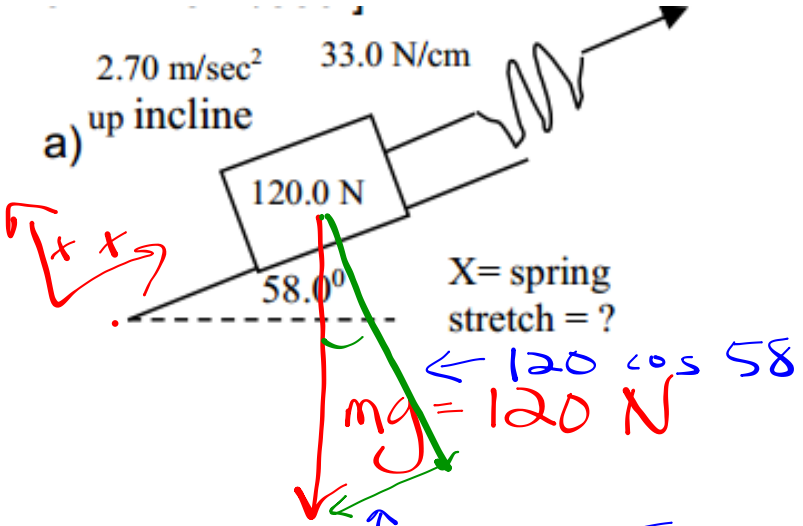


Equations:

$\Sigma F_x = ma_x$

$\Sigma F_y = ma_y$

$\Sigma F = ma$

$F_{spring} = kx$

$F_{Friction} = \mu F_N$

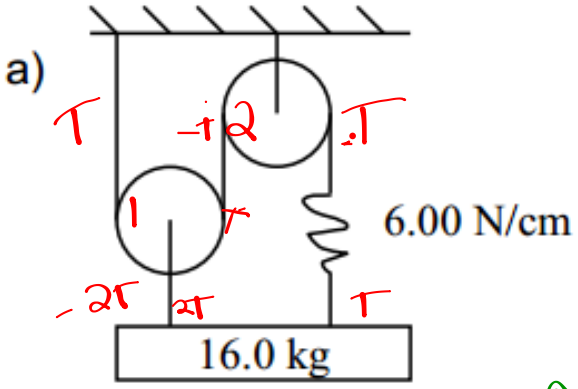
(motion) $F_{fr} = \mu_K F_N$

$F_{fr(max)} = \mu_S F_N$

$\tau = F_\perp \ell$

$\Sigma \tau = 0$ (static situations)

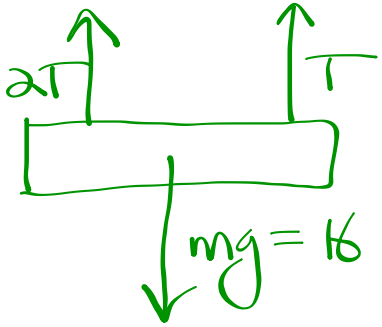
a)



$F_{spring} = kx$

$53N = 6\frac{N}{cm} \cdot x$

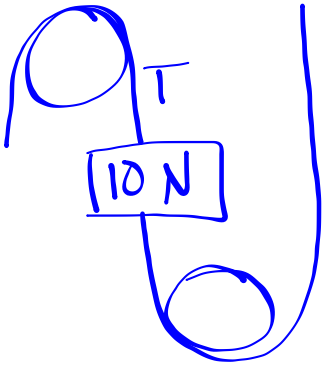
$x \approx 8.8\,cm$

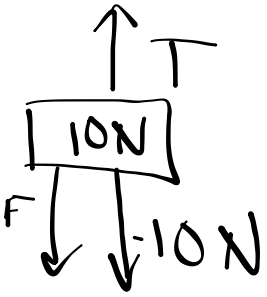


$\Sigma F_y = 2T + T - 160 = 0$

$3T = 160$

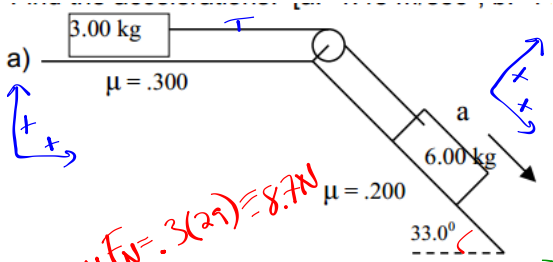
$T = 53N$





$\Sigma F_y = T + -F + -10 = 0 \quad -F$

$F = T - 10$



$F_{fr} = \mu F_N = .3(29) = 8.7N$

F_N 29N $mg = 3 \cdot 9.8 = 29\ N$

$\Sigma F_y = F_N - 29N = 0$

$F_N = 29N$

$\Sigma F_x = -8.7N + T = (3)a$

$a = \frac{-8.7N + T}{3}$

$\mu F_N = F_{fr}$

$(.2)(48.6) = 9.7N$

$-58\cos 33$

$58\sin 33$

$mg = 6 \cdot 9.8 = 58N$

$\Sigma F_y = F_N - 58\cos 33 = 0$

$F_N = 48.6N$

$\Sigma F_x = -9.7N + -T + 31.6 = (6)a$

$a = \frac{-9.7N + -T + 31.6}{6}$

$6 \cdot \frac{(-8.7 + T)}{3} = \frac{(21.9 - T)}{6} \cdot 3$

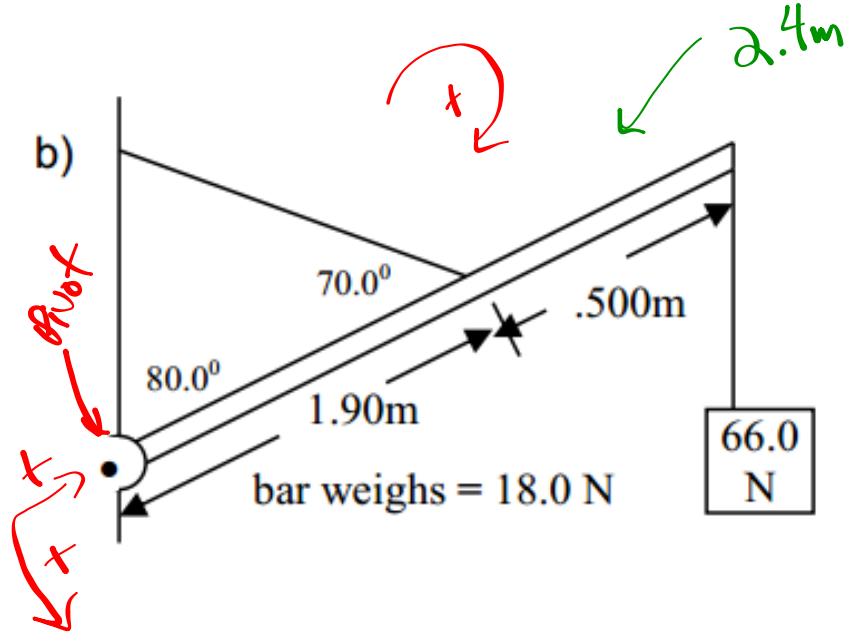
$-52.2 + 6T = 65.7 - 3T$

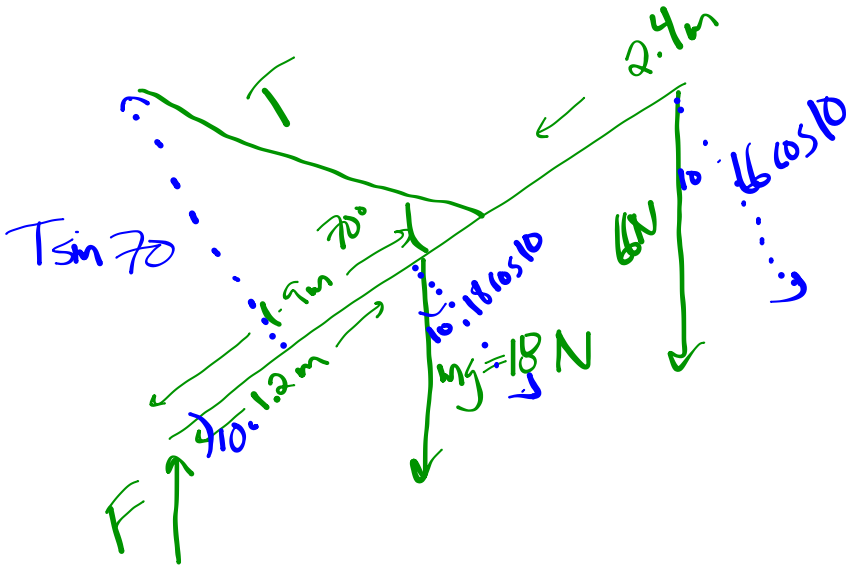
$9T = 117.9$

$T = 13.1\ N$

$a = \frac{-8.7 + 13.1}{3}$

$a = 1.47\ m/s^2$



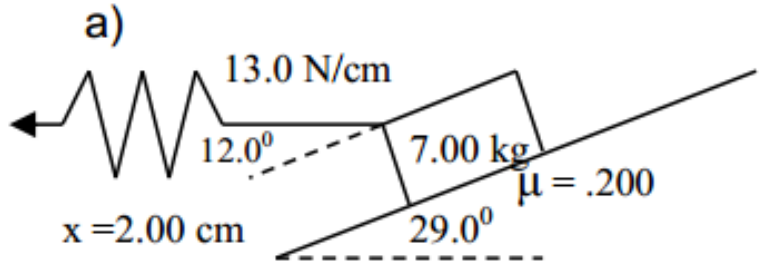


$$\sum \tau = F(0) - T(\sin 70)(1.9) + 18(\cos 10)(1.2) + 66(\cos 10)(2.4)$$

$$-1.8T + 21.3 + 156 = 0$$

$$-1.8T = -177.3$$

$$T = 98.5\,N$$



$x_0 = 0$ $\quad x = x_0 + v_0 t + \frac{1}{2}at^2$

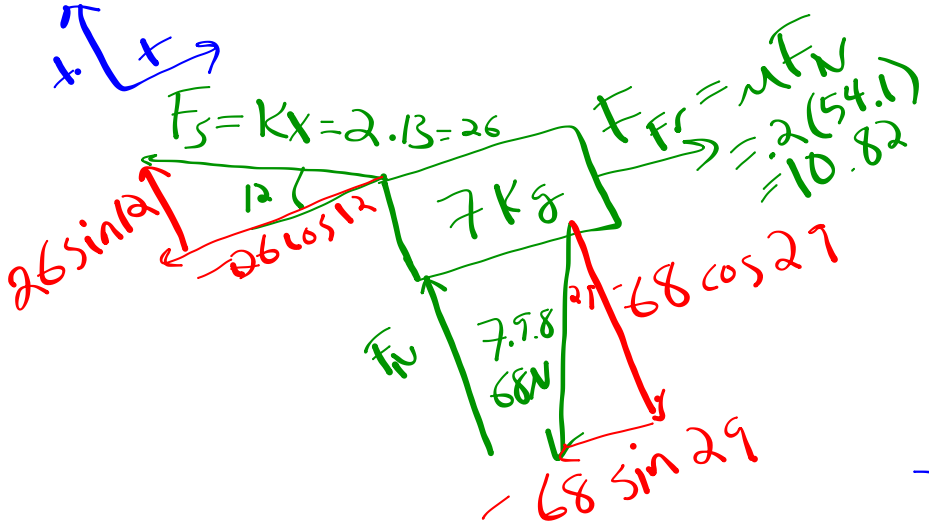
$x = -48$ $\quad -48 = \frac{1}{2}(-6.8)t^2$

$v_0 = 0$

$v =$ $\quad t = 3.8\,s$

$a = -6.8$

$t = 3.8\,s$ $\quad v = v_0 + at = -6.8 \cdot 3.8 = -25.84\ m/s$



$\sum F_y = F_N - 68\cos 29 + 26\sin 12 = 0$

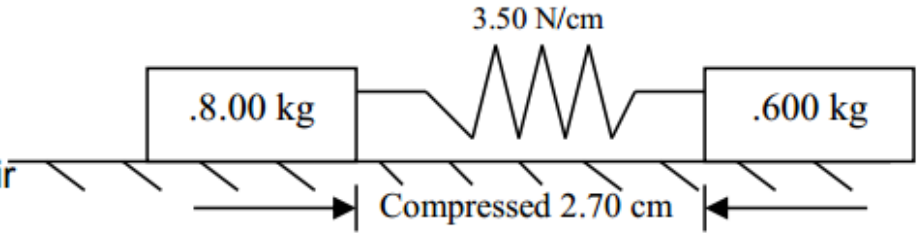
$F_N = 54.1\,N$

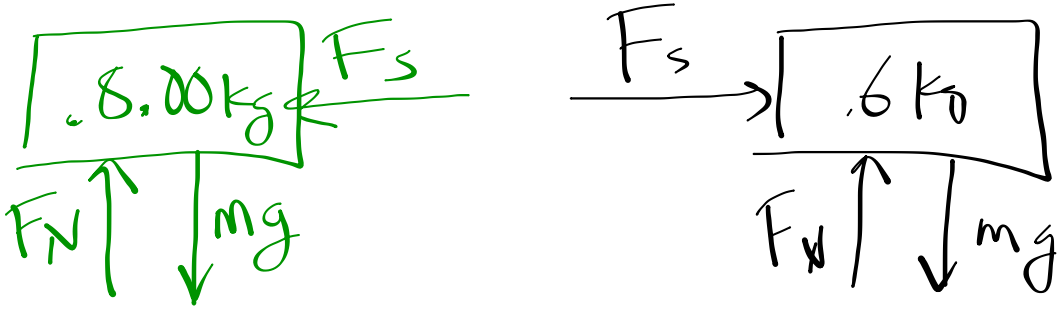
$\sum F_x = -26\cos 12 + 10.82 - 68\sin 29 = ma$

$-25.4 + 10.82 - 33 = 7(a)$

$a = -6.8\ m/s^2$

19. Two masses are scrunched 2.70 cm together against a 3.50 N/cm spring. What is the acceleration of each immediately after their release? [11.8 m/sec^2, 15.8 m/sec^2]

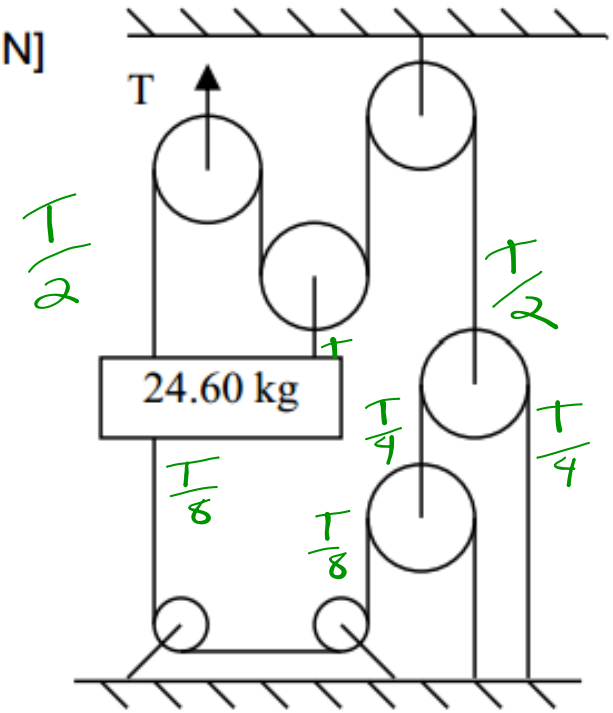


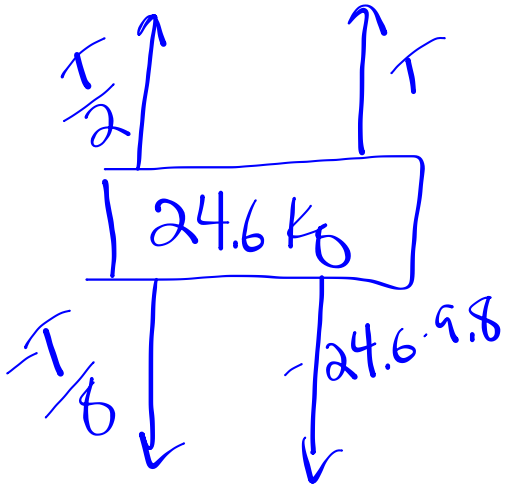


$F_s = kx = 3.5 \cdot 2.7 = 9.45N$

175.3 N]

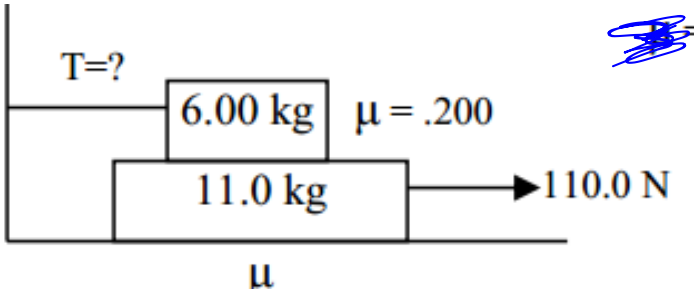
b)

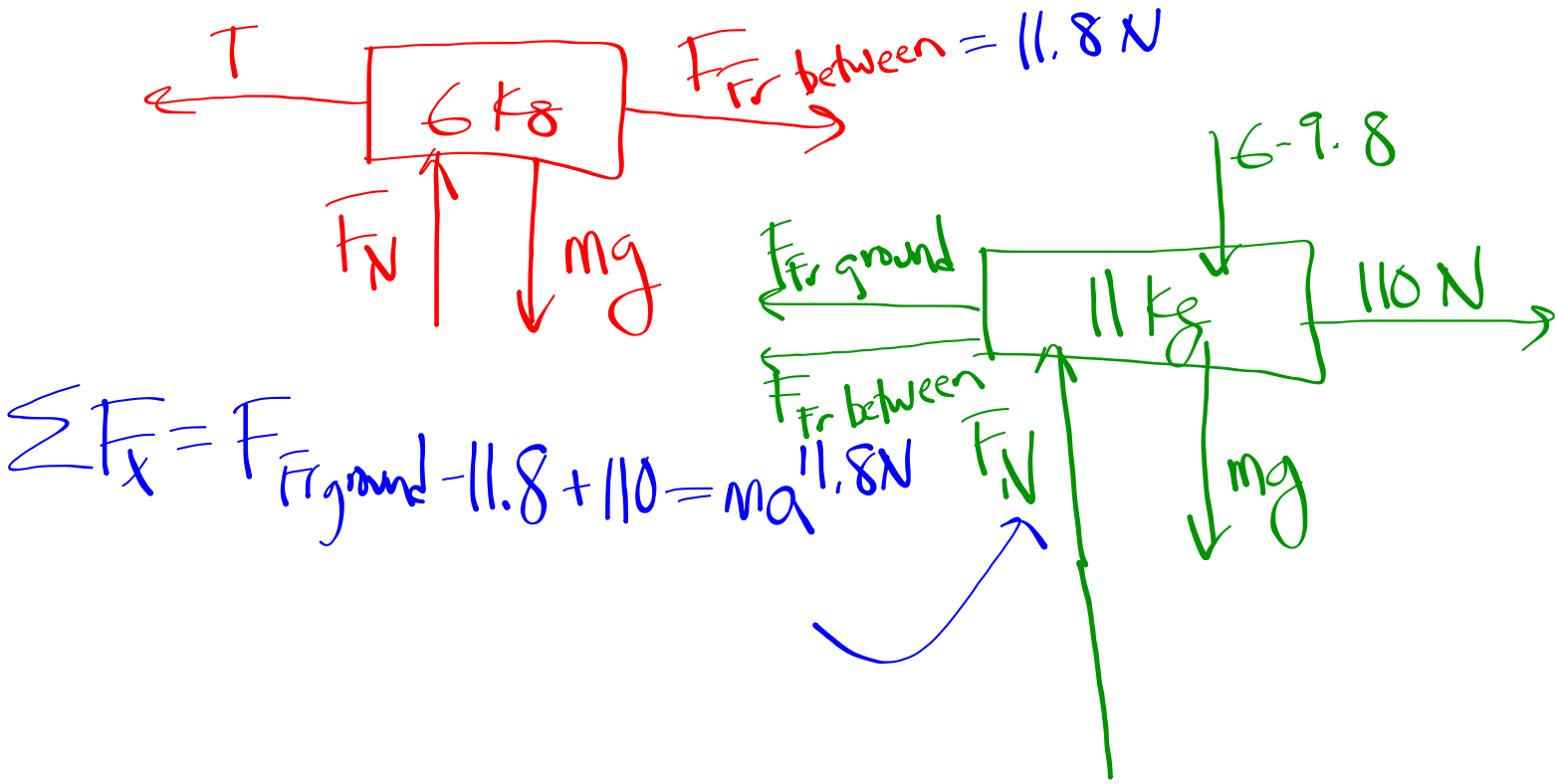




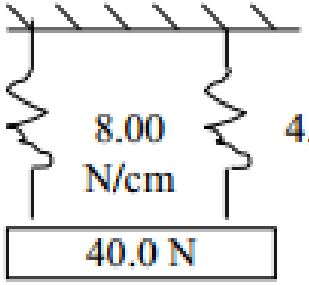
$$\Sigma F_x = \frac{T}{2} + T + \frac{-T}{8} + -(24.6)(9.8) = 0$$

25. A 110.0 N force is applied to the bottom block. This block accelerates at 4.0 m/sec^2. a) What is μ? b) What is T? [.326, 11.8 N]





b)



Assume the deflection is the same in each spring.

$F_{S1} = 8x$

$F_{S2} = 4x$

$F_{S1} = kx = 8x$

$F_{S2} = kx = 4x$

40 N

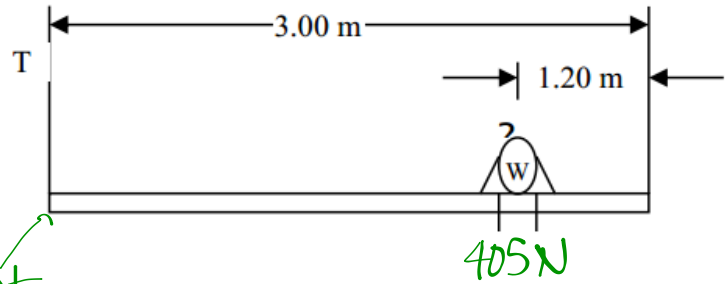
40N

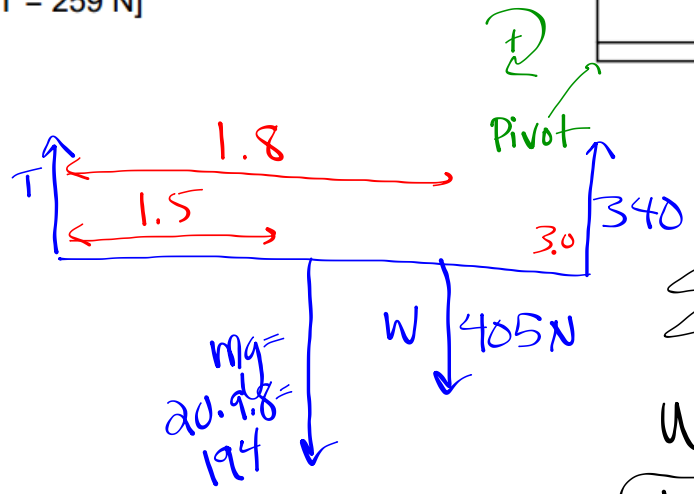
$\Sigma F_y = 8x + 4x - 40 = 0$

$12x = 40$

$x = 3.3$

10. A painter sits on a 20.0-kg scaffolding, 3.00 m long. If the tension in the right hand rope is 340.0 N, what is the weight of the painter? What is the tension in the left hand rope? [W = 403 N; T = 259 N]





$\Sigma\tau = T\cdot 0 + 194(1.5) + W(1.8) - 340(3) = 0$

$W = \frac{340(3) - 194(1.5)}{1.8}$

$W = 405\,N$

$\Sigma F_y = T + 194 - 405 + 340 = 0$

$T = 260\,N$