{x\,table}(.2)$

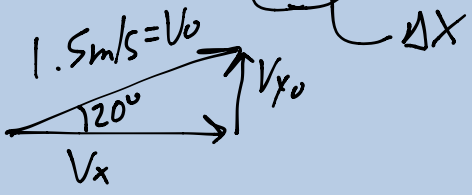
$v_{x\,table} = 1.5 m/s = v_{x\,ball}$



②	
$V_x = 1.5 m/s$	$V_{y0} = 0 m/s$
$\Delta x = ?$	$a = -10 m/s^2$
	$\Delta y = -.92 m$

6. Suppose now that the same ball, released from the same ramp (92 cm high) struck a coin placed 25 cm from the end of the ramp.
   a) What was the ball's horizontal velocity?
   b) How long did it take for the ball to pass through the photogates?

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.

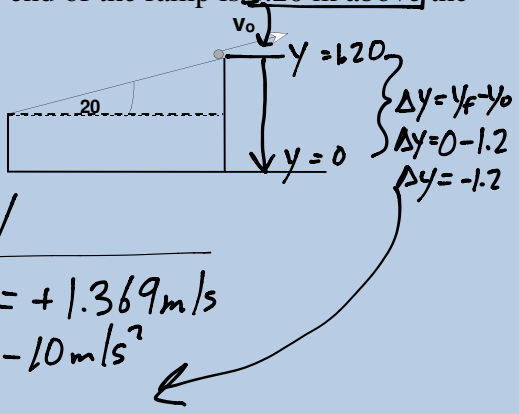


$1.5\cos 20^\circ = V_x$

$V_x = 0.612\ m/s$

$1.5\sin 20^\circ = V_{y0}$

$V_{y0} = 1.369\ m/s$



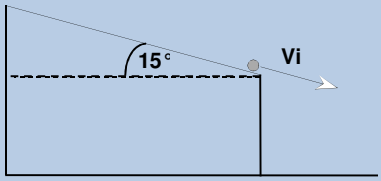
X | Y

$V_x = .612\ m/s$

$V_{y0} = +1.369\ m/s$

$a = -10\ m/s^2$

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.