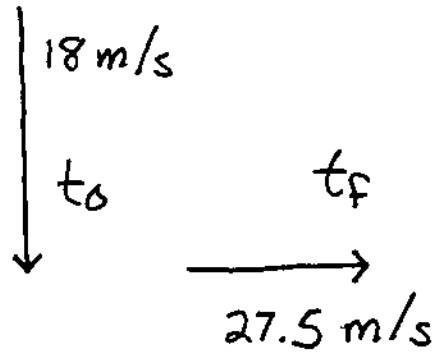
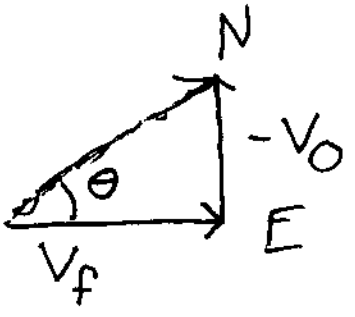
3-21)



a) Not known if $\vec{a}$ is uniform then $\bar{V} = \frac{\vec{V}_f + \vec{V}_0}{2}$

but it is not stated

b) $\bar{a} = \frac{\vec{V}_f - \vec{V}_0}{\Delta t}$



$|\bar{a}| = \frac{\sqrt{V_f^2 + V_0^2}}{\delta_s} = 4.1\ m/s^2$ $\theta' = \tan^{-1}\left(\frac{V_0}{V_f}\right) = 33.2^0$ North of East

c) Again Not enough information.

23) $a_x = 4\ m/s^2$ $a_y = 3\ m/s^2$ $V_0 = 0$

$V_x = (4\ m/s^2)t$ $V_y = (3\ m/s^2)t$

b) speed $= \sqrt{((4\ m/s^2)t)^2 + ((3\ m/s^2)t)^2}$

c) $\Delta x = \frac{1}{2}(4\ m/s^2)t^2$ $\Delta y = \frac{1}{2}(3\ m/s^2)t^2$

$V_x = 8\ m/s$ $V_y = 6\ m/s$ speed $= 10\ m/s$

$\Delta x = 8\ m$ $\Delta y = 6\ m$

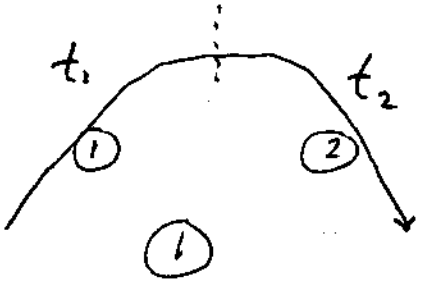
3-29) $R = \frac{v_0^2 \sin 2\theta}{g}$ (derivation on pg 60)

$$3m = \frac{(5.5m/s)^2 \sin 2\theta}{9.8m/s^2}$$

so $\sin 2\theta = \frac{(3m)(9.8m/s^2)}{(5.5m/s)^2} = .972$

$2\theta = \sin^{-1}(.972) \Rightarrow \theta = 38.2°, 51.8°$

3-34)



①	②
$\Delta y = v_{oy} - \frac{1}{2}gt_1^2$	$-\Delta y = -\frac{1}{2}gt_2^2$
$0 = v_{oy} - gt_1$	$v_y = -gt_2$
$0^2 = v_{oy}^2 - 2g\Delta y$	$v_y^2 = -2g(-\Delta y)$ ②

$v_{oy}^2 = v_y^2$ so $v_y = -v_{oy}$ ✓

(down) (up)

$v_{oy} = gt_1$ $\quad v_y = -gt_2$

$v_{oy} = gt_1$ $\quad +v_{oy} = gt_2$

$t_1 = t_2$ ✓

37) $\frac{160\text{km}}{\text{hr}} = 44.4\ \text{m/s}$

$\Delta x = v_x t \qquad \Delta y = v_{oy} t - \frac{1}{2} g t^2$

$v_{oy} = 0$

$-160\text{m} = -\frac{1}{2} g t^2$

$320\text{m} = g t^2 \Rightarrow t = 5.71\text{s}$

47) $\Delta y = -\frac{1}{2} g t^2$

(i) $v_y = -gt$

$v_y^2 = -2g\Delta y$

(1) $t = \frac{-v_y}{g}$

(2) $\Delta x = v_o t$ (does not help)

(2) $\Delta x = v_o \left(\frac{-v_y}{g}\right)$

(1) $\frac{v_y}{v_x} = \tan\theta = \frac{-gt}{v_o}$ so $\theta = \tan^{-1}\left(\frac{gt}{v_o}\right)$

54) $a = \frac{v^2}{r} \Rightarrow \quad v = 45\frac{\text{rev}}{\text{min}} \left(\frac{2\pi r}{\text{rev}}\right) \frac{1\text{min}}{60\text{s}} = .707\frac{\text{m}}{\text{s}}$

$a = \frac{(.707\text{m/s})^2}{(.15\text{m})} = 3.33\ \text{m/s}^2$

61) $V_{Rel} = 1560\ km/hr$

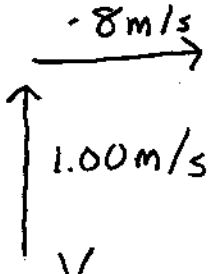
$V_{P1\,P2} = V_{P1E} + V_{EP2}$ $\quad (V_{EP_2} = V_{P_2E})$

$= +780\frac{km}{hr} + \left(+780\frac{km}{hr}\right)$

so $10km = 1560km/hr\,(\Delta t)$

$\Delta t = 6.41 \times 10^{-3}\ hr = 23\ s$

67)



$\vec{V}_{SE} = \vec{V}_{SW} + \vec{V}_{WE}$

$V_{SWx} = 0 \quad V_{WEy} = 0$

$V_{SEx} = .8m/s$

$V_{SEy} = 1.0m/s$

so $\Delta x = (.8m/s)t$ ←

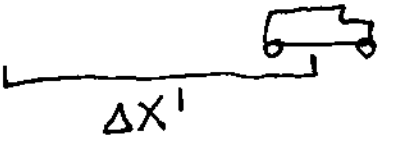
$\Delta y = (1.0m/s)\,t = 75m$ so $t = 75s$

$\Delta x = (.8m/s)(75s) = 60m$

3-87) Hard way)

(1) $\Delta x = \left(150 \frac{km}{hr}\right) t$

(2) $\Delta x + \Delta x' = \left(200 \frac{km}{hr}\right) t$



(3) $\Delta y = -\frac{1}{2} g t^2$ (3) $156\,m = g t^2$

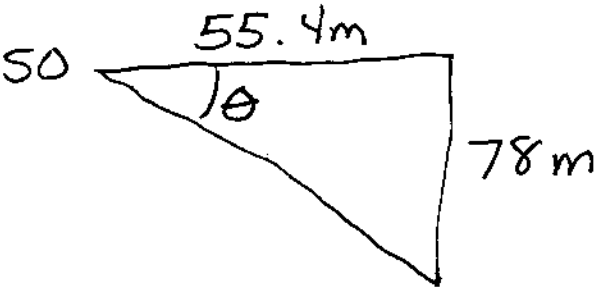
$t = 3.99\,s$

(1) $\Delta x = \left(150 \frac{km}{hr}\right)(3.99\,s)\left(\frac{1000\,m}{km}\right)\left(\frac{1\,hr}{3600\,s}\right)$

$= 166.25\,m$

(2) $(166.25\,m) + \Delta x' = \left(200 \frac{km}{hr}\right)\left(\frac{1000\,m}{3600\,s}\right)(3.99\,s)$

$\Delta x' = 55.4\,m$



$\theta = \tan^{-1}\left(\frac{78\,m}{55.4\,m}\right)$

$= 54.6^\circ$ //

Easier - Relativity

$\Delta x' = \frac{50\,km}{hr}\left(\frac{1000\,m}{km}\right)\left(\frac{1\,hr}{3600\,s}\right)(3.99\,s)$

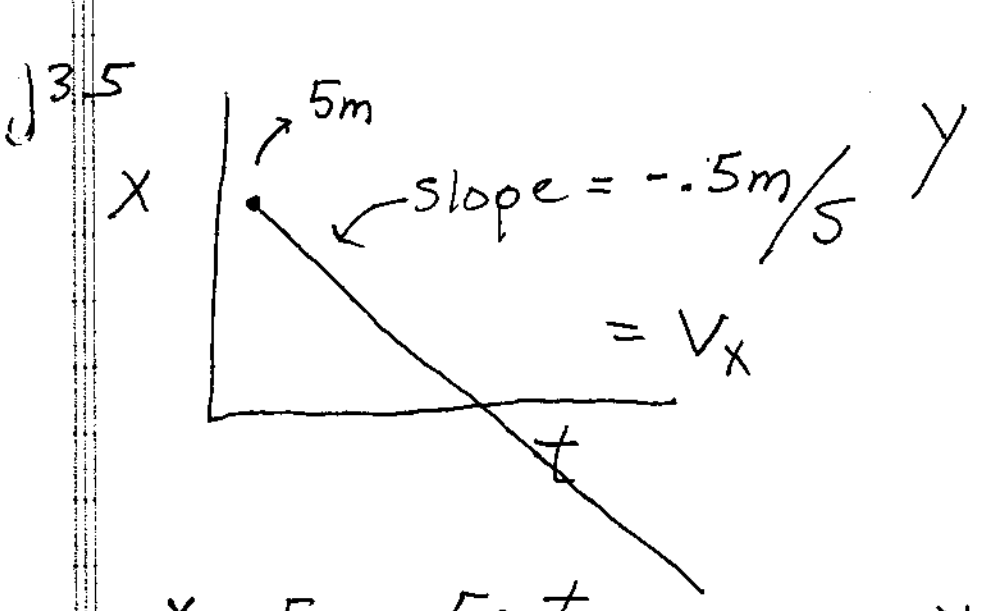
$\Delta x' = 55.4\,m$

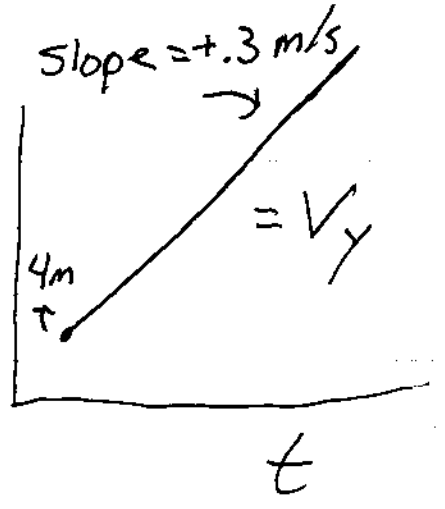
Physlets

J3.2

	$Blue_x = 15$	$Blue_y = 10$
	$Red_x = -10$	$Red_y = 12$
Total	$+5$	22

J3.5





$x = 5m - .5\frac{m}{s}t$ $\qquad$ $y = 4m + .3\frac{m}{s}t$

$$\text{speed} = \sqrt{(.5\,m/s)^2 + (.3\,m/s)^2} = .583\,m/s$$