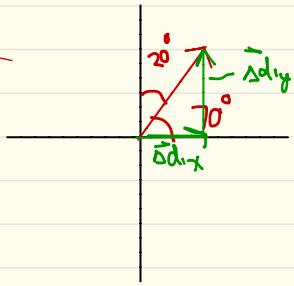
Pg 75 #3.

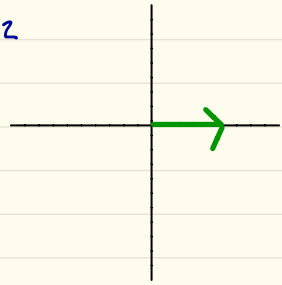
$\vec{\Delta d}_1 = 11\text{m}\,[\text{N}\,20^\circ\text{E}]$

$\vec{\Delta d}_2 = 9.0\text{m}\,[\text{E}]$

$\vec{\Delta d}_1$



$\vec{\Delta d}_2$



$\vec{\Delta d}_{1x} = 11\text{m}\cos 70^\circ$

$= 3.76\text{m}\,[\text{E}]$

$\vec{\Delta d}_{1y} = 11\text{m}\sin 70^\circ$

$= 10.3\text{m}\,[\text{N}]$

$\vec{\Delta d}_{2x} = 9\text{m}\,[\text{E}]$

$\vec{\Delta d}_{2y} = 0\text{m}$

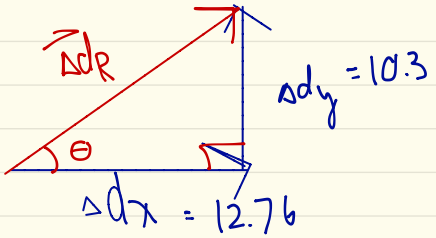
$\vec{\Delta d}_{Rx} = 3.76\text{m}\,[\text{E}] + 9\text{m}\,[\text{E}]$

$\vec{\Delta d}_{Rx} = 12.76\text{m}\,[\text{E}]$

$\vec{\Delta d}_{Ry} = 10.3\text{m}\,[\text{N}]$

$\vec{\Delta d}_{Rx} = 12.76\,m\,[E]$

$\vec{\Delta d}_{Ry} = 10.3\,m\,[N]$



$$|\vec{\Delta d}_R| = \sqrt{12.76^2 + 10.3^2}$$

$$= \sqrt{268.9}$$

$$|\vec{\Delta d}_R| = 16\,m$$

$$\tan\theta = \frac{10.3}{12.76}$$

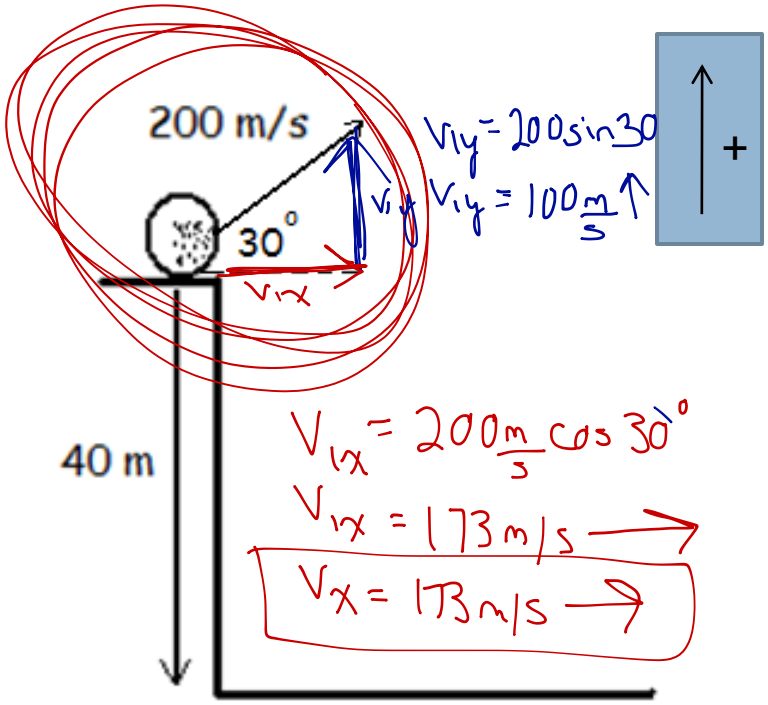
$$\theta = \tan^{-1}\left(\frac{10.3}{12.76}\right)$$

$$\theta = 39^\circ$$

$$\therefore \vec{\Delta d}_R = 16\,m\,[E\,39^\circ N]$$

Example #2

a)Find the horizontal distance travelled by the projectile shown.



$V_{1y} = 200\sin 30$

$V_{1y} = 100\ \frac{m}{s}\uparrow$

$V_{1x} = 200\ \frac{m}{s}\cos 30^\circ$

$V_{1x} = 173\ m/s \rightarrow$

$V_x = 173\ m/s \rightarrow$

VERTICAL	HORIZONTAL
$a = -9.8\ m/s^2$	$d_h =$
$\vec{\Delta}d_y = -40\ m$	$v_h = 173\ m/s \rightarrow$
$v_{1y} = 100\ m/s$	$t =$
$v_{2y} = -104\ m/s$	
$t =$	

Analysis

$\Delta d_y = v_y \Delta t + \frac{1}{2} a \Delta t^2$

$v_{2y}^2 = v_{1y}^2 + 2a\vec{\Delta}d$

b)Find the impact velocity

① Determine V_{2y}

② Determine t

③ Determine $\vec{\Delta d}_x$

④ Use $\vec{V}_{2y}$ and $\vec{V}_x$ to determine impact velocity.

① $V_{2y}^2 = V_{1y}^2 + 2a\Delta d$

$V_{2y}^2 = \left(100\frac{m}{s}\right)^2 + 2\left(-9.8\frac{m}{s^2}\right)(-40m)$

$V_{2y}^2 = 10784\frac{m^2}{s^2}$

$V_{2y} = \sqrt{10784\frac{m^2}{s^2}}$

$V_{2y} = 104\frac{m}{s}\downarrow$

② $V_{2y} = V_{1y} + \vec{a}\,\Delta t$

$-104 m/s = 100\frac{m}{s} + \left(-9.8\frac{m}{s^2}\right)\Delta t$

$-104\frac{m}{s} - 100\frac{m}{s} = \left(-9.8\frac{m}{s^2}\right)\Delta t$

$-204\frac{m}{s} = \left(-9.8\frac{m}{s^2}\right)\Delta t$

$\frac{-204\ m/s}{-9.8\ m/s^2} = \Delta t$

$20.8\ s = \Delta t$

③ $V_x = 173\frac{m}{s}\rightarrow$

$\Delta t = 20.8\ s$

$\vec{\Delta d}_x = V_x\,\Delta t$

$= \left(173\frac{m}{s}\rightarrow\right)(20.8\ s)$

$\vec{\Delta d}_x = 3600\ m\rightarrow$

④ $\vec{V}_{fy} = 104\frac{m}{s}\downarrow$

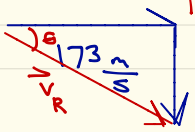
$\vec{V}_x = 173\frac{m}{s}\rightarrow$

$|\vec{V}_R| = \sqrt{173^2 + 104^2}$

$|\vec{V}_R| = 202\ m/s$

$\theta = \tan^{-1}\left(\frac{104}{173}\right)$

$\theta = 31^\circ$



$\vec{V}_R = 202\ m/s$ [31° from horizontal]

Example #3

A plane flying horizontally at 75 m/s drops a supply box when it is directly over a tower 250m below.

a) How far from the tower does the box land?
b) What is its velocity when it hits the ground?

Unit Test Tuesday

Pg. 81

#1, #7.

↓

$\Delta dy = 0$