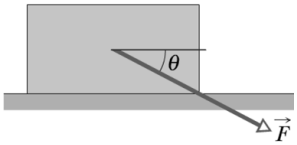
- For material covering Ch. 6 skipping Sect. 6-2, 10th edition (6-5, 9th edition).
- Due Friday, Sept. 26 at 5 pm

1. The floor of a railroad flatcar is loaded with loose crates having a coefficient of static friction of 0.40 with the floor. If the train is initially moving at a speed of 58 km/h, in how short a distance can the train be stopped at constant acceleration without causing the crates to slide over the floor?
[Answer: 33.1 m].

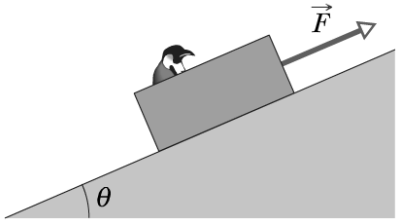
2. A slide-loving pig slides down a certain 34° slide in twice the time it would take to slide down a frictionless 34° slide. What is the coefficient of kinetic friction between the pig and the slide? [Answer: 0.506].

3. *The mysterious sliding stones.* Along the remote Racetrack Playa in Death Valley, California, stones sometimes gouge out prominent trails in the desert floor, as if they had been migrating. For years, curiosity mounted about why the stones moved. One explanation was that strong winds during the occasional rainstorms would drag the rough stones over ground softened by rain. When the desert dried out, the trails behind the stones were hard-baked in place. According to measurements, the coefficient of kinetic friction between the stones and the wet playa ground is about 0.694. What horizontal force is needed on a stone of typical mass 11 kg to maintain the stone's motion once a gust has started it moving? [Answer: 74.8 N].

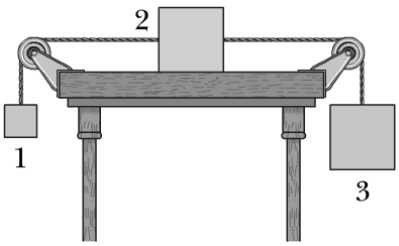
4. A 3.3 kg block is pushed along a horizontal floor by a force $\vec{F}$ of magnitude 32 N at a downward angle θ = 40°. The coefficient of kinetic friction between the block and the floor is 0.25. Calculate the magnitudes of **(a)** the frictional force on the block from the floor and **(b)** the block's acceleration. [Answer: (a) 13.2 N; (b) 3.42 m/s^2].



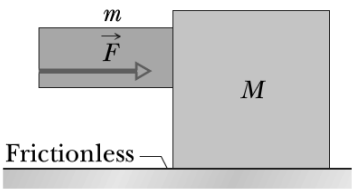
5. A loaded penguin sled with weight W rests on a plane inclined at angle θ to the horizontal (see the figure). Between the sled and the plane, the coefficient of static friction is μ_s, and the coefficient of kinetic friction is μ_k. **(a)** What is the minimum magnitude of the force parallel to the plane, that will prevent the sled from slipping down the plane? **(b)** What is the minimum magnitude F that will start the sled moving up the plane? **(c)** What value of F is required to move the sled up the plane at constant velocity? State your answers in terms of the given variables. [Answer:
(a) $F_{min} = W \sin\theta - \mu_s W \cos\theta$;
(b) $F_{up} = W \sin\theta + \mu_s W \cos\theta$;
(c) $F_c = W \sin\theta + \mu_k W \cos\theta$].



6. When the three blocks in the figure are released from rest, they accelerate with a magnitude of 0.900 m/s^2. Block 1 has mass M, block 2 has 2M, and block 3 has 2M. What is the coefficient of kinetic friction between block 2 and the table? [Answer: 0.270].

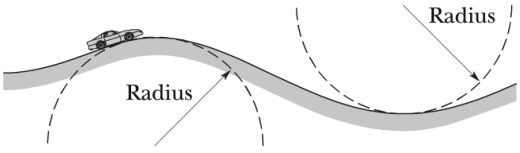


7. The two blocks (m = 16 kg and M = 94 kg) in the figure are not attached to each other. The coefficient of static friction between the blocks is $\mu_s = 0.32$, but the surface beneath the larger block is frictionless. What is the minimum magnitude of the horizontal force $\vec{F}$ required to keep the smaller block from slipping down the larger block? [Answer: 573 N].



8. What is the smallest radius of an unbanked (flat) track around which a bicyclist can travel if her speed is 29 km/h and the coefficient of static friction between tires and track is 0.38? [Answer: 17.4 m].

9. In the figure, a car is driven at constant speed over a circular hill and then into a circular valley with the same radius, r. At the top of the hill, the normal force on the driver from the car seat is 0. Let the driver have a mass m. What is the magnitude of the normal force on the driver from the seat when the car passes through the bottom of the valley? State your answers in terms of the given variables and g. [Answer: 2mg].



10. An airplane is flying in a horizontal circle at a speed of 490 km/h (see the figure). If its wings are tilted at angle $\theta = 43°$ to the horizontal, what is the radius of the circle in which the plane is flying? Assume that the required force is provided entirely by an "aerodynamic lift" that is perpendicular to the wing surface. Use g = 9.8 m/s^2. [Answer: 2030 m].