1. Cube 1 lies on a frictionless horizontal surface. Cube 2 lies atop cube 1. The massless, stretchless string attached to cube 2 pulls with a force of magnitude $T$ in the direction shown. The coefficient of static friction at the interface between the 2 cubes is $\mu_s$. Find the maximum value of $T$ so that cube 2 does not slide on cube 1.

2. A massless, stretchless string passes through a hole in a frictionless horizontal table. A mass $m$ is tied to one end of the string and executes uniform circular motion of radius $r$, centered on the hole, while sliding on the table. Another mass $M$ hangs from the other end of the string. With what speed does $m$ move if $M$ is stationary?

3. An initially stationary box of sand is to be pulled across a floor by means of a cable in which the tension should not exceed 1100 N. The coefficient of static friction between the box and the floor is 0.35. (a) What should be the angle between the cable and the horizontal in order to pull the greatest possible amount of sand, and (b) what is the weight of the sand and box in that situation?

4. A conical pendulum has a small mass with $m = 0.040$ kg (this mass is called the bob) that is attached to the lower end of a massless, stretchless string of length $L = 0.90$ m. The upper end of the string is anchored to a ceiling. The bob moves in a horizontal circle of circumference 0.94 m at constant speed so that the cord sweeps out a cone as the bob rotates. What are (a) the tension in the string and (b) the period of the motion?

5. In the figure, a crate slides down an inclined right-angled trough. The coefficient of kinetic friction between the crate and the trough is $\mu_k$. What is the acceleration of the crate in terms of $\mu_k$, $\theta$ and $g$?
6. A 110 g hockey puck sent sliding over ice is stopped in 15 m by the frictional force on it from the ice. (a) If its initial speed is 6.0 m/s, what is the magnitude of the frictional force? (b) What is the coefficient of friction between the puck and the ice?

7. Body A in the figure weighs 102 N, and body B weighs 32 N. The coefficients of friction between A and the incline are $\mu_s = 0.56$ and $\mu_k = 0.25$. Angle $\theta$ is 40°. What is the acceleration of A if A is initially (a) at rest, (b) moving up the incline, and (c) moving down the incline? The pulley is massless and frictionless. The rope is massless and stretchless.

8. In the figure, force $\vec{F}$ is applied to a crate of mass $m$ on a floor where the coefficient of static friction between crate and floor is $\mu_s$. Angle $\theta$ is initially $\theta_o$ but is gradually increased so that the force vector rotates clockwise in the figure. During the rotation, the magnitude $F$ of the force is continuously adjusted so that the crate is always on the verge of sliding. For $\mu_s = 0.70$, (a) plot the ratio $F/mg$ versus $\theta$ and (b) determine the angle $\theta_{inf}$ at which the ratio approaches an infinite value. (c) Does lubricating the floor increase or decrease $\theta_{inf}$, or is the value unchanged? (d) What is $\theta_{inf}$ for $\mu_s = 0.60$?

9. In the figure, 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 $\mu_s$ between A and the table is 0.20. (b) Block C suddenly is lifted off A. What is the acceleration of block A if $\mu_k$ between A and the table is 0.15?

10. When a small 2.0 g coin is placed at a radius of 5.0 cm on a horizontal turntable that makes three full revolutions in 3.14 s, the coin does not slip. What are (a) the coin's speed, the (b) magnitude and (c) direction (radially inward or outward) of the coin's acceleration, and the (d) magnitude and (e) direction (inward or outward) of the frictional force on the coin? The coin is on the verge of slipping if it is placed at a radius of 10 cm. (f) What is the coefficient of static friction between coin and turntable?