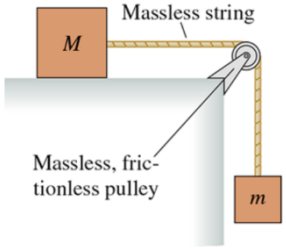
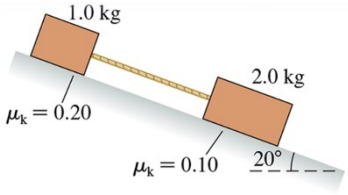
PCS211 P2022 Tutorial 4

1. Connected by a massless string and a massless, frictionless pulley to a hanging mass, the 2.0 kg block slides on a horizontal, frictionless surface. For what value of the hanging mass *m* does the block accelerate at 1.5 m/s^2?



2. The two blocks are sliding down the incline. What is the tension in the massless string?

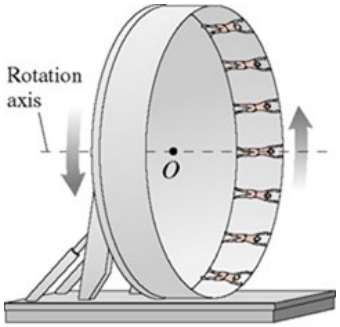


3. A concrete highway curve of radius 70.0 m is banked at a 15.0° angle. What is the maximum speed with which a 1500 kg rubber-tired car can take this curve without sliding? (Take the static coefficient of friction of rubber on concrete to be 1.0.)

4. In an amusement park ride called The Roundup, passengers stand inside a 16.0 m -diameter rotating ring. After the ring has acquired sufficient speed, it tilts into a vertical plane, as shown in the figure.

a) Suppose the ring rotates once every 4.50 s. If a rider's mass is 55.0 kg, with how much force does the ring push on her at the top of the ride? At the bottom of the ride?

b) What is the longest rotation period of the wheel that will prevent the riders from falling off at the top?



5. A Stone Age hunter places a 1.0 kg rock in a sling and swings it in a horizontal circle around his head on a 1.0-m-long vine. If the vie breaks at a tension of 200 N, what is the maximum angular speed, in rpm, with which he can swing the rock?