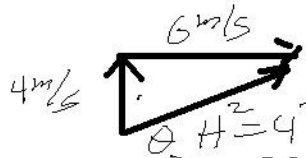
10. A person can swim 4 m/s. The river has a current flowing 6 m/s directly east.
    A. What will be the direction and velocity of the person if they aim directly across the river (north)?



θ = $H^2 = 4^2 + 6^2$
7.2 m/s at 33.7° OR 56.3° west of North

   B. If the person swims at constant speed, how long does it take them to swim across the 40 m wide river?

$40/4 = 10$ sec

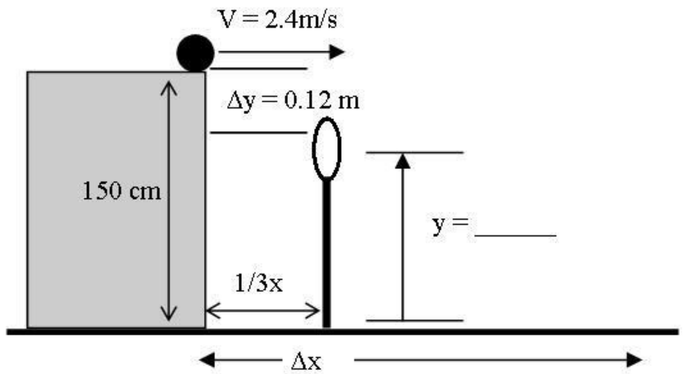
   C. If the river's current increases (gets faster), will the person take more or less time to cross the river?

Same time – x-dir. is indep. of y-dir.

11. Use the diagram at the right for the following:
    A. When you calculate Δy, this tells you what?
    how far away from initial pos.

    B. A person calculates Δy as 0.12 m. What is the position of the hoop (what is y)? 1.38 m or 138 cm

In this case it would have been easier in this case to substitute $\Delta y = y_f - y_i$. Then you would have solved for the final position of the hoop instead of Δy.



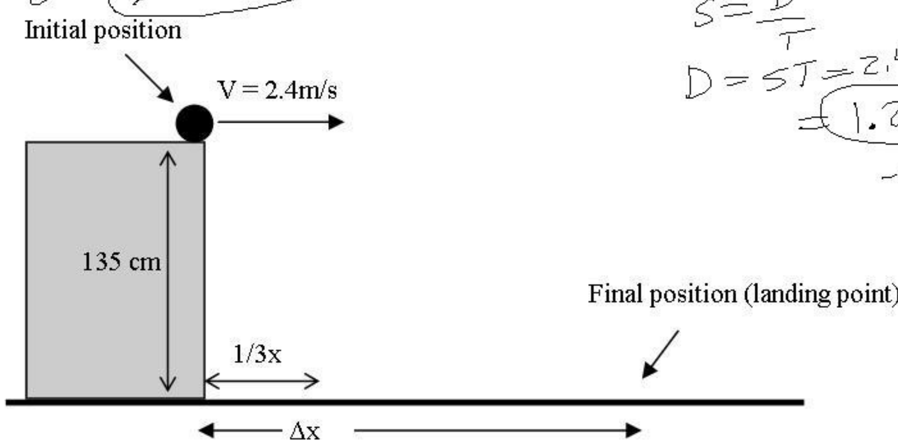
The following questions will teach you how to calculate your hoop positions for the "Shoot the Hoops" lab. Come in for help if you don't get this. But please fight thru it first.

12. A small metal ball is launched from a projectile launcher from the top of a 135 cm tall table. The ball is launched 2.4 m/s horizontally and will pass thru 2 hoops.
    A. Calculate the range of the ball (find Δx).

y-dir.
$a = -9.8$
$v_i = 0$ m/s
$t =$ ____
$\Delta y = -1.35$ m

$\Delta y = (v_i t) + (\frac{1}{2} a t^2)$
$-1.35 = -4.9t^2$
$t = .52$ sec -5w

x-dir.
$a_x = 0$
$v_i = 2.4$ m/s $= v_f$
$S = \frac{D}{T}$
$D = ST = 2.4(.52)$
$= 1.25$ m
-5w



Hoop 1 is on the projectile's path at 1/3 of Δx (the range you just found).

B. Calculate the x and y positions of this hoop. (*Your initial position is still at the top of the table, but your final position is now at hoop 1. So you will have to change your variable list and recalculate. You may also want to learn from question 11, so that you are solving for the actual position of the hoop, not* Δy.)

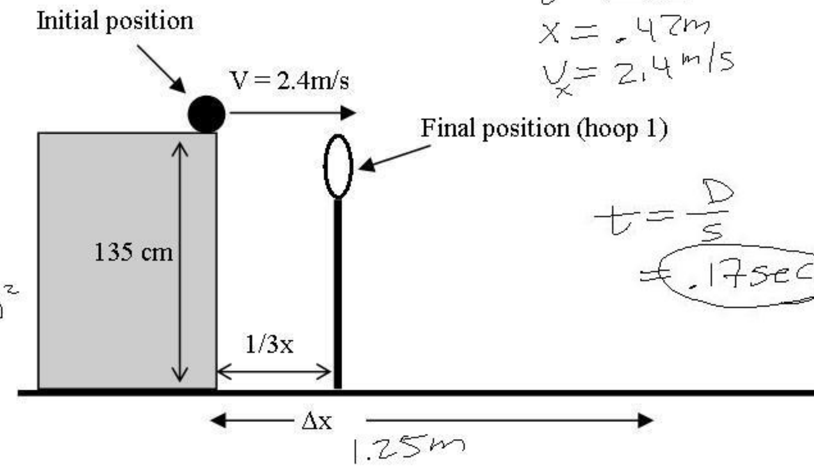
$\frac{1}{3}(1.25) = .42m$

y-dir.
$a = g$
$V_i = 0$
$y_i = 1.35m$
$y_f = ?$
$t = .17sec$

$\Delta y = V_i t + \frac{1}{2}at^2$
$y_f - y_i = 0 - 4.9(.17)^2$
$y_f - 1.35 = -.1416$
$y_f = 1.20m$

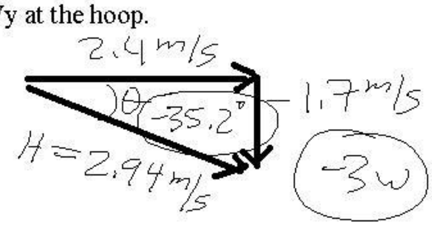
x-dir.
$t =$ ___
$x = .42m$
$V_x = 2.4m/s$

$t = \frac{D}{S} = .17sec$



C. Calculate the angle of hoop 1 by finding Vx and Vy at the hoop.

$V_f = 0 - 9.8(.17)$
$V_f = -1.7m/s$
$V_x = 2.4m/s$



-3w

hoop angle =
$-35.2 + 90$
$= 54.8°$

Hoop 2 is placed on the projectile's path so that it is 1/2 of y (the table height).

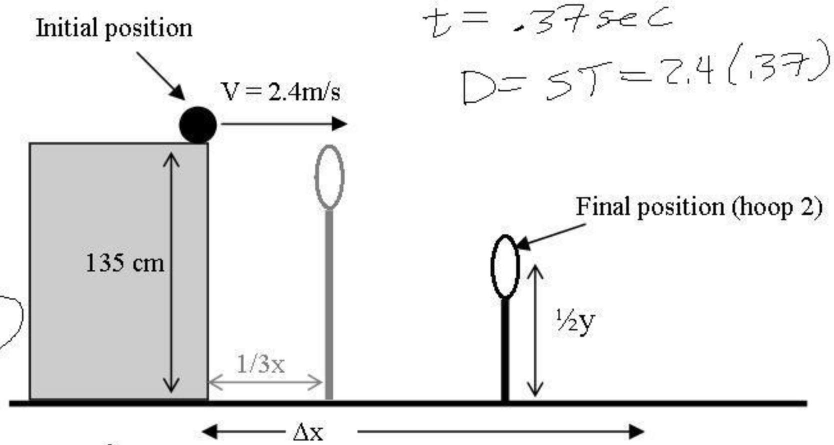
D. Calculate position and angle of hoop 2. Your initial position is still at the top of the table. Your final position is now at hoop 2. You will have to change your variable list again.

y-dir.
$a = g$
$V_i = 0m/s$
$V_f =$ ___
$t =$ ___
$\Delta y = -.675$

$\Delta y = V_i t + \frac{1}{2}at^2$
$-.675 = -4.9t^2$
$t = .37sec$

x-dir.
$a = 0$
$V_i = 2.4m/s = V_f$
$t = .37sec$
$D = ST = 2.4(.37) = .89m$

-5w



-5w

$V_f = 0 - 9.8(.37) = -3.64m/s$

$\theta = \tan^{-1}\left(\frac{V_y}{V_x}\right) = \frac{-3.64}{2.4} = -56.6°$

This is how you will calculate your hoops for the "Shoot the Hoops" lab. You will be graded on how accurately you shoot thru your hoops. If you hit the hoops, you will lose points. So measure and calculate correctly. I can double check your numbers IF you have them calculate already.

hoop = 33.4°