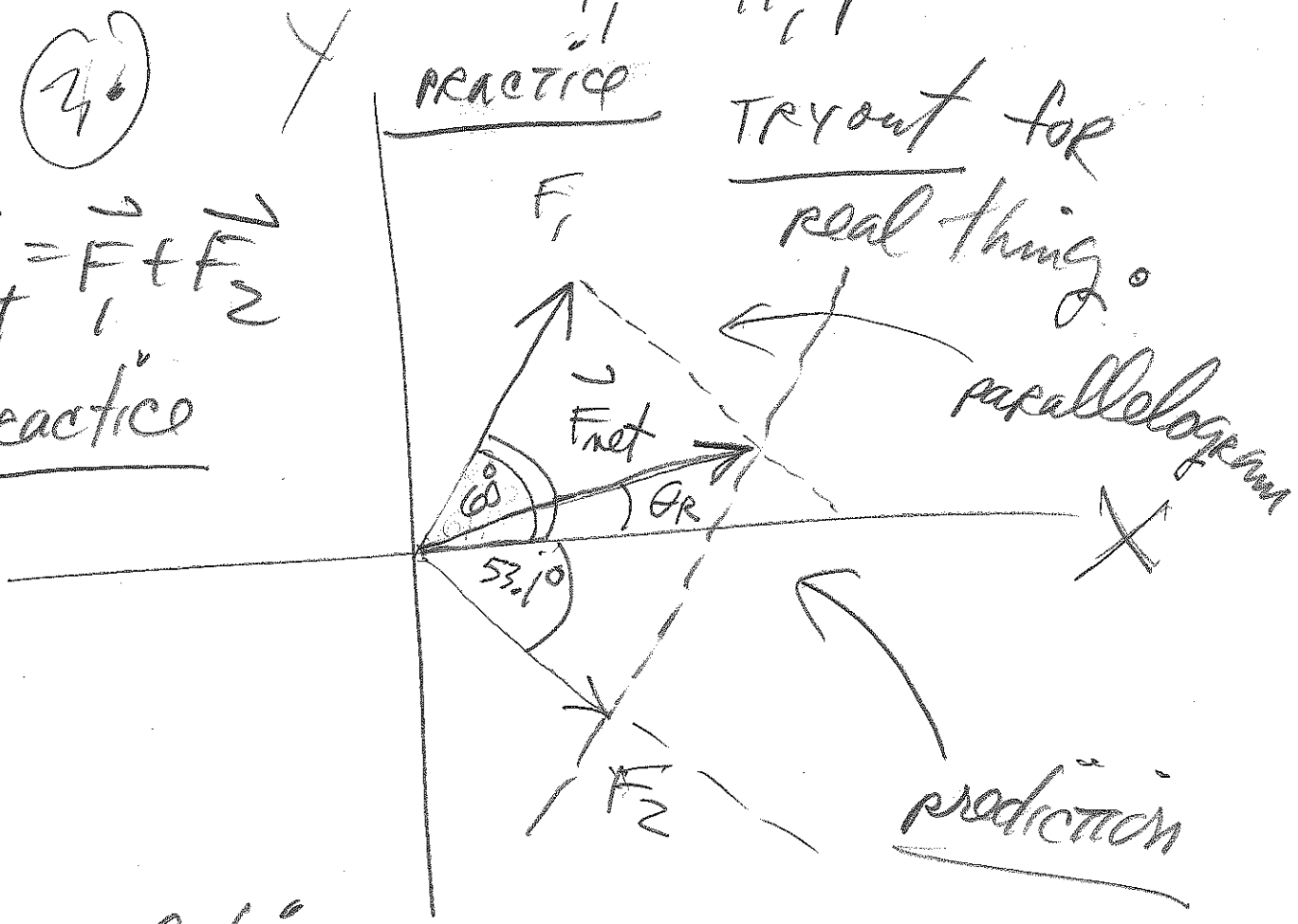
Test 1 spill vectors §1-1-3 C1

$F_1 = |\vec{F}_1|$

(4.)

$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2$

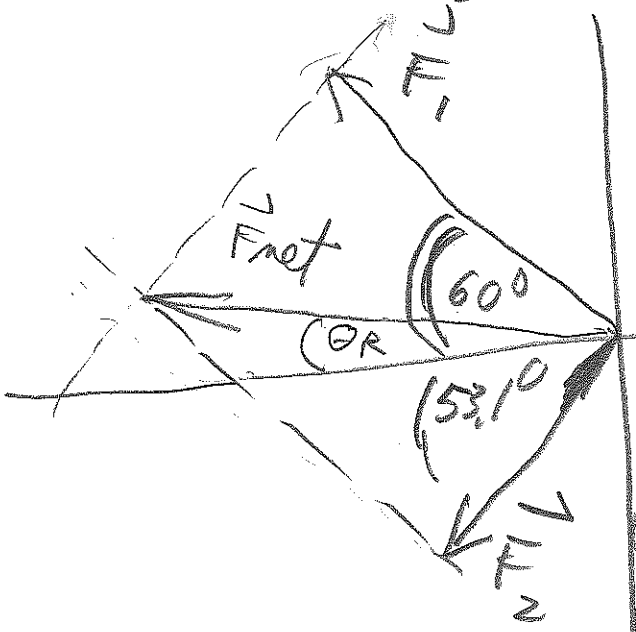
practice



Tryout for real thing ☺ parallelogram

prediction

real thing:



prediction:

$\theta_R = 22.6^\circ$

(a) $F_{net_x} = -7$

(b) $F_{net_y} = +2.92$

check

(a) $F_{net_x} = -8 \cdot \cos 60 - 5 \cdot \cos 53 = -7$

(b) $F_{net_y} = 8 \cdot \sin 60 - 5 \cdot \sin 53 = 2.92$

Test I SPYII vectors

b) Practice

$F_{net_x} = F_{1x} + F_{2x}$

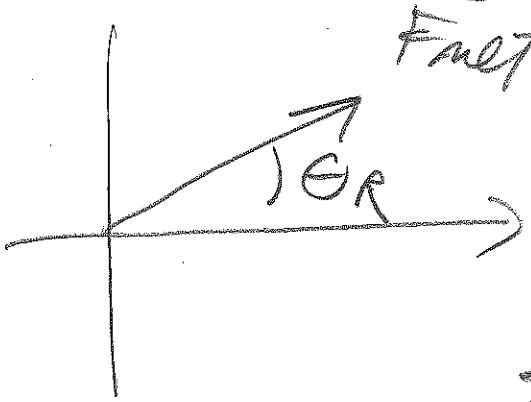
$F_{net_x} = F_1 \cdot \cos 60 + F_2 \cdot \cos 53.1 > 0$

$F_{net_y} = F_1 \cdot \sin 60 - F_2 \cdot \sin 53.1 > 0$

numbers:

$F_{net_x} = 8 \cdot \cos 60 + 5 \cdot \cos 53 = 7$

$F_{net_y} = 8 \cdot \sin 60 - 5 \cdot \sin 53 = 2.92$

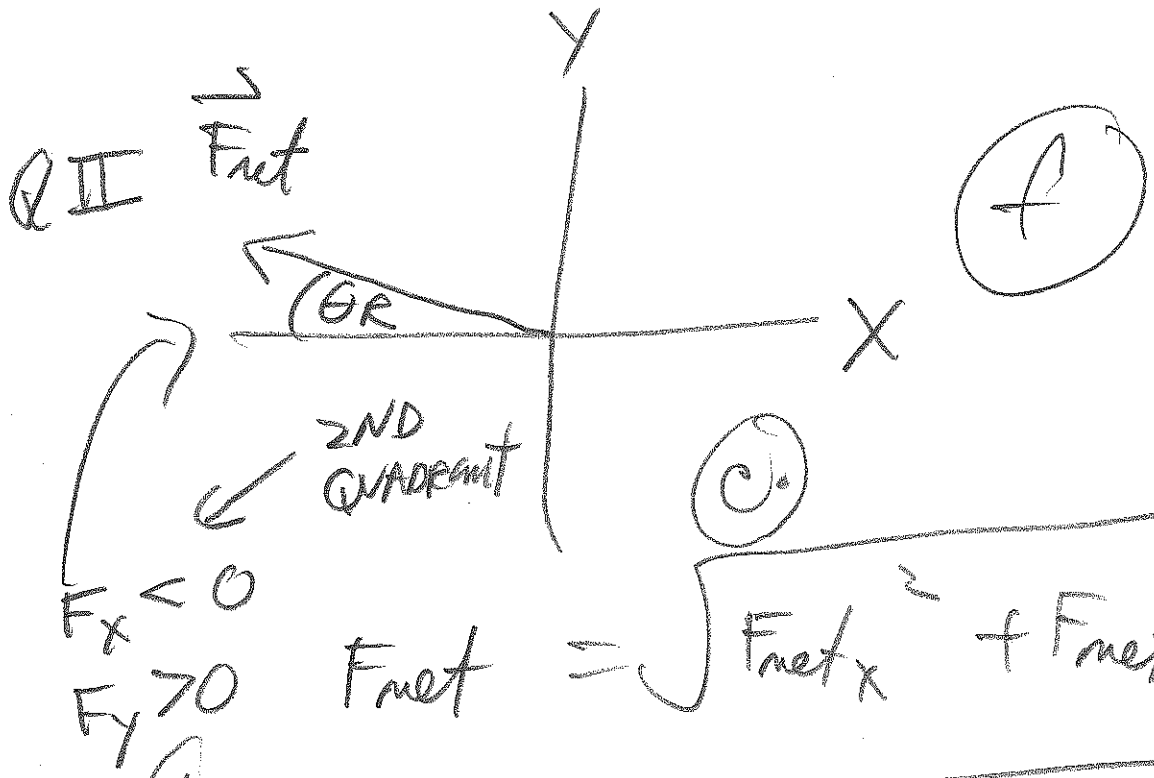


$\tan\theta_R = \dfrac{|F_{y\,net}|}{|F_{x\,net}|}$

Note: $F_{y\,net} = F_{net_y}$

$\tan\theta_R = \dfrac{2.92}{7} \rightarrow \theta_R = 22.6°$

Real thing:



(f)

(c)

$$F_{net} = \sqrt{F_{net_x}^2 + F_{net_y}^2}$$

(d)

$$= \sqrt{(-7)^2 + (2.92)^2}$$

$$= \underline{\underline{7.6}}$$

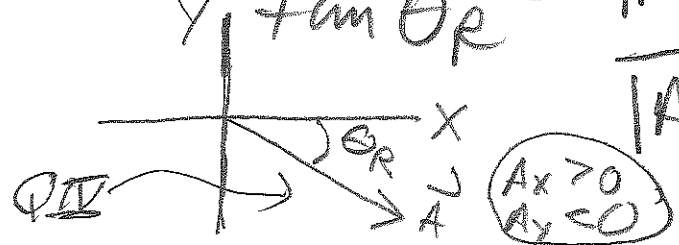
(c)

$$\tan\theta_R = \frac{|F_{y\,NET}|}{|F_{x\,net}|} = \frac{2.92}{7}$$

$$\Rightarrow \theta_R = 22.6^0$$

$\tan\theta_R = \dfrac{|A_y|}{|A_x|}$; related angle $= \theta_R$

$0 \le \theta_R \le 90$



given

$V_0 = 25\ m/s$

$x = 50\ m$

$H = ?$

$t = ?$

$V_{0y} = 0$

$a = 9.8\ m/s$

sample test 1, #4, Fall '12

(40) student work

$x = Vt$

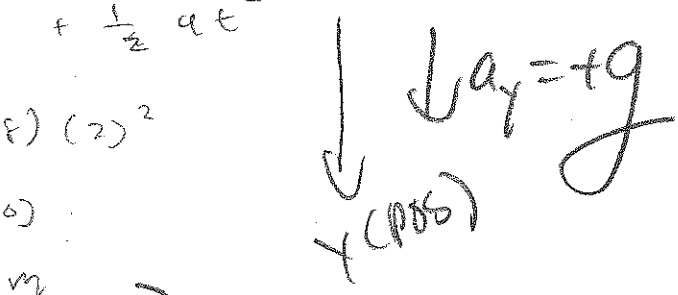
$t = \frac{x}{V} = \frac{50\ m}{25\ m/s} = 2\ seconds$

$H = \cancel{V_{0y}^{0}}\, t + \frac{1}{2} a t^2$

$= \frac{1}{2}(9.8)(2)^2$

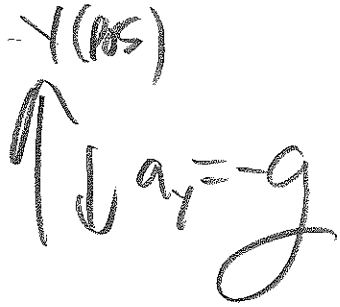
$= 2(9.80)$

$= 19.6\ m$



$\Delta y = +H = \frac{1}{2} g \Delta t^2$

FORMAL EQUATIONS



$\Delta y = y_2 - y_1$

x-motion $(\Delta t = t_2 - t_1)$ $(\Delta x = x_2 - x_1)$

$\Delta x = V_{1x} \cdot \Delta t$

$\Delta x = V_1 \cos\theta_1 \cdot \Delta t$

y-motion

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

$V_{2y}^2 = V_{1y}^2 - 2g\Delta y$

$V_{2y} = V_{1y} - g\Delta t$

$V_y = \frac{V_{1y} + V_{2y}}{2} = \frac{\Delta y}{\Delta t}$

sample exam #4

$V_{1y} = 0,\ V_{1x} = 25\ \frac{m}{s}$

$\Delta y = ?$ note: $\Delta y = -H$

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

$$\Delta y = -H \approx -\frac{1}{2} g \Delta t^2$$

need Δt :

$$\Delta x = 50m = v_x \cdot \Delta t$$

$$50m = v_0 \cos 20 \cdot \Delta t$$

$$50m = V_0 \cdot 1 \cdot \Delta t$$

$$50m = 25\frac{m}{s} \cdot \Delta t$$

$$\Delta t = 2(s)$$

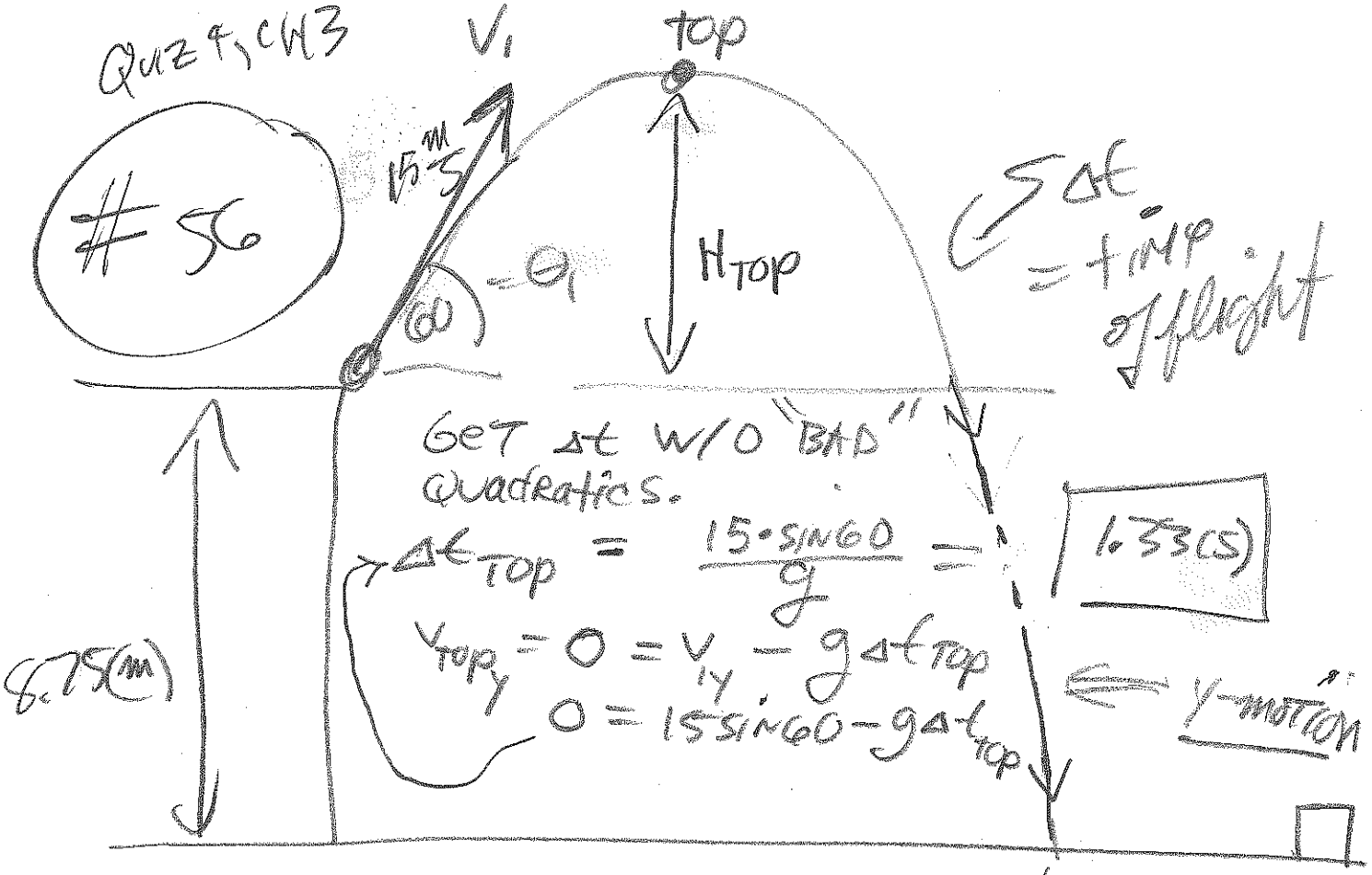
$$-H = -\frac{1}{2}(9.8)(2)^2$$

$$H \approx 20(m)$$

Recap projectile motion

Quiz 4, CH3

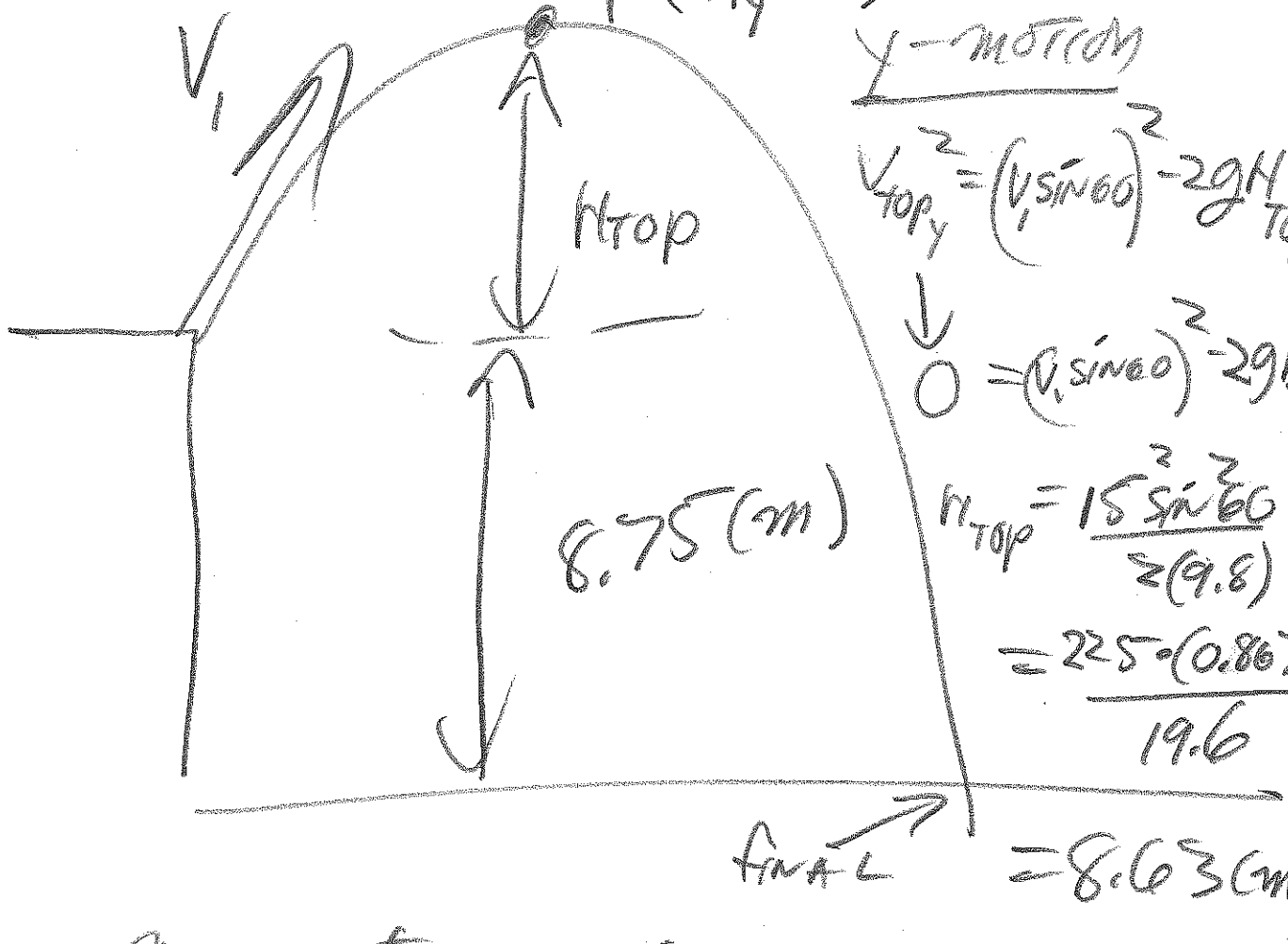
#56



$D = \Delta x + d$

$d = 0.45 \frac{m}{s} \cdot \Delta t$

#56 QUIZ 4, CH 3



Y-MOTION

$V_{top_y}^2 = (V_i \sin 60)^2 - 2gH_{top}$

$\downarrow$

$0 = (V_i \sin 60)^2 - 2gH_{top}$

$H_{top} = \frac{15^2 \sin^2 60}{2(9.8)}$

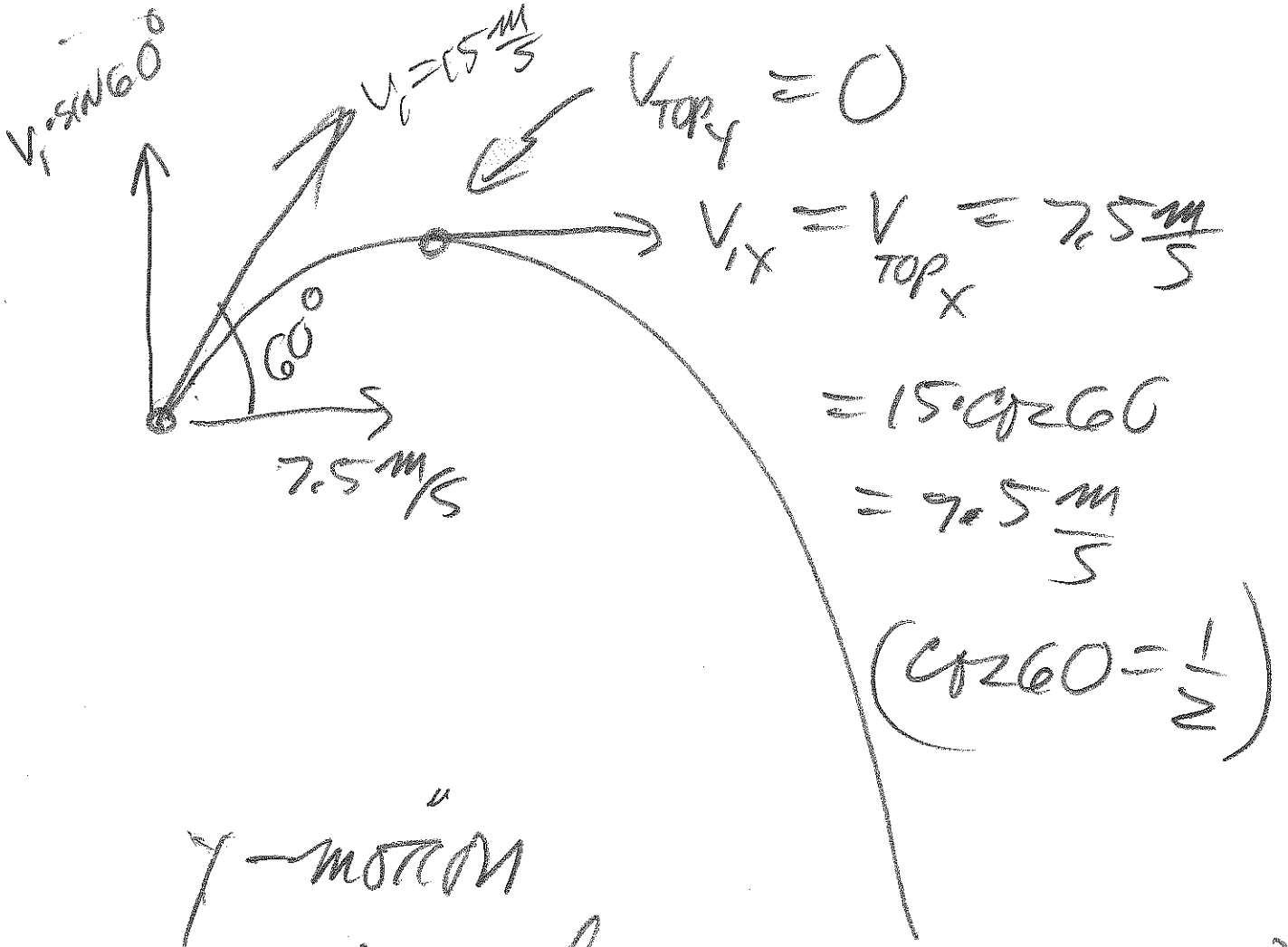
$= \frac{225 \cdot (0.867)^2}{19.6}$

$= 8.63 (m)$

now $\Delta t_{TOTAL} = \Delta t_{top} + \Delta t_f$

Δt_f is from top to final (bottom).

pretend you drop an object from height $8.75 + 8.63 = 17.38 (m)$



$= 15 \cdot \cos 60$

$= 7.5 \frac{m}{s}$

$\left(\cos 60 = \frac{1}{2}\right)$

y-motion

starting at top $\left(V_{y_{top}} = V_{top_y} = 0\right)$

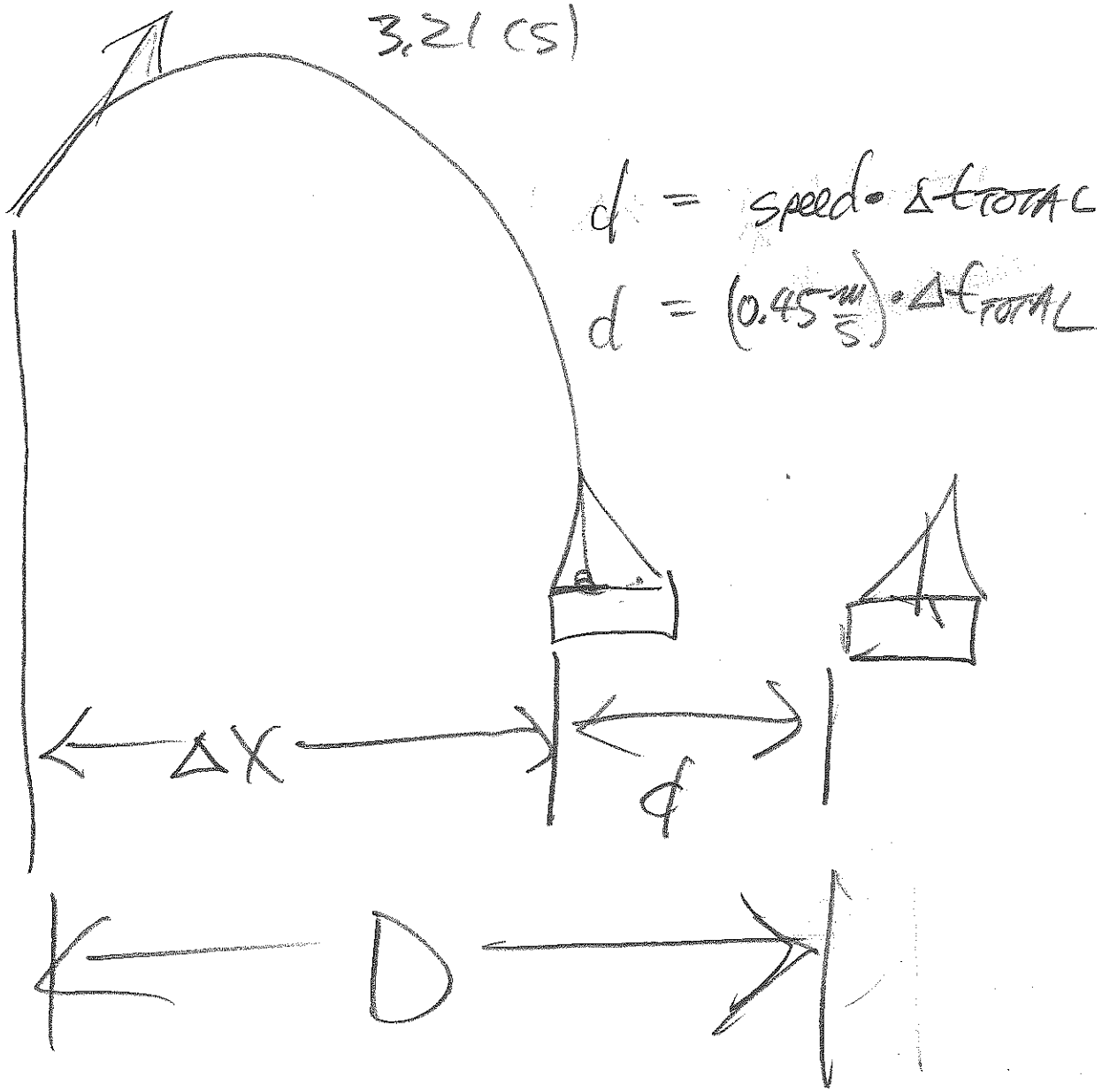
$$y_f - y_{top} = V_{top_y} \Delta t_f - \frac{1}{2} g \Delta t_f^2$$

$$-17.38 (m) = -\frac{1}{2} g \Delta t_f^2$$

$$\Delta t_f = \sqrt{\frac{2(17.38)}{9.8}} = \boxed{1.885}$$

$$\Delta t_{TOTAL} = 1.33 + 1.88$$

$$= 3.21 (s)$$

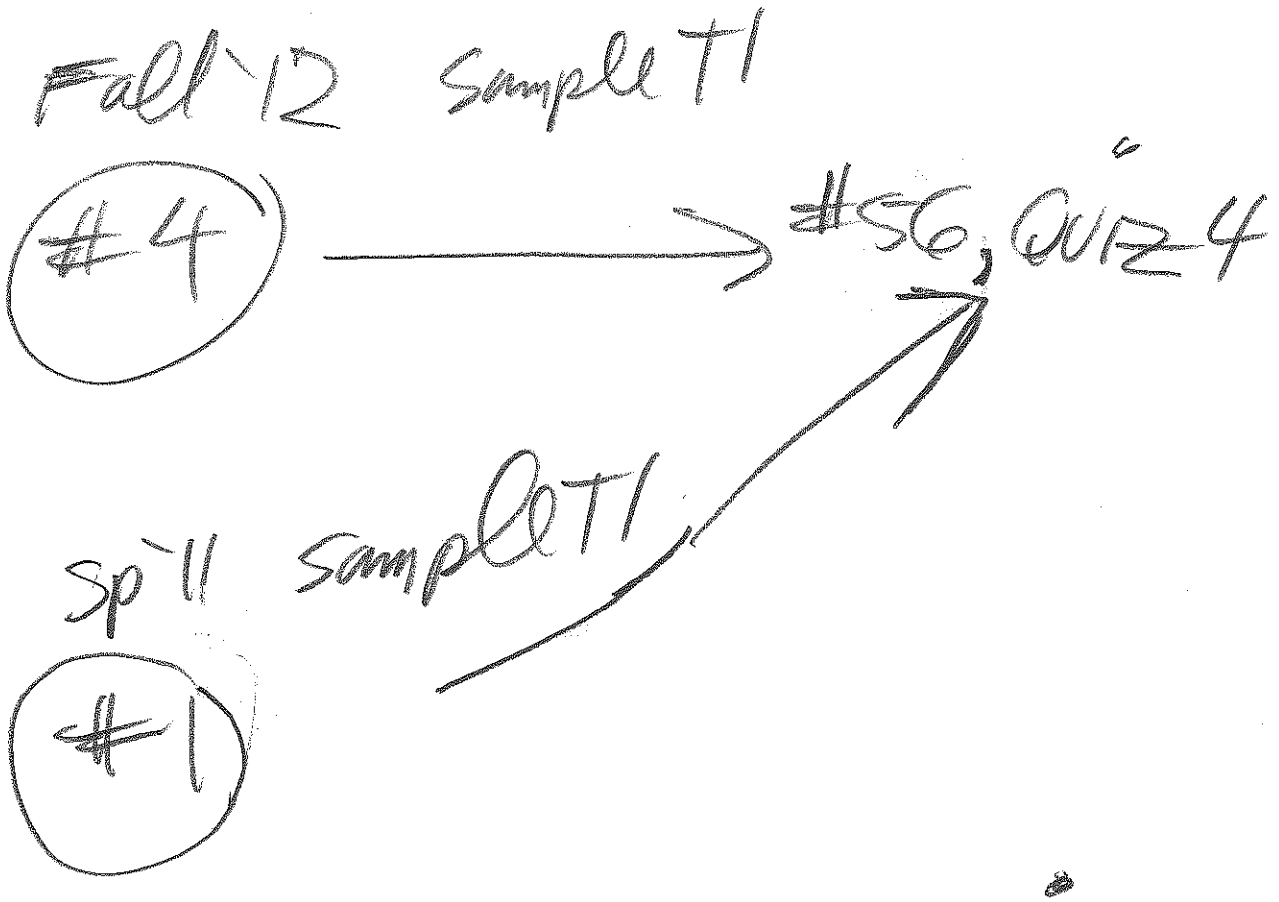


$$D = (15.60260 + 0.45)(3.21) \ (m)$$

$$= 25 \ (m)$$

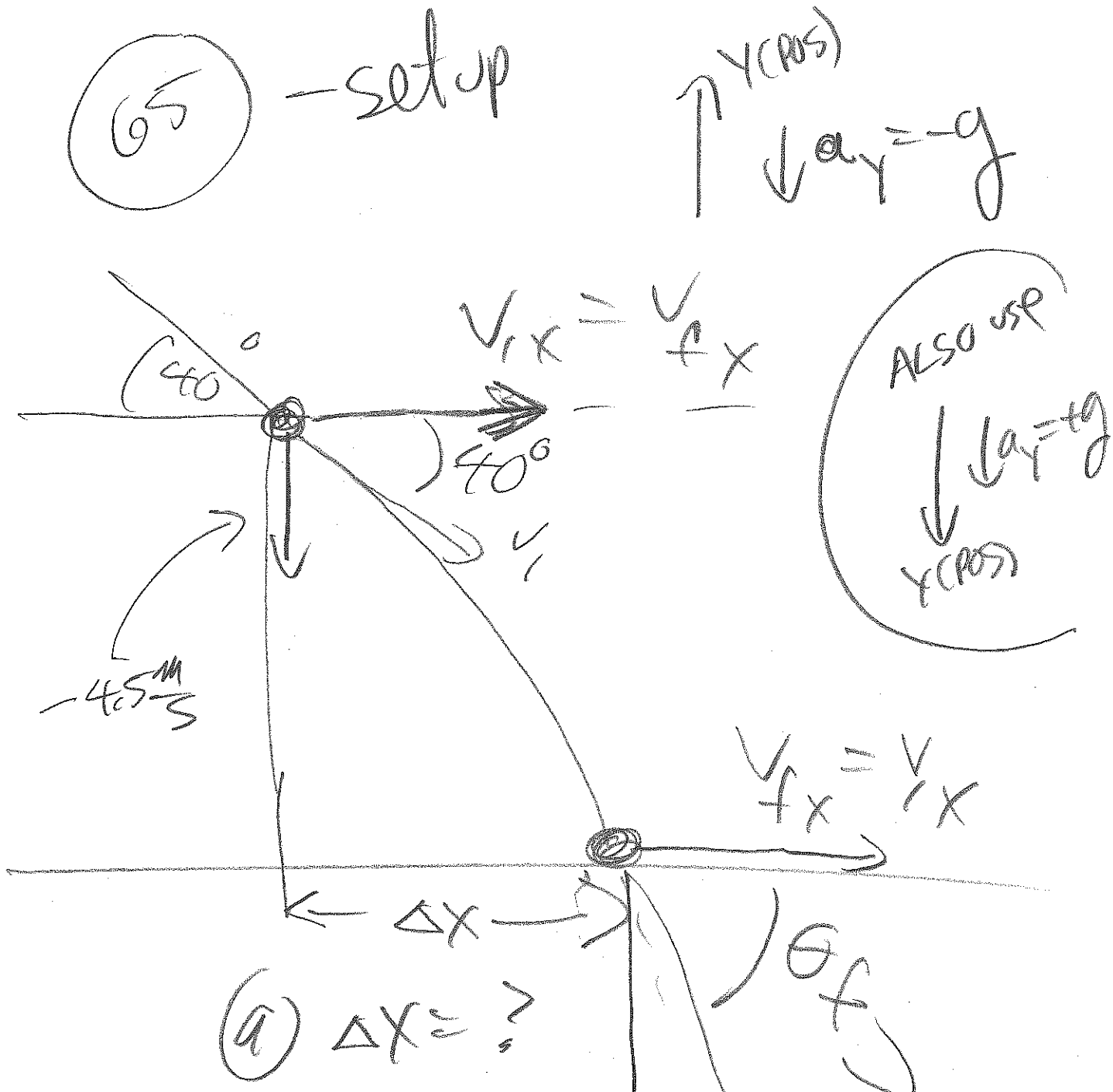
special map

MAP



#1, Sp '11, ST1 = #5604 IN 1-D

(65) - set up



(a) $\Delta x = ?$

way 1

$$V_{fy}^2 = V_{iy}^2 - 2g(-14)$$

$$V_{fy}^2 = (-45\sin 40)^2 + 2g14$$

$$V_{fy}^2 = 49\sin^2 40 + (19.6)(14) = 294.64$$

$$V_{fy} = -\sqrt{294.64} = -17.1 \frac{m}{s} \Rightarrow \Delta t = \frac{-17.1 - (-45)}{-g} = \frac{\Delta V_y}{-g}$$

$$-g = \frac{\Delta V}{\Delta t}$$

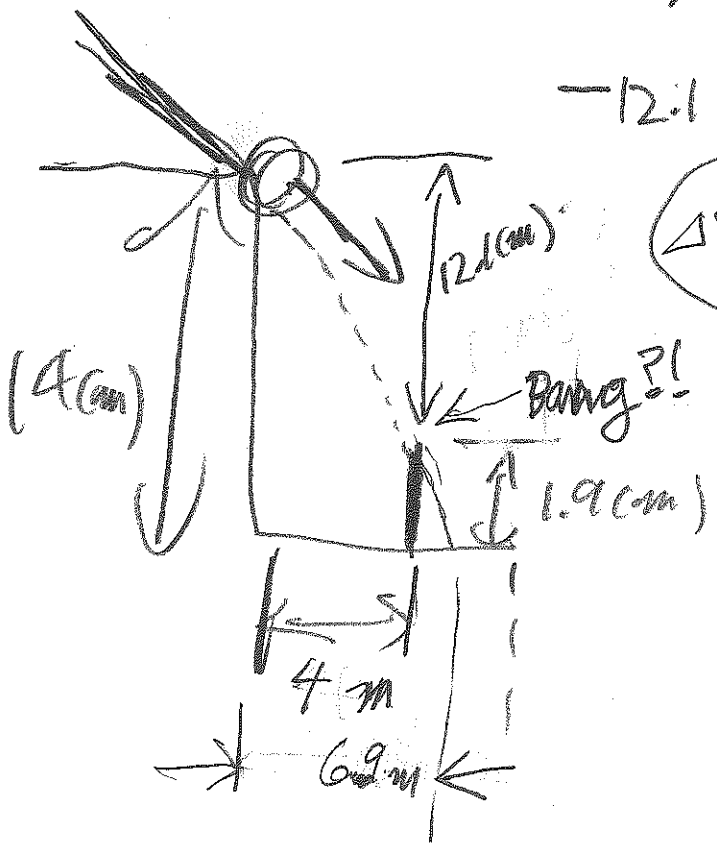
$$\Delta t = \frac{-12.6\ m/s}{-9.8\ m/s^2} = 1.29\ (s)$$

$$\Delta t = 1.29\ (s)$$

$$\Delta x = 7 \cdot \cos 40° \cdot (1.29\ (s))$$

$$= 6.9\ (cm)$$

(b) FOR $\Delta x = 4\ m$, get Δt; CHECK



$$-12.1 = -7\sin 40\,\Delta t - \frac{1}{2} g \Delta t^2$$

$$\Delta y = v_{iy}\Delta t - \frac{1}{2} g \Delta t^2$$

IF ↓ y (cos)

$$\Delta y \stackrel{?}{=} +7\sin 40\,\Delta t + \frac{1}{2} g \Delta t^2$$

$$12.1 \stackrel{?}{=} -7\sin 40\,\Delta t + \frac{1}{2} g \Delta t^2$$