Tuesday, October 15, 2019 8:24 AM

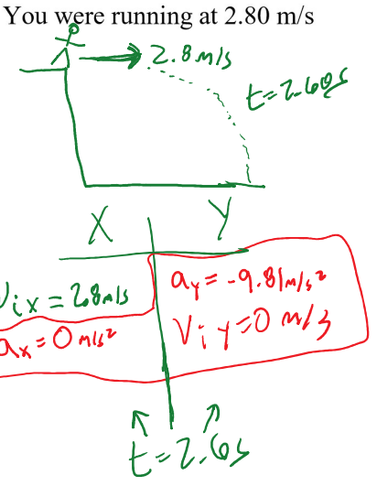
6. You take a running horizontal leap off a high-diving platform. You were running at 2.80 m/s and hit the water 2.60 s later.

A) How high was the platform?

$d_y = ?$ $\quad d_y = v_{iy}t^{0} + \frac{1}{2}a_y t^2$

$d_y = \frac{1}{2}(-9.81\,m/s^2)(2.6s)^2$

$d_y = -33.2\,m$



B) What is the vertical speed right before you hit the water?

$v_{fy} = ?$ $\quad v_{fy} = v_{iy}^{0} + a_y t$

$v_{fy} = (-9.81\,m/s^2)(2.6s) = -25.5\,m/s$ (DOWN)

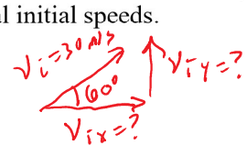
C) How far away from the platform did you land?

$d_x = ?$ $\quad d_x = v_{ix}t + \frac{1}{2}a_x t^2$ ($a_x = 0$)

$d_x = (2.8\,m/s)(2.6s) = 7.28\,m$

II. Vector Components (Hint: Sketch a right triangle and label the sides)

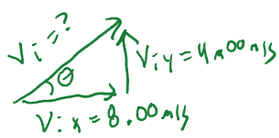
1. A projectile if fired with a velocity of 30.0 m/s at 60.0 degrees. Calculate the horizontal and vertical initial speeds.



$v_{ix} = v_i\cos\theta = (30.0\,m/s)\cos(60.0°) = 15.0\,m/s$

$v_{iy} = v_i\sin\theta = (30.0\,m/s)\sin(60.0°) = 26.0\,m/s$

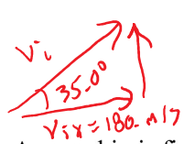
2. A ball is kicked with a horizontal velocity of 8 m/s and vertical velocity of 4.00 m/s. Calculate the angle if it was kicked at and initial speed.



$\theta = \tan^{-1}\left(\frac{4.00\,m/s}{8.00\,m/s}\right) = 26.6°$

$v_{ix} = v_i\cos\theta \rightarrow v_i = \frac{v_{ix}}{\cos\theta} = \frac{8.00\,m/s}{\cos(26.6°)} = 8.94\,m/s$

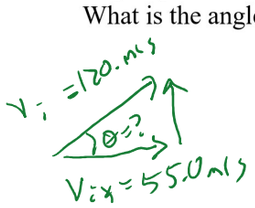
3. A cannon is fired at an angle of 35.0 degrees. If the horizontal component of its initial speed of 180. m/s, calculate the cannon's initial speed.



$v_{ix} = v_i\cos\theta$

$v_i = \frac{v_{ix}}{\cos\theta} = \frac{180.\,m/s}{\cos 35.0°} = 220.\,m/s$

4. A pumpkin is fired with an initial velocity of 120. m/s, at an angle theta above the horizontal. What is the angle theta if the pumpkin's initial horizontal speed is 55.0 m/s?



$v_{ix} = v_i\cos\theta$

$\theta = \cos^{-1}\left(\frac{v_{ix}}{v_i}\right)$

$\theta = \cos^{-1}\left(\frac{55.0\,m/s}{120.\,m/s}\right) = 62.7°$