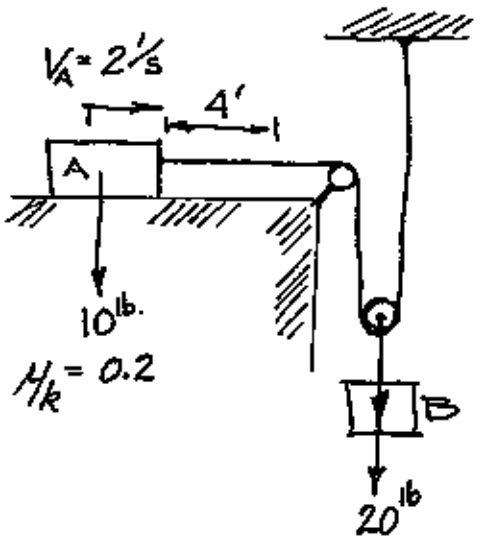
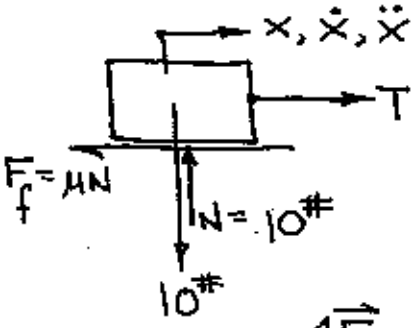
HIBBELER

PROB 13-22

PULLEYS, WEIGHTS, MOTION IN 2 DIRECTIONS.

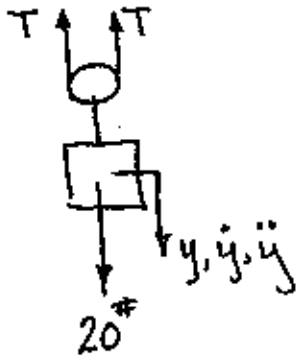


- ISOLATE MASSES & DIRECTIONS.
- APPLY NEWTON'S 2nd. LAW TO EACH MASS.
- SOLVE SIMULTANEOUSLY.



$\mu N = (0.2)(10^{\#})$

$F_f = 2^{\#}$



$$\Sigma \vec{F}_x = m\vec{a}_x$$

$$T - \mu N = \left(\frac{10^{lb_f}}{32.2'/s^2}\right)\vec{a}_x \quad (1.)$$

$$\Sigma \vec{F}_y = m\vec{a}_y$$

$$2T - 20^{\#} = \left(\frac{20^{lb}}{32.2'/s^2}\right)\vec{a}_y$$

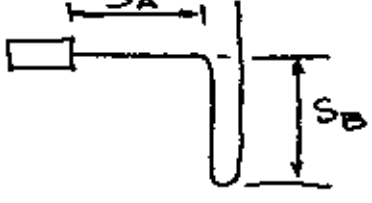
$$\boxed{T = 10^{\#} + \frac{10}{32.2}a_y} \quad (2.) \text{ sub. into } (1.)$$

$$(1.)\quad \left[10^{\#} + \frac{10}{32.2}a_y\right] - 2^{\#} = \frac{10}{32.2}a_x$$

$$\frac{32.2}{10}\left[8 + \frac{10}{32.2}a_y\right] = \boxed{a_x = 25.76 + a_y} \quad (3.)$$

RELATIONSHIP

NEED TO USE RELATION OF DISTANCE.



CABLE LENGTH = CONSTANT

$$s_A + 2s_B = L$$

$$\dot{s}_A + 2\dot{s}_B = 0$$

$$\ddot{s}_A + 2\ddot{s}_B = 0$$

$$\boxed{a_A = -2a_B} \text{ sub. } (3.)$$

$$(3.)\quad -2a_y = 25.76 + a_y$$

$$a_y = \frac{25.76}{-3} = -8.6'/s^2 \therefore a_x = +17.2'/s^2$$

back sub. into (2.) Solve for T

$$T = 10^{\#} + \frac{10}{32.2}\left(-8.6\,\frac{1}{s^2}\right) = \boxed{7.33^{\#} = T}$$

? V_A when BLOCK A has moved 4' ?

SINCE TIME IS NOT A FACTOR, USE THE EQ. THAT RELATES DIST., VEL., & ACC.

$$2a_x(s - s_0) = V^2 - V_0^2$$

where

$s = 4'$

$s_0 = 0$

$V = ?$

$V_0 = 2\,\frac{1}{s}$

$a_A = 17.2\,\frac{1}{s^2}$

$$2\left(17.2\,\frac{1}{s^2}\right)(4') + \left(2\,\frac{1}{s}\right)^2 = V^2$$

$$\sqrt{\qquad} = V$$

$$V = 11.899 \doteq \boxed{11.9\,\frac{1}{s} = V}$$