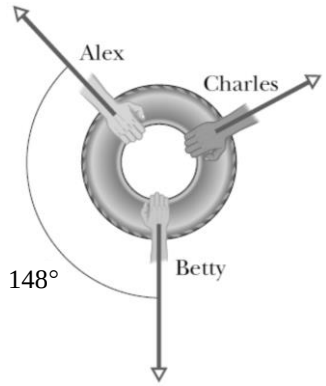
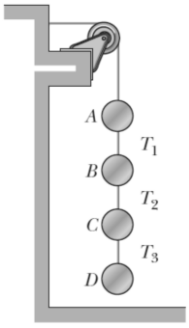
- For material covering Ch. 5.
- Due Friday, Sept. 19 at 5 pm

1. Only two horizontal forces act on a 1.5 kg body. One force is 4.6 N, acting due east, and the other is 8.3 N, acting 39° north of west. What is the magnitude of the body's acceleration?
[Answer: 3.7 m/s^2].

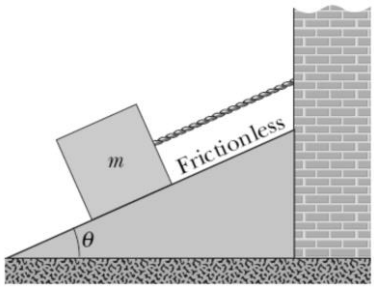
2. In a two-dimensional tug-of-war, Alex, Betty, and Charles pull horizontally on an automobile tire at the angles shown in the picture. The tire remains stationary in spite of the three pulls. Alex pulls with force $\vec{F}_A$ of magnitude 207 N, and Charles pulls with force $\vec{F}_C$ of magnitude 182 N. Note that the direction of $\vec{F}_C$ is not given. What is the magnitude of Betty's force $\vec{F}_B$? [Answer: 320 N].



3. The figure shows an arrangement in which four disks are suspended by cords. The longer, top cord loops over a frictionless pulley and pulls with a force of magnitude 83.9 N on the wall to which it is attached. The tensions in the shorter cords are T_1 = 63.9 N, T_2 = 46.3 N, and T_3 = 7.6 N. What are the masses of **(a)** disk A, **(b)** disk B, **(c)** disk C, and (d) disk D? [Answer: (a) 2.04 kg; (b) 1.80 kg; (c) 3.95 kg; (d) 0.776 kg].



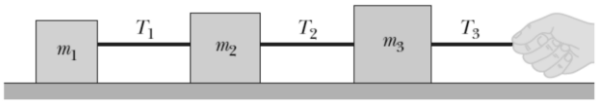
4. In the figure, let the mass of the block be 6.9 kg and the angle θ be 25°. Find **(a)** the tension in the cord and **(b)** the normal force acting on the block. **(c)** If the cord is cut, find the magnitude of the block's acceleration. [Answer: (a) 28.6 N; (b) 61.3 N; (c) 4.14 m/s^2].



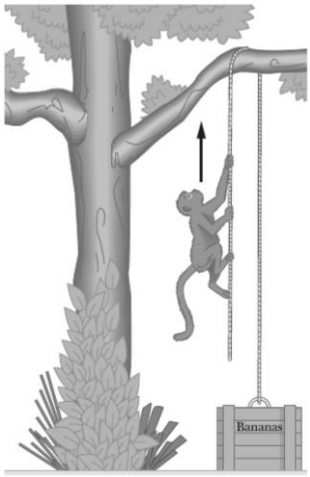
5. A 40 kg girl and a 5.6 kg sled are on the frictionless ice of a frozen lake, 19 m apart but connected by a rope of negligible mass. The girl exerts a horizontal 5.9 N force on the rope. What are the acceleration magnitudes of **(a)** the sled and **(b)** the girl? **(c)** How far from the girl's initial position do they meet? [Answer: (a) 1.1 m/s^2; (b) 0.15 m/s^2; (c) 2.3 m].

6. A 30 kg skier skis directly down a frictionless slope angled at 11° to the horizontal. Choose the positive direction of the x axis to be downhill along the slope. A wind force with component F_x acts on the skier. What is F_x if the magnitude of the skier's velocity is **(a)** constant, **(b)** increasing at a rate of 1.1 m/s^2, and **(c)** increasing at a rate of 2.2 m/s^2? Use g = 9.81 m/s^2. [Answer: (a) -56.2 N; (b) -23.2 N; (c) 9.84 N].

7. In the figure, three connected blocks are pulled to the right on a horizontal frictionless table by a force of magnitude T_3. Calculate **(a)** the magnitude of the system's acceleration, **(b)** the tension T_1, and **(c)** the tension T_2 in terms of T_3 and the masses m_1, m_2 and m_3. [Answer: (a) $\frac{T_3}{m_1+m_2+m_3}$; (b) $\frac{T_3 m_1}{m_1+m_2+m_3}$; (c) $\frac{T_3(m_1+m_2)}{m_1+m_2+m_3}$].



8. A 17 kg monkey climbs up a massless rope that runs over a frictionless tree limb and back down to a 24 kg package on the ground. **(a)** What is the magnitude of the least acceleration the monkey must have if it is to lift the package off the ground? If, after the package has been lifted, the monkey stops its climb and holds onto the rope, what are **(b)** the magnitude and the direction of the monkey's acceleration (choosing the positive direction up), and **(c)** what is the tension in the rope? [Answer: (a) 4.04 m/s^2; (b) 1.67 m/s^2; (c) 195 N].



9. A hot-air balloon of mass 200 kg is descending vertically with downward acceleration of magnitude 1.2 m/s^2. How much mass (ballast) must be thrown out to give the balloon an upward acceleration of magnitude 1.2 m/s^2 (same magnitude but opposite direction)? Assume that the upward force from the air (the lift) does not change because of the decrease in mass. [Answer: 44 kg].

10. The figure shows a box of mass $m_2 = 1.1$ kg on a frictionless plane inclined at angle $\theta = 34°$. It is connected by a cord of negligible mass to a box of mass $m_1 = 2.6$ kg on a horizontal frictionless surface. The pulley is frictionless and massless. **(a)** If the magnitude of the horizontal force $\vec{F}$ is 1.1 N, what is the tension in the connecting cord? **(b)** What is the largest value the magnitude of $\vec{F}$ may have without the connecting cord becoming slack? [Answer: (a) 3.91 N; (b) 14.2 N].