***** Homework Format** for Physics 195A *******

This is an image of what your homework MUST look like.

4 - 38
Chapter problem #

Given: stone thrown from top of building.

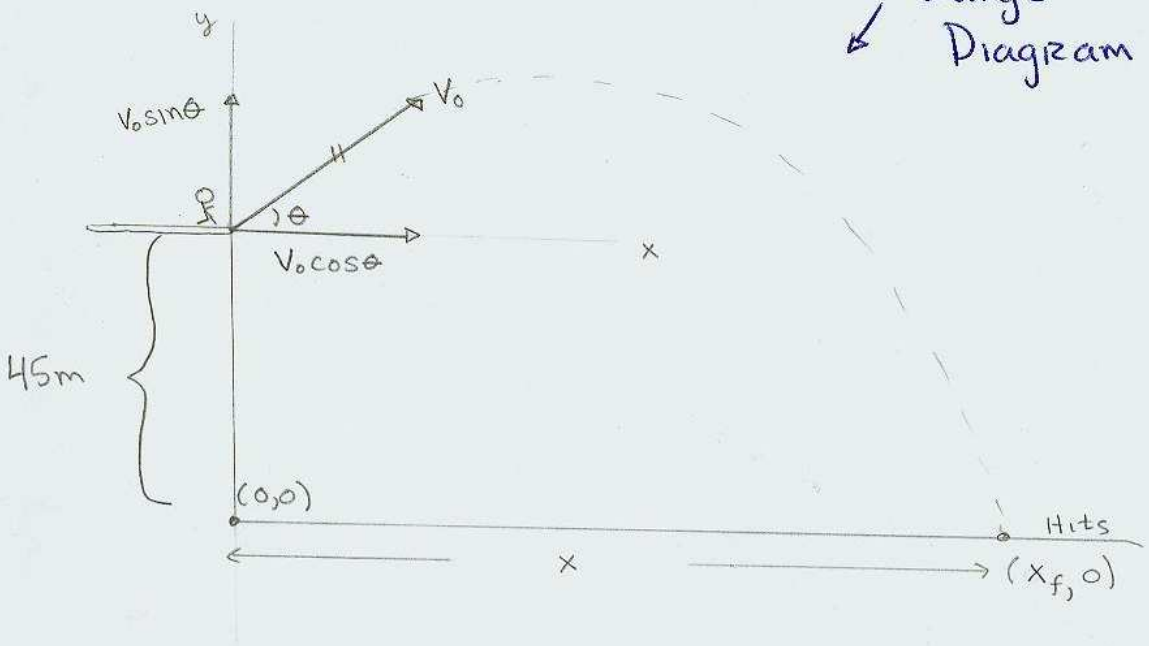
#38 Building Height is 45 m.

$\theta = 30°$

$V_0 = 20\ m/s$

← Given info

Large Diagram ↙



WORK ↙

a) How Long is stone in flight? $t = ?$

$y_f(t) = y_0 + v_{oy} t + \frac{1}{2} a_y t^2$ but $a_y = -9.8\ m/s^2$

$v_{oy} = v_0 \sin\theta = 20\ m/s \sin 30° = 10\ m/s = v_{oy}$ $y_0 = 45m$

When it hits the ground, $y_f = 0$.

$0 = 45m + 10\ m/s\ t + \frac{1}{2}(-9.8\ m/s^2) t^2$

$-4.9t^2 - 10t - 45 = 0$ Quad Eq: USE Calculator

$t = -2.18s$, OR $4.22\ sec$ $\therefore t = 4.22\ sec$ →

Can't be Negative

Your Answer ↓

(a)

$t = 4.22\ sec$

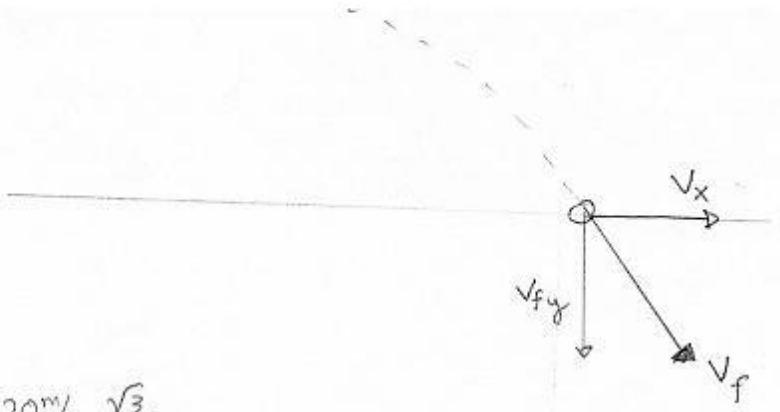
OVER →

4-38 cont

b) Speed of stone as it hits the ground = ?

$V_f = ?$ Note $V_{ox} = V_{fx} = V_o \cos 30°$

Note: This part 'b' would NOT be on the reverse side of part 'a'. It would be on a second sheet of paper.



$V_x = V_o \cos 30° = 20 \text{ m/s} \frac{\sqrt{3}}{2}$

$V_x = 10\sqrt{3} \text{ m/s}$

$V_f = \sqrt{V_x^2 + V_y^2}$ Pythagorean Th^m.

∴ Find V_{fy}:

$V_{fy} = V_{oy} + a_y t = 10 \frac{m}{s} + (-9.8 \frac{m}{s^2})(4.22 \text{ sec})$

$\therefore V_{fy} = -31.4 \text{ m/s}$

$\therefore V_f = \sqrt{V_x^2 + V_y^2} = \sqrt{(10\sqrt{3})^2 \frac{m^2}{s^2} + (-31.4)^2 \frac{m^2}{s^2}}$

$V_f = 35.9 \text{ m/s}$ ⟶ ★ separate parts b & c

Your Answer (b)

$V_f = 35.9 \text{ m/s}$

c) where does it strike the ground? $x_f = ?$ ↑ with a line.

$x_f = x_o + v_{ox} t + \frac{1}{2} a_x t^2 = 0 + V_o \cos\theta \, t = (20 \frac{m}{s})(\cos 30°)(4.22 s)$

$x_f = 73 \text{ m}$ ⟶

(c)

$x_f = 73 \text{ m}$ from base of building.

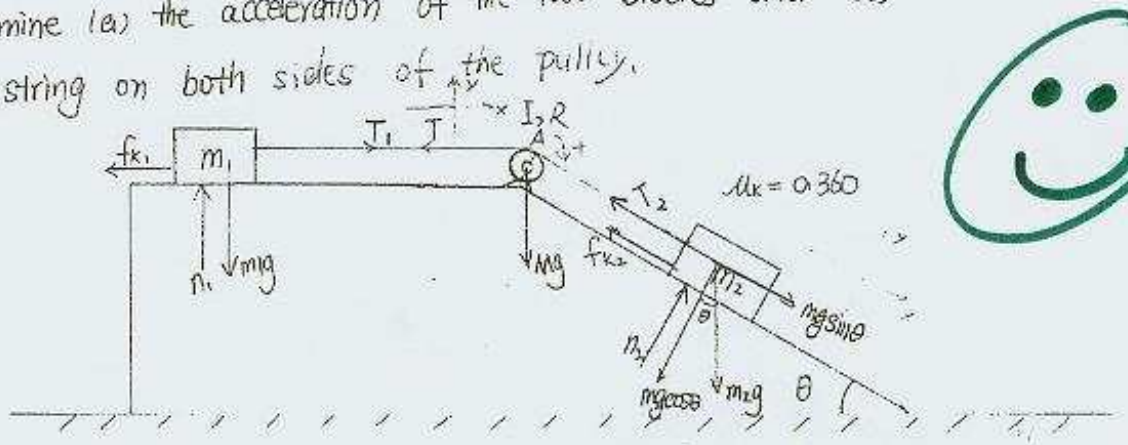
STUDENT SAMPLE: Good!

89. A block of mass $m_1 = 2.00\,kg$ and a block of mass $m_2 = 6.00\,kg$ are connected by a light string that passes over a frictionless pulley. The pulley has the shape of a disk having a mass of $M = 1.00\,kg$ and a radius of $R = 0.100\,m$. The blocks are allowed to move on fixed, rough surfaces, as shown in Figure P10.39. The coefficient of kinetic friction for both blocks is 0.360. Draw free-body diagrams of both blocks and of the pulley. Determine (a) the acceleration of the two blocks and (b) the tensions in the string on both sides of the pulley.

10-39

Note: Please DO NOT write out the entire problem statement. Just put enough of the given information on your paper that allows you to work the problem.

* INSTRUCTOR NOTE: * This is NOT necessary



(a) Find a

#1) $\Sigma F_x = m_1 a$, $T_1 - f_{k1} = m_1 a$ but $f_{k1} = \mu_k n_1 = \mu_k m_1 g$

$$T_1 - \mu_k m g = m_1 a \quad (1)$$

$\Sigma \tau_A = I_A \alpha$, $I_A = \frac{1}{2}MR^2$,

$T_2R - T_1R = \frac{1}{2}MR^2\alpha$.

And $a_{rim} = a_{string} = a_t = a = R\alpha \Rightarrow \alpha = \frac{a}{R}$

$\therefore (T_2 - T_1)R = \frac{1}{2}MR^2\left(\frac{a}{R}\right) \Rightarrow T = \frac{1}{2}Ma$

$$T_2 - T_1 = \tfrac{1}{2}Ma \quad (2)$$

#2) $\Sigma F_x = m_2 a$.

$$m_2 g\sin\theta - T_2 - f_{k2} = m_2 a$$

$$m_2 g\sin\theta - T_2 - \mu_k m_2 g\cos\theta = m_2 a \quad (3)$$

(1)+(3), $T_1 - T_2 + m_2 g\sin\theta - \mu_k m g - \mu_k m_2 g\cos\theta = (m_1 + m_2)a$ (4)

Sub (2) into (4),

$$m_2 g\sin\theta - \mu_k m_1 g - \mu_k m_2 g\cos\theta = (m_1 + m_2 + \tfrac{1}{2}M)a$$

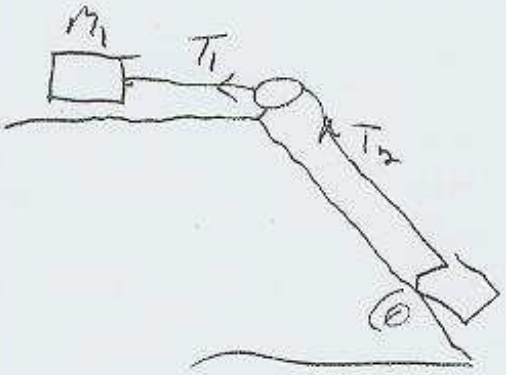
$$\therefore a = \frac{m_2 g\sin 30^\circ - \mu_k m_1 g - \mu_k m_2 g\cos 30^\circ}{m_1 + m_2 + \frac{1}{2}M}$$

$$= \frac{(6.00\,kg)(9.80\,m/s^2)\sin 30^\circ - (0.360)(2.00\,kg)(9.80\,m/s^2) - (0.360)(6.00\,kg)(9.80\,m/s^2)\cos 30^\circ}{6.00\,kg + 2.00\,kg + \frac{1}{2}(1.00\,kg)}$$

$$= 0.309\,m/s^2$$

(a) $\Rightarrow 0.309\,m/s^2$

Student Sample: Bad!



10-39

$mg = 18.6N$
$N = 19.1N$
$\mu_k = 7.06N$

$\Sigma F_x = T - \mu_k$

$mg\cos\theta = 51.0N$
$mg\sin\theta = 29.4N$
$N = 29.4N$
$\mu_k = 10.58N$
$\Sigma F_x = 51.0 - 10.6N$