PHYS 1050
Tutorial 2

Yutong Zhao

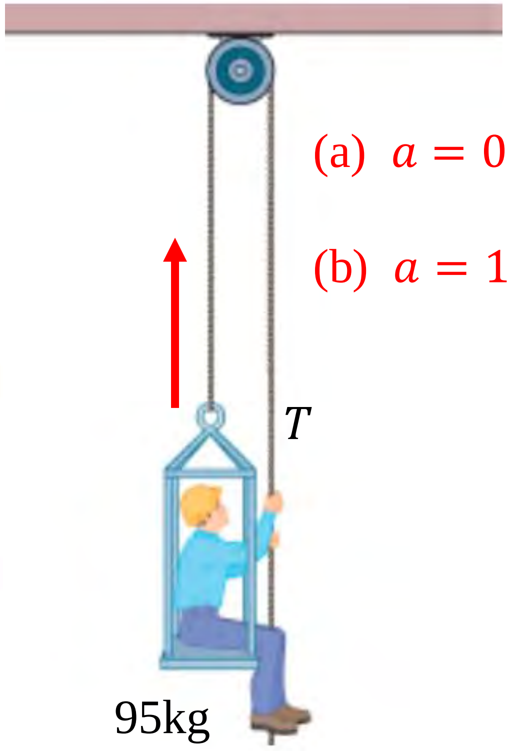
Department of Physics and astronomy

University of Manitoba

Feb 7th 2019

chapter 5 - problem 58

Figure 5-53 shows a construction worker sitting in a bosun's chair that dangles from a massless rope, which runs over a massless, frictionless pulley and back down to the worker's hand. The combined mass of worker and chair is 95.0 kg. With what force magnitude must the worker pull on the rope if they are to rise (a) with a constant velocity and (b) with an upward acceleration of 1.30 m/s^2? (*Hint:* A free-body diagram can really help.) If the rope on the right extends to the ground and is pulled by a co-worker, with what force magnitude must the co-worker pull for the seated worker to rise (c) with a constant velocity and (d) with an upward acceleration of 1.30 m/s^2? What is the magnitude of the force on the ceiling from the pulley system in (e) part a, (f) part b, (g) part c, and (h) part d?



(a) $a = 0$

(b) $a = 1.3m/s^2$

(a)

$$2T = mg$$

$$T = \frac{mg}{2} = 465.5N$$

(b)

$$2T = mg + ma$$

$$T = \frac{m(g+a)}{2} = 527.25N$$

(c)

$$T = mg = 931N$$

(d)

$$T = mg + ma = 1054.5N$$

(e)

$$F = 2T = mg = 931N$$

(f)

$$F = 2T = mg + ma = 1054.5N$$

(g)

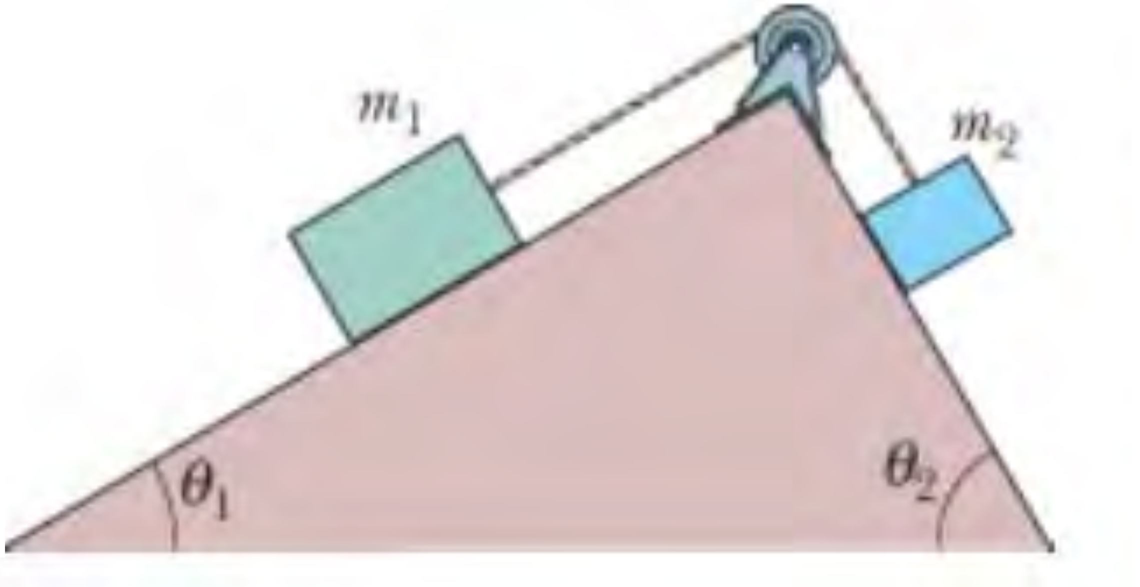
$$F = 2T = 1862N$$

(h)

$$F = 2T = 2109N$$

chapter 5 - problem 71

Figure 5-60 shows a box of dirty money (mass $m_1 = 3.0$ kg) on a frictionless plane inclined at angle $\theta_1 = 30°$. The box is connected via a cord of negligible mass to a box of laundered money (mass $m_2 = 2.0$ kg) on a frictionless plane inclined at angle $\theta_2 = 60°$. The pulley is frictionless and has negligible mass. What is the tension in the cord?

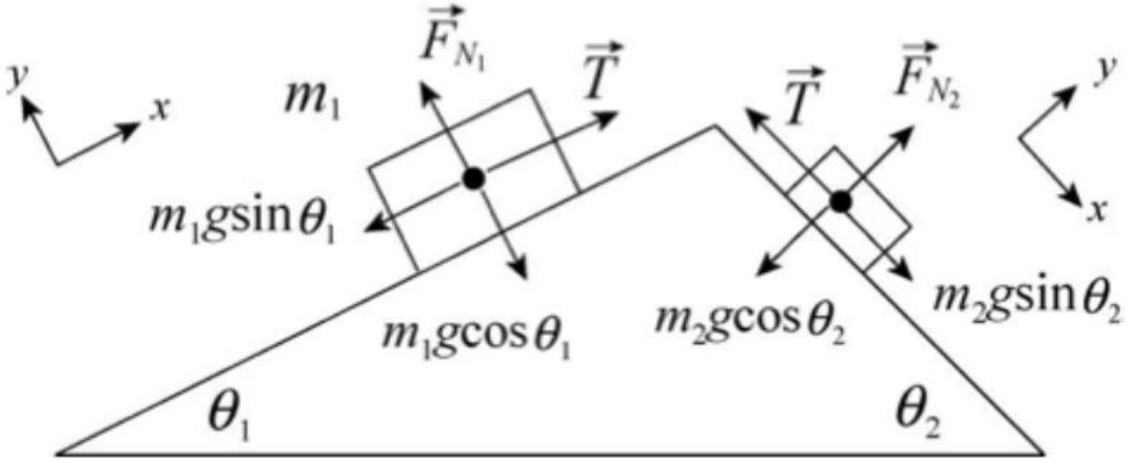


$$T - m_1 g \sin\theta_1 = m_1 a$$

$$m_2 g \sin\theta_2 - T = m_2 a$$

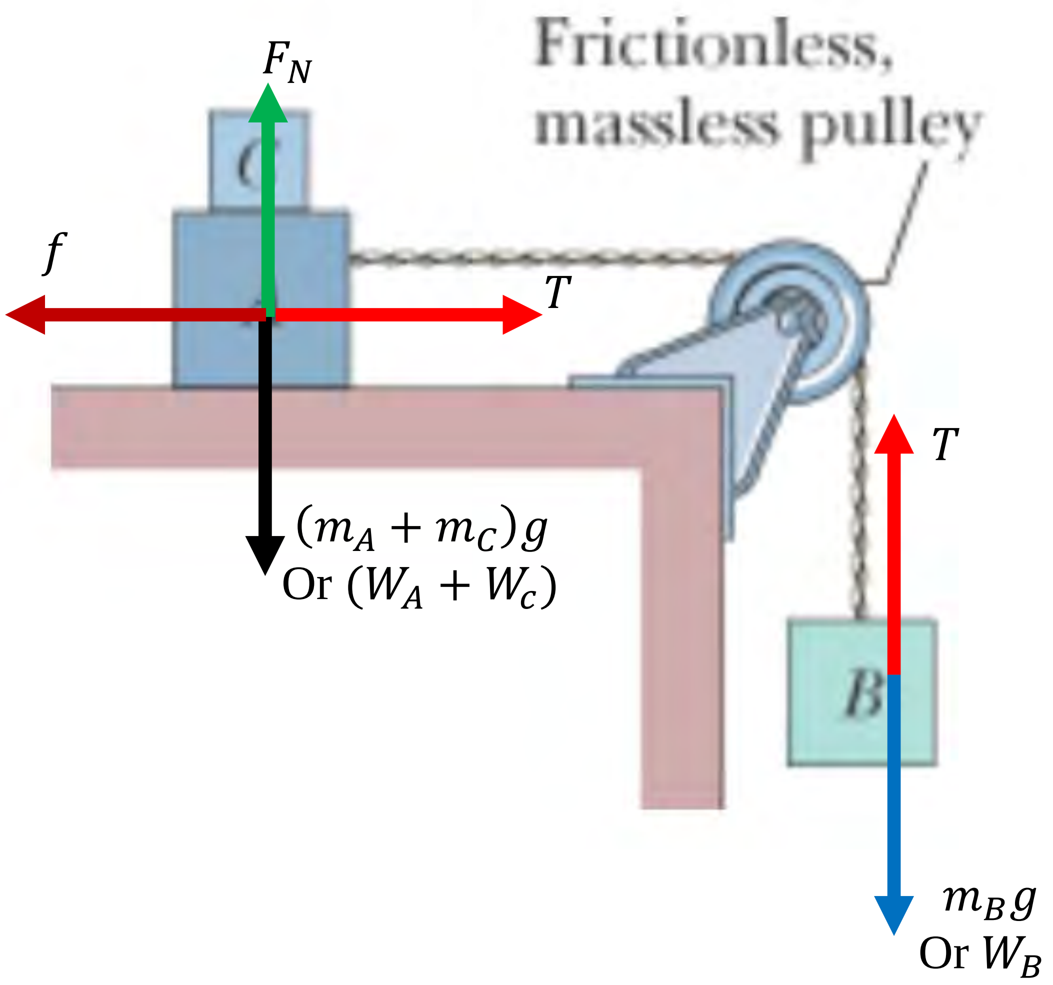
$$a = \left(\frac{m_2 \sin\theta_2 - m_1 \sin\theta_1}{m_2 + m_1}\right) g$$

$$T = \frac{m_1 m_2 g}{m_2 + m_1}(\sin\theta_2 + \sin\theta_1) = 16.1\,\mathrm{N}$$



chapter 6 - problem 29

In Fig. 6-34, blocks *A* and *B* have weights of 44 N and 22 N, respectively. (a) Determine the minimum weight of block *C* to keep *A* from sliding if μ_s between *A* and the table is 0.20. (b) Block *C* suddenly is lifted off *A*. What is the acceleration of block *A* if μ_k between *A* and the table is 0.15?



(a)

$$f = (W_A + W_C) \times \mu_s = W_B$$

$$W_C = \frac{W_B}{\mu_s} - W_A = 110N - 44N = 66N$$

(b)

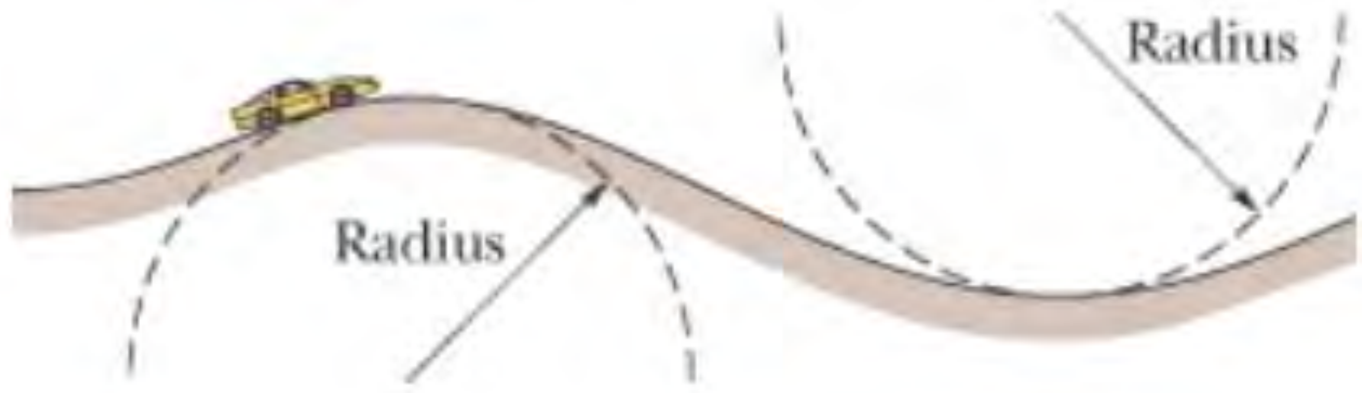
$$T - f = (m_A + m_B)a$$

$$W_B - \mu_k W_A = (m_A + m_B)a$$

$$a = \frac{W_B - \mu_k W_A}{W_A/g + W_B/g} = 2.3m/s$$

chapter 6 - problem 49

In Fig. 6-39, a car is driven at constant speed over a circular hill and then into a circular valley with the same radius. At the top of the hill, the normal force on the driver from the car seat is 0. The driver's mass is 70.0 kg. What is the magnitude of the normal force on the driver from the seat when the car passes through the bottom of the valley?



Top:

$$F_N = m\left(g - \frac{v^2}{r}\right) = 0$$

$$v^2 = g \times R$$

Bottom:

$$F_N = m\left(g + \frac{v^2}{r}\right)$$

$$= m\left(g + \frac{g \times R}{R}\right)$$

$$= 2mg = 1372N$$