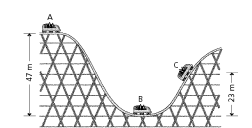
1. Write an equation that expresses the conservation of mechanical energy in a system where the only forms of mechanical energy are kinetic energy and gravitational potential energy.
2. A bobsled zips down an ice track, starting from rest at the top of a hill with a vertical height of 170 m. Disregarding friction, what is the velocity of the bobsled at the bottom of the hill?
3. Meena releases her 10.5-kg toboggan from rest on a hill. The toboggan glides down the frictionless slope of the hill, and at the bottom of the slope it moves along a rough horizontal surface, which exerts a constant frictional force on the toboggan.
   1. When the toboggan is released from a height of 15.0 m, it travels 6.0 m along the horizontal surface before coming to rest. How much work does the frictional force do on the toboggan?
   2. From what height should the toboggan be released so that it stops after traveling 10.0 m on the horizontal surface?
4. A 6.00-g block, initially at rest, is pulled to the right along a frictionless horizontal surface by a constant horizontal force of 1.20x10–2 N for a distance of 3.00 cm.
   1. What is the work done by the force?
   2. What is the change in the kinetic energy of the block?
   3. What is the speed of the block after the force is removed?
5. A loaded freight car of mass 50.0x103 kg, moving at 18.0 km/h along a straight, level track, collides with a stationary empty freight car of mass 15.0 x103 kg. At the collision, the two boxcars lock together.
   1. What is the velocity of the moving pair of boxcars after the collision?
   2. How much energy is lost during the collision?
6. As shown below, a 450-kg roller-coaster car starts from rest at point A at a height of 47 m, rolls down the track, reaching point B at a speed of 25 m/s, and then rolls up a second hill where it reaches a height of 23 m before coming to rest (at point C). What are the gravitational potential energy and kinetic energy of the car when it is at points A, B, and C?



1. Fred and Barney are wearing harnesses and are hanging from the ceiling by means of ropes attached to them. They are face to face and push off against one another. Fred has a mass of 140. kg, and Barney has a mass of 90.0 kg. Following the push, Barney swings upward to a height of 1.20 m above his starting point. To what height above his starting point does Fred rise?