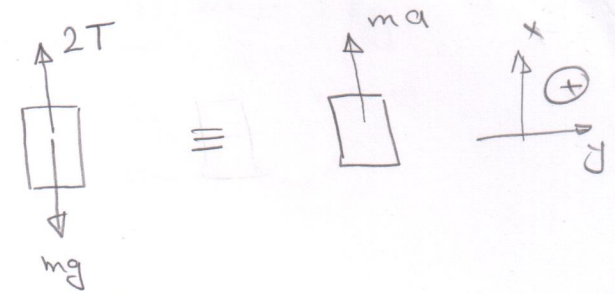
13.7

$m = 500\ kg$

$s = 0$ when $t = 0$ $\quad v_0 = 0$

$s = 2.5\ m$ ~ $\quad t = 1.5\ sec$



calculate T

$\Sigma F_x = ma$

$\Sigma F_y = 0$

$2T - mg = ma$

$$T = \frac{500a + 5000}{2}$$

for a const accel.

$v = v_0 + at$

$v^2 = v_0^2 + 2as$

$s = v_0 t + \frac{1}{2} a t^2$

sub. by I.V.

$s = v_0 t + \frac{1}{2} a t^2$

$2.5 = 0 + \frac{1}{2} a (1.5)^2 \quad \therefore \quad a = \frac{2.5 * 2}{(1.5)^2} = 2.22\ m/s^2$

$$T = \frac{500 * 2.22 + 500 * 9.81}{2}$$

$= 3008\ N$

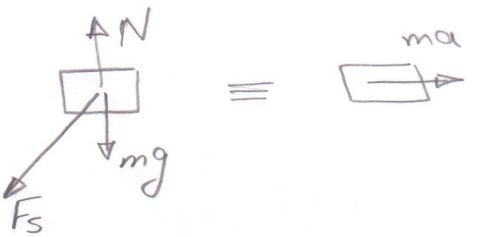
13.17

$w = 10\ N \qquad K = 65\ N/m$

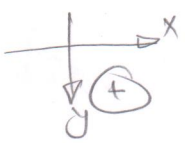
$s = 0 \longrightarrow F_s = 0,\ v_0 = 4.5\ m/s$

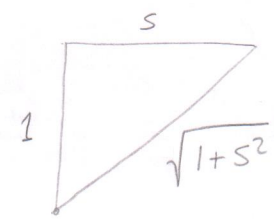
$v = ?$ at $s = 1\ m$

$l_0 = 1\ m \qquad L = \sqrt{1 + s^2}$



$F_s = K(L - l_0)$





$\Sigma F_x = 0$

$$ma = -F_s * \frac{s}{\sqrt{1+s^2}} \longrightarrow (1)$$

$\Sigma F_y = 0$

$$mg + F_s * \frac{1}{\sqrt{1+s^2}} - N = 0 \longrightarrow (2)$$

$$a = -\frac{K}{m}\,\frac{\left(\sqrt{1+s^2}-1\right)s}{\sqrt{1+s^2}}$$

$$= -65\left(s - \frac{s}{\sqrt{1+s^2}}\right)$$

$$a = f_n(s) \qquad \therefore\ a = v\frac{dv}{ds}$$

$$v\frac{dv}{ds} = -65\left(s - \frac{s}{\sqrt{1+s^2}}\right)$$

$$\int_{4.5}^{v} v\,dv = -65\int_{0}^{s}\left[s - \frac{s}{\sqrt{1+s^2}}\right]ds$$

$$\left[\frac{v^2}{2}\right]_{4.5}^{v} = -65\left[\frac{s^2}{2} - \sqrt{1+s^2}\right]_0^s$$

$$v^2 - (4.5)^2 = -65*2\left(\frac{s^2}{2} - \sqrt{1+s^2} + 1\right)$$

$$\boxed{v^2 = 20.25 - 130\left(\frac{s^2}{2} + 1 - \sqrt{1+s^2}\right)}$$

at $s = 1$ m

$$v = \sqrt{20.25 - 130\left(1 + \frac{1}{2} - \sqrt{2}\right)}$$

$= 3.02$ m/s

3.05 m/s

$w = mg$

$10 = m * 10$

$\therefore m = 1$ Kg

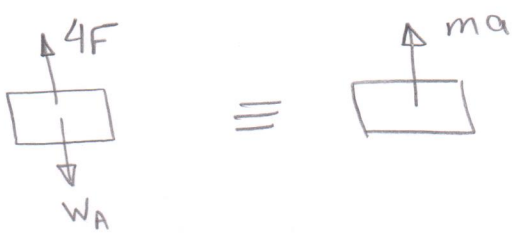
13.25

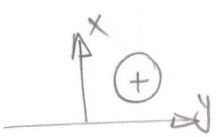
$W_A = 150$ N $\qquad m = 15$ Kg

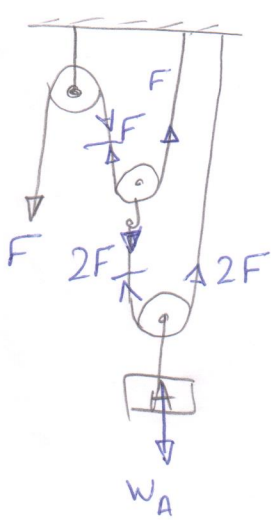
$s = 1$ m $\qquad v = 3.6$ m

$s = 0 \qquad v_0 = 0 \longrightarrow$ start from rest.

determine F







for a = Cond.

$v = v_0 + at$

$v^2 = v_0^2 + 2as$

$s = v_0 t + \frac{1}{2}at^2$

$\Sigma F_x = \cancel{0}\ ma$

$4F - W_A = ma$

$$F = \frac{ma + W_A}{4}$$

* for saying Constant force ∴ Constant acceleration.

$v^2 = v_0^2 + 2as$

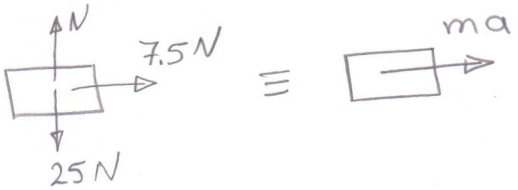
$(3.6)^2 = 0 + 2 * a * 1$

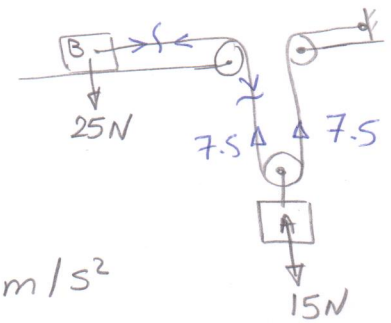
$$\therefore a = \frac{(3.6)^2}{2} = 6.48 \ m/s$$

sub.

$$F = \frac{15 * 6.48 + 150}{4} = 61.8 \ N$$

13.27





$\Sigma F_x = 0$

$7.5 = ma$ $\quad \therefore a = \frac{7.5}{2.5} = 3 \ m/s^2$

this of 15 N is acted on the attached cord

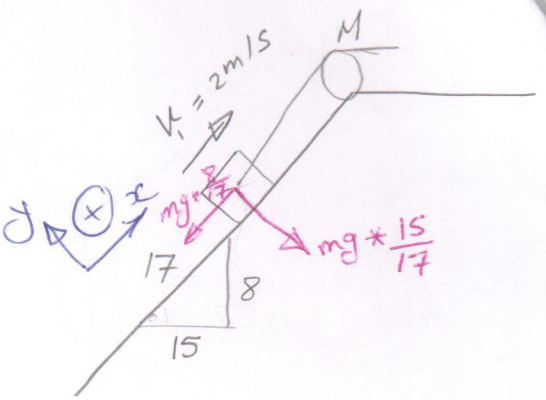
* for using a A block of 15N weight

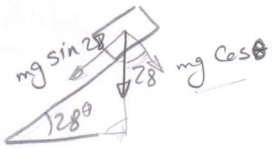
13.29

$m = 400\ kg$ $\quad F = (3200t^2)\ N$

I.V. $\quad v_0 = 2\ m/s \quad s = 0 \quad t = 0$

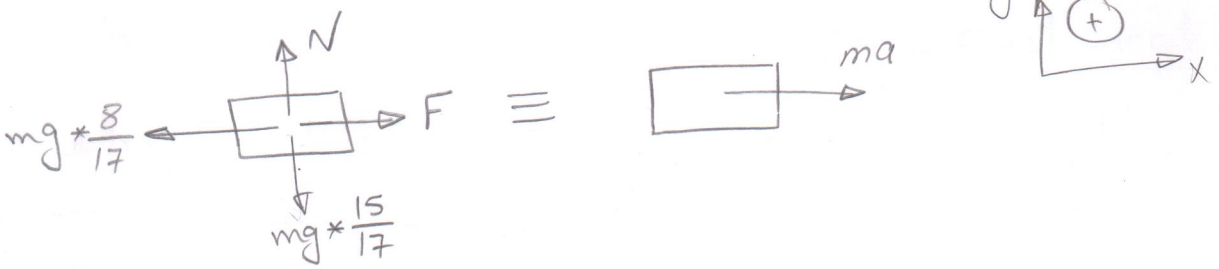
determine (at $t = 2\ sec$) $\quad s = ?$





$$\cos\theta = \frac{15}{17}$$

$$\sin\theta = \frac{8}{15}$$



$$\Sigma F_x = ma$$

$$F - 400 * 9.81 * \frac{8}{17} = 400\ a$$

$$a = \frac{3200t^2}{400} - 9.81 * \frac{8}{17}$$

$$\boxed{a = 8t^2 - 4.6}$$

$$a = \frac{dv}{dt}$$

$$\int_2^v dv = \int_0^t (8t^2 - 4.6)\,dt$$

$$v - 2 = \left[\frac{8t^3}{3} - 4.6t\right]_0^t$$

$$\boxed{v = 2.67t^3 - 4.6t + 2}$$

$$v = \frac{ds}{dt}$$

$$\int_0^s ds = \int_0^t (2.67t^3 - 4.6t + 2)\,dt$$

$$s = \left[0.67t^4 - 2.3t^2 + 2t\right]_0^t$$

$$\boxed{s = 0.67t^4 - 2.3t^2 + 2t}$$

at $t = 2$ sec

$$s = 0.67(2)^4 - 2.3(2)^2 + 2(2)$$

$$= 5.43\ m$$