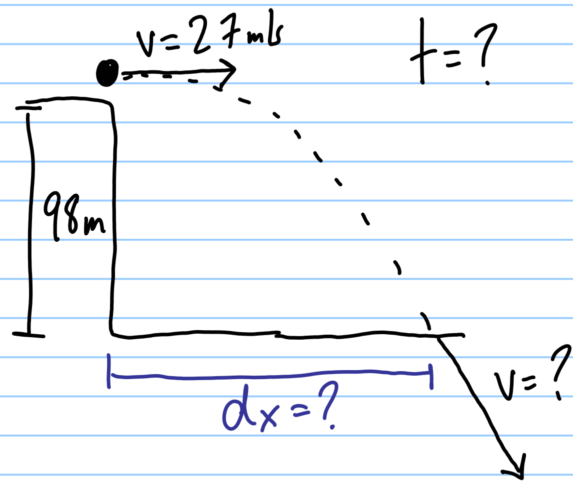
Note Title 12/11/2009

Worksheet 3.4

1.)



$t=?$

X	Y
$V_x = 27\ m/s$	$V_y =$
$d_x =$	$V_{yo} = 0$
$t = 4.472s$	$a_y = -9.80\ m/s^2$
	$d_y = -98\ m$
	$t =$

$d = \cancel{v_o t}^{\,0} + \frac{1}{2}at^2$

$d = \frac{1}{2}at^2$

$t = \sqrt{\frac{2d}{a}}$

$= \sqrt{\frac{2(-98)}{-9.80}}$

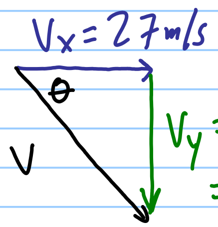
$= 4.472$

$= \boxed{4.47s}$

$d_x = V_x \cdot t$

$= (27)(4.472)$

$= \boxed{121\ m}$



$V_y = \sqrt{2ad}$

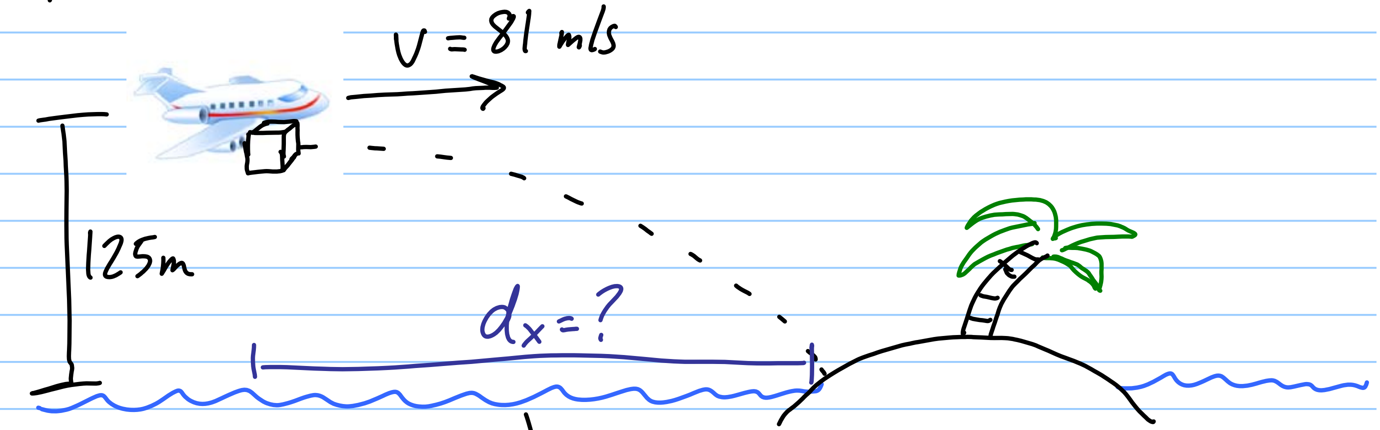
$= 43.8\ m/s$

$V = \sqrt{V_x^2 + V_y^2} = \boxed{51.5\ m/s}$

$\theta = \tan^{-1}\left(\frac{43.8}{27}\right)$

$= \boxed{58° \text{ below horizontal}}$

2.)



X	Y
$v_x = 81\ m/s$	$v_y =$
$d_x = ?$	$v_{y0} = 0$
$t = 5.051\ s$	$a_y = -9.80$
	$d_y = -125$
	t

$$d = \overset{0}{\cancel{v_0 t}} + \frac{1}{2} a t^2$$

$$t = \sqrt{\frac{2d}{a}}$$

$$= \sqrt{\frac{2(-125)}{-9.80}}$$

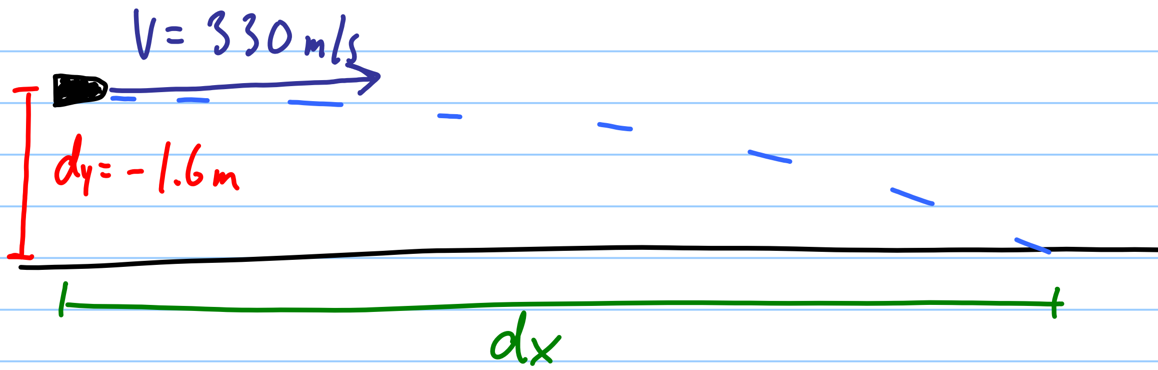
$$= 5.051\ s$$

$$d_x = v_x \cdot t$$

$$= (81)(5.051)$$

$$= \boxed{409\ m}$$

3.)



X	Y
$v_x = 330 m/s$	$v_y =$
$d_x =$	$v_{yo} = 0$
$t = 0.5714 s$	$a_y = -9.80 m/s^2$
	$d_y = -1.6m$
	$t =$

$$d = \cancel{v_o t}^{\,0} + \frac{1}{2}at^2$$

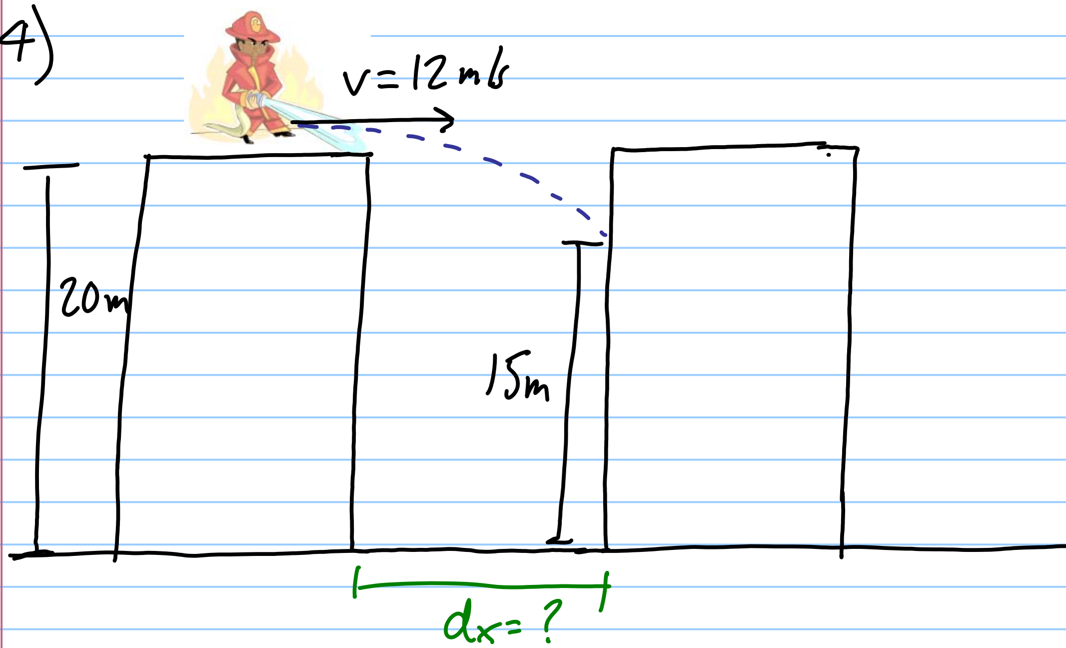
$$d = \frac{1}{2}at^2 \qquad t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(-1.6)}{-9.80}} = 0.5714 s$$

$$v_x = \frac{d_x}{t}$$

$$d_x = v_x t$$

$$= (330)(0.5714) = \boxed{190 m}$$

4)

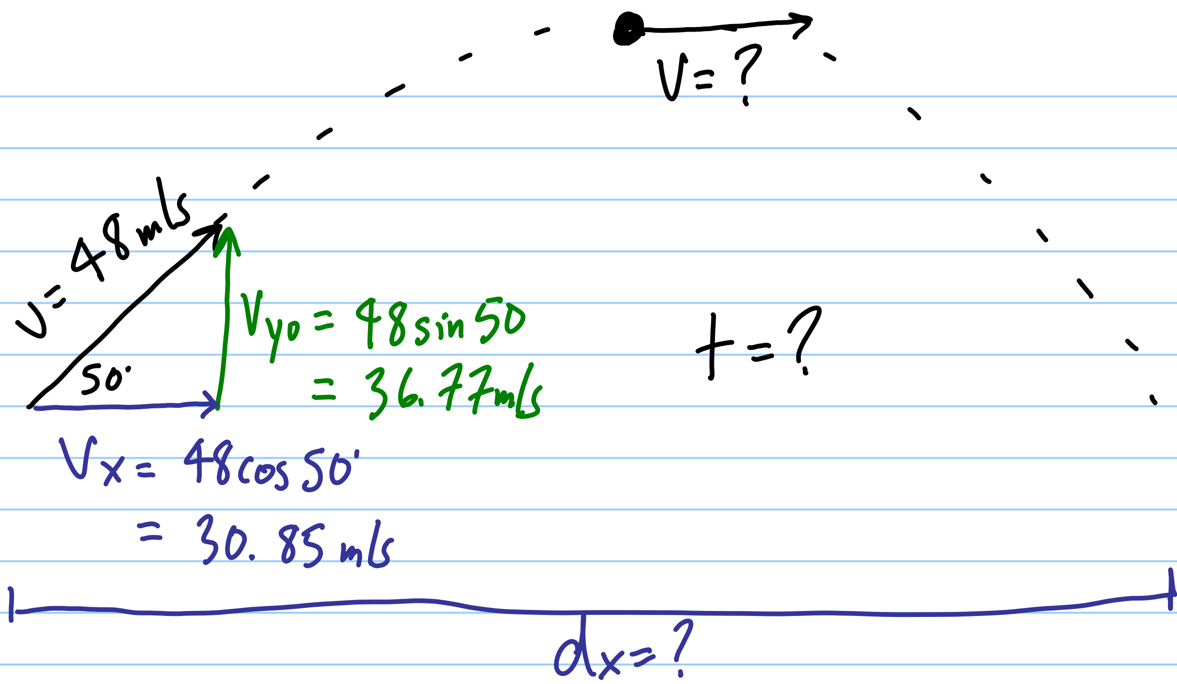


X	Y
$V_x = 12\text{ m/s}$	$V_y =$
$d_x =$	$V_{yo} = 0$
$t = 1.01\text{s}$	$a_y = -9.80\text{ m/s}^2$
	$d_y = -5.0\text{m}$
	$t =$

$$t = \sqrt{\frac{2d}{a}}$$
$$= 1.01\text{s}$$

$$d_x = V_x t$$
$$= \boxed{12.1\text{m}}$$

5)



$V_{yo} = 48\sin 50$
$= 36.77\,m/s$

$V_x = 48\cos 50°$
$= 30.85\,m/s$

X	y @ $t_{\frac{1}{2}}$
$V_x = 30.85\,m/s$	$V_y = 0$
$d_x =$	$V_{yo} = 36.77\,m/s$
$t = 2 \times t_{\frac{1}{2}}$	$a_y = -9.80\,m/s^2$
$= 7.504\,s$	$d_y =$
	$t_{\frac{1}{2}} =$

$\cancel{V}^{\,0} = V_o + a t_{\frac{1}{2}}$

$t_{\frac{1}{2}} = \dfrac{-V_o}{a}$

$= \dfrac{-36.77}{-9.80}$

$= 3.752$

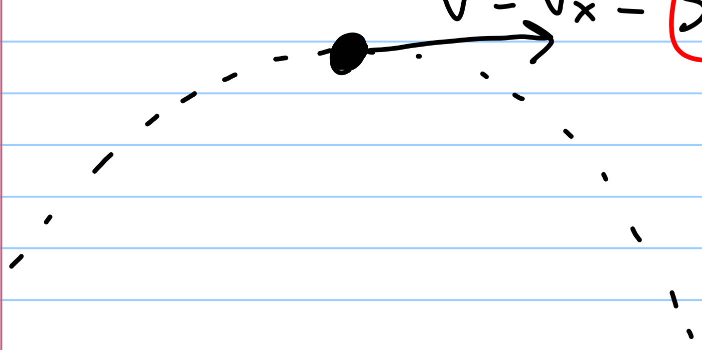
$= \boxed{3.75\,s}$

$d_x = V_x \cdot t$

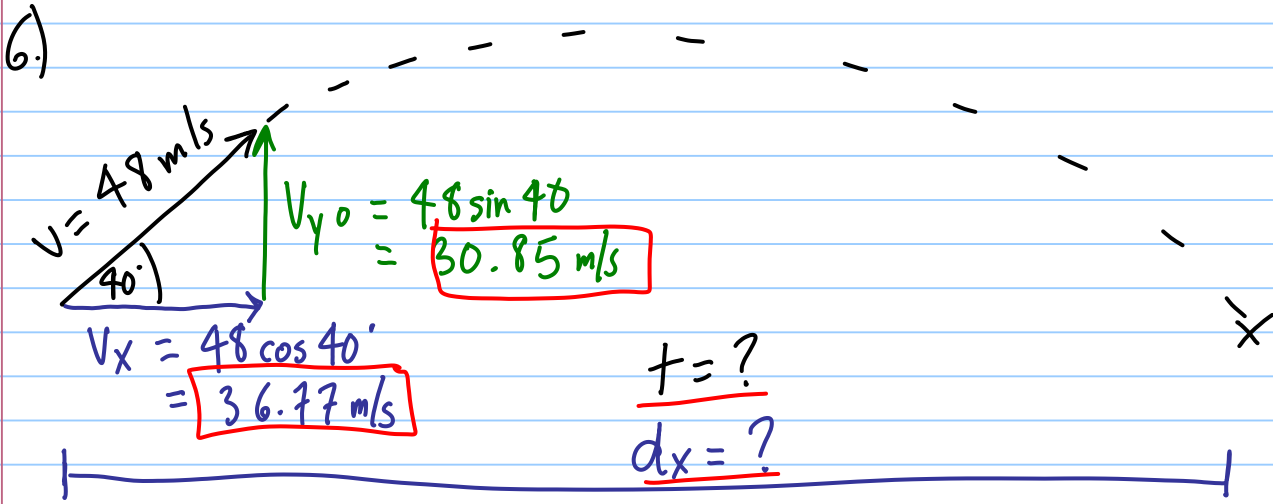
$= (30.85)(7.504)$

$= \boxed{232\,m}$

$V = V_x = \boxed{30.9\,m/s}$



6.)



$V_{yo} = 48 \sin 40$
$= \boxed{30.85 \text{ m/s}}$

$V_x = 48 \cos 40°$
$= \boxed{36.77 \text{ m/s}}$

X	Y
$V_x = 36.77$ m/s	$V_y = -30.85$ m/s ← for total flight $V = -V_o$
$d_x = ?$	$V_{yo} = 30.85$ m/s
$t = 38.56$ s	$a_y = -1.6$ m/s²
	$d_y =$
	$t = ?$

$V = V_o + at$

$$t = \frac{V - V_o}{a}$$

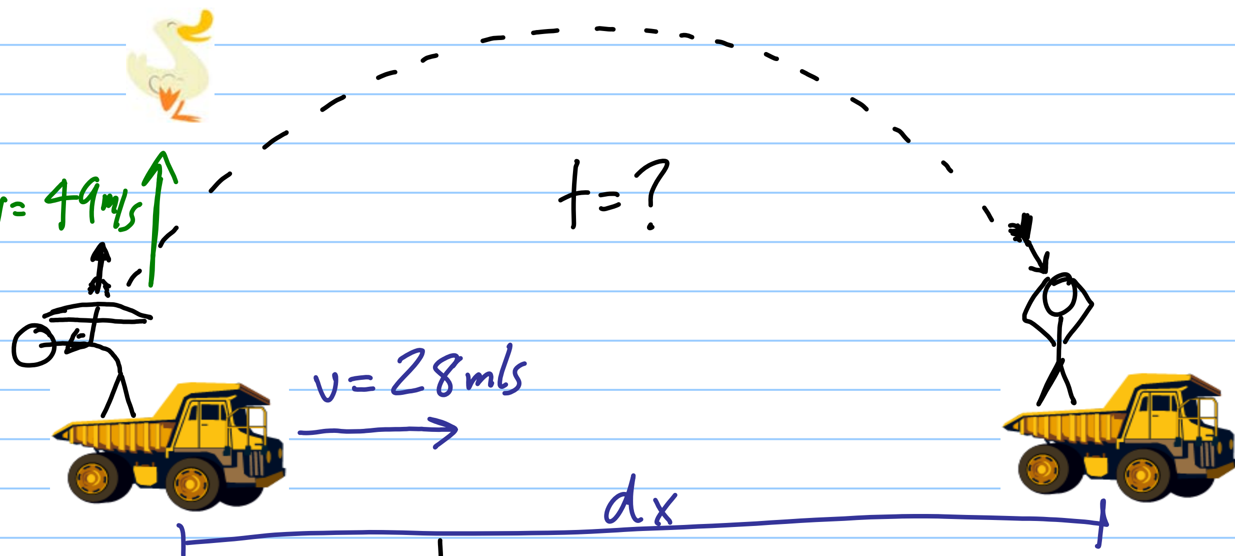
$$= \frac{-30.85 - 30.85}{-1.6}$$

$= 38.56$ s

$= \boxed{38.6 \text{ s}}$

$d_x = V_x \cdot t$
$= (36.77)(38.56)$
$= \boxed{1420 \text{ m}}$

7.)

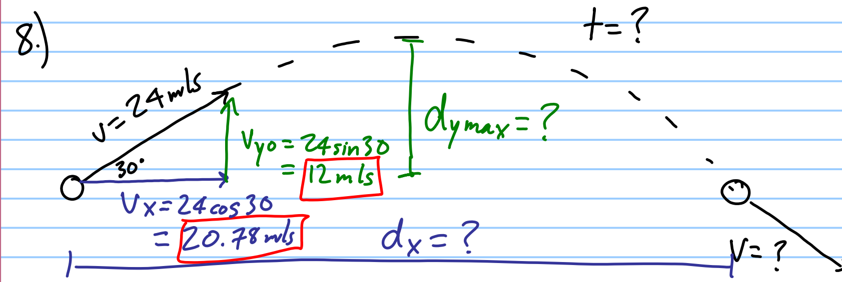


X	Y
$v_x = 28\ m/s$	$v_y = -49\ m/s$
$d_x =$	$v_{yo} = 49\ m/s$
$t = 10.0s$	$a_y = -9.80\ m/s^2$
	$d_y =$
	$t =$

$$t = \frac{v - v_o}{a} = \frac{-49-49}{-9.80} = \boxed{10.0s}$$

$$d_x = (28)(10.0) = \boxed{280\ m}$$

8)



X	y @ $t_{\frac{1}{2}}$
$V_x = 20.78\ m/s$	$V_y = 0$
$d_x =$	$V_{yo} = 12\ m/s$
$t = 2.448s$	$a_y = -9.80$
	$d_{ymax} =$
	$t_{\frac{1}{2}} =$

$d_x = V_x \cdot t$

$= (20.78)(2.448)$

$= \boxed{50.9\ m}$

$t_{\frac{1}{2}} = \frac{V - V_0}{a}$

$= \frac{0 - 12}{-9.80}$

$= 1.224$

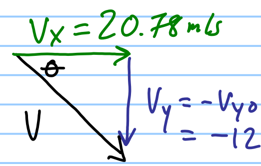
$t_{total} = 2 \times t_{\frac{1}{2}}$

$= \boxed{2.45s}$

$\cancel{v}^{2} = v_0^2 + 2ad$

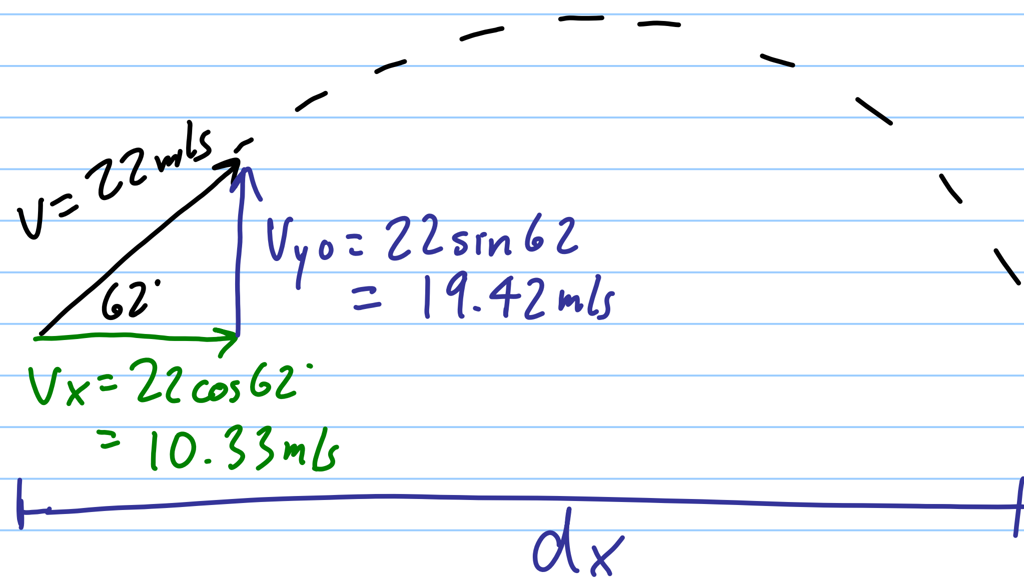
$d_{ymax} = \frac{-V_0^2}{2a} = \frac{-(12)^2}{2(-9.80)}$

$= \boxed{7.35m}$



$\therefore \boxed{V = 24\ m/s\ \ 30°\ \text{below horiz}}$

9.)



$V_{yo} = 22 \sin 62$
$= 19.42 \text{ m/s}$

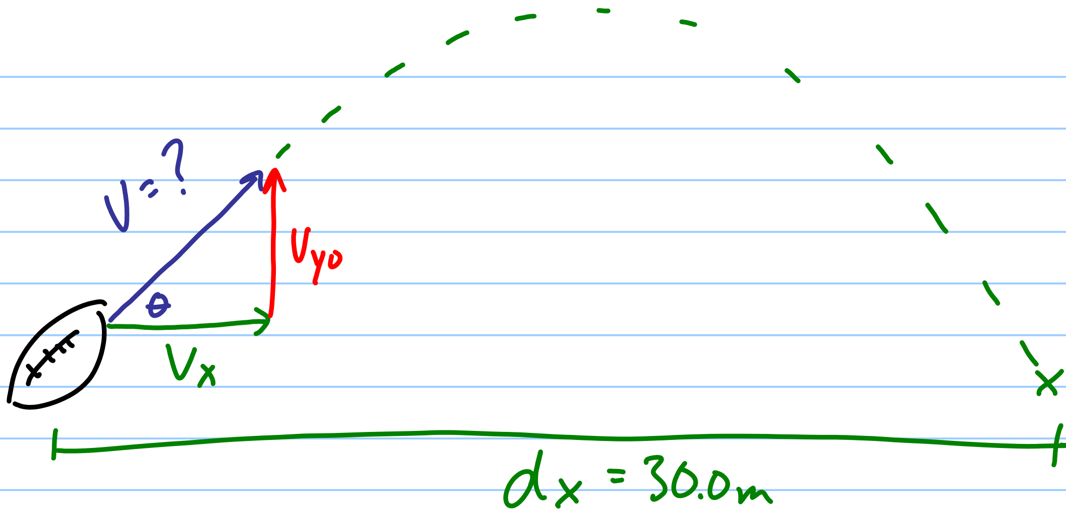
$V_x = 22 \cos 62°$
$= 10.33 \text{ m/s}$

X	y @ t_{total}
$V_x = 10.33 \text{ m/s}$	$V_y = -19.42$
$d_x =$	$V_{yo} = 19.42 \text{ m/s}$
$t = 3.963 s$	$a_y = -9.80 \text{ m/s}^2$
	$d_y =$
	$t =$

$$t = \frac{V - V_0}{a}$$
$$= \frac{-19.42 - 19.42}{-9.80}$$
$$= 3.963 s$$

$$d_x = V_x \cdot t$$
$$= (10.33)(3.963)$$
$$= \boxed{40.9 m}$$

10)



x	y @ $t_{\frac{1}{2}}$
$v_x =$	$v_y = 0\,m/s$
$d_x = 30.0\,m$	$v_{yo} =$
$t = 2.0\,s$	$a_y = -9.80$
	$d_y =$
	$t = 2.0\,s$

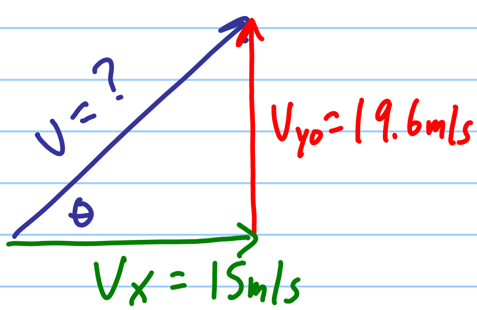
$\cancel{v}^{0} = v_0 + at$

$v_0 = -at$

$= -(-9.80)(2.0)$

$= 19.6\,m/s$

$v_x = \frac{d_x}{t} = \frac{30.0\,m}{2.0\,s} = 15\,m/s$



$v^2 = v_x^{\,2} + v_{yo}^{\,2}$

$v = \sqrt{v_x^{\,2} + v_{yo}^{\,2}}$

$= \sqrt{(15)^2 + (19.6)^2}$

$= \boxed{25\,m/s}$

$\tan\theta = \frac{19.6}{15}$

$\theta = \tan^{-1}\left(\frac{19.6}{15}\right)$

$= \boxed{53^\circ \text{ above the horizontal}}$