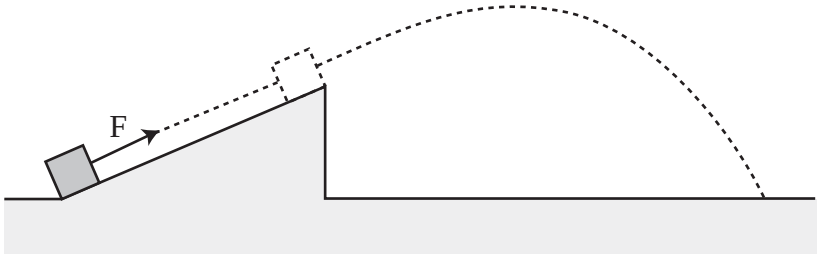
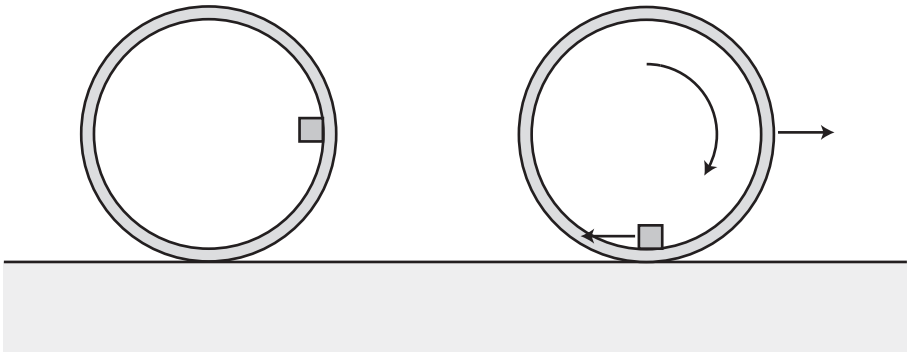
Sample Final

There are 4 problems worth 50 points each. You must show your work and justify your answer to receive full credit.

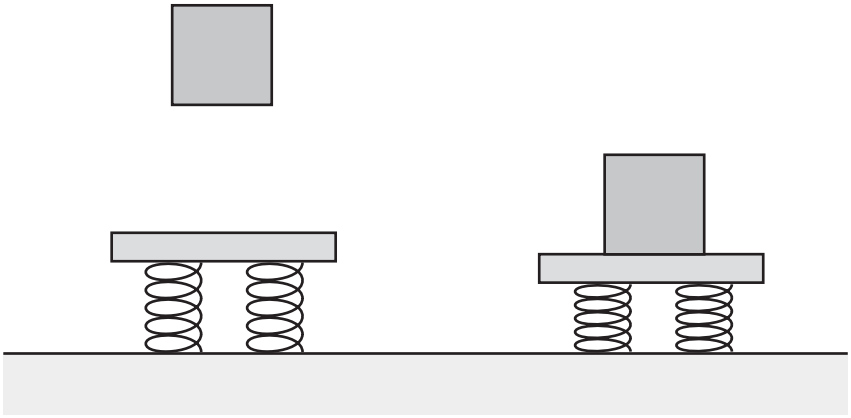
1. A block of mass 0.54 kg starts at rest at the bottom of a ramp, and is accelerated upward by a constant force 21 N parallel to the ramp. The ramp has length 1.0 m and is inclined at an angle of 25° above the horizontal. **Find the total horizontal distance travelled by the block before it hits the ground.** Neglect friction and air resistance.



2. A hollow cylinder of mass 0.22 kg and radius 0.21 m is on a horizontal surface. A small block of mass 0.055 kg is inside the cylinder and can slide without friction along the inner surface of the cylinder. The system is released from rest at the position shown at left. **Find the velocity of the cylinder when the block reaches the bottom of the cylinder.** Assume that the cylinder rolls without slipping.



3. A platform of mass 0.12 kg is supported by two springs, each with spring constant 220 N/m. A block of mass 0.32 kg is dropped onto the platform from a height of 1.3 m above the platform. **Find the maximum distance that the platform moves after the block lands on the platform.**



4. A daredevil motorcycle rider rides his motorcycle around the vertical walls of a cylinder, as shown below. The mass of the motorcycle plus rider is 220 kg, the radius of the cylinder is 5.0 m, and the coefficient of static friction between the tires and the wall is 0.46. **Find the minimum speed that the motorcycle must have so that it does not fall down.**