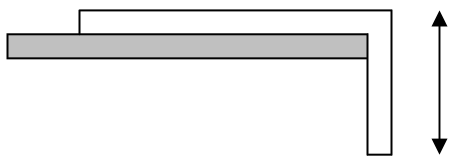
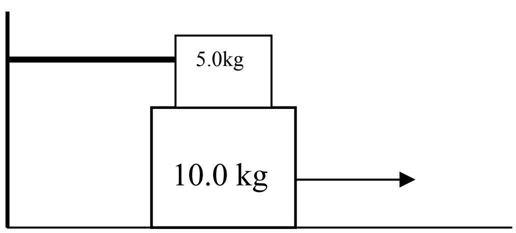
PARTIAL CREDIT will be given so do what you can and make sure that you show all work for each problem. **No credit will be given if no work is shown**. The point value of each question is indicated.

1. A uniform rope of length L and mass M is held on a frictionless table by a force **F.** One fourth of its length (¼ L) is hanging over the edge. Find the work required to pull the hanging part back onto the table.



2. A 5.00 kg block is placed on top a 10.0 kg block as shown below. A horizontal force of 45.0 N is applied to the 10.0 kg block, and the 5.00 kg block is tied to the wall. The coefficient of kinetic friction between all surfaces is 0.20.

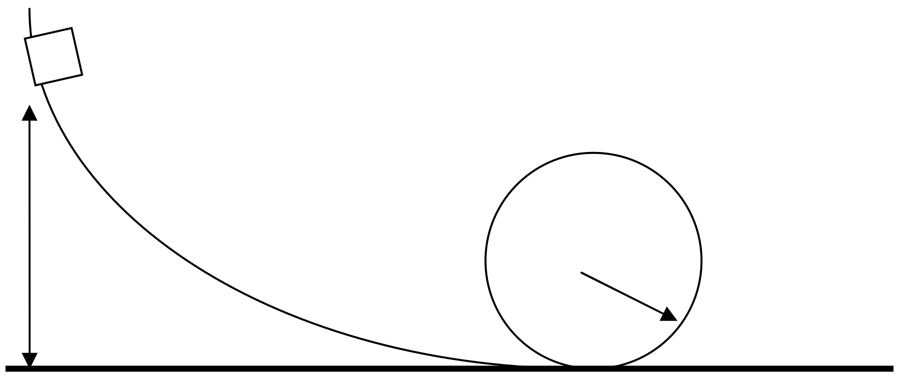


   a) Draw a free-body diagram for each block.
   b) Determine the tension in the string and the acceleration of the 10.0 kg block.

3. A force in the xy plane is given by $\vec{F} = \left(\frac{F_o}{r}\right)(y\hat{i} - x\hat{j})$ where F_o is a constant and $r = \sqrt{x^2 + y^2}$.

   a) Find the magnitude of the force.
   b) Show that $\vec{F}$ is perpendicular to $\vec{r} = x\hat{i} + y\hat{j}$.
   c) Find the work done by this force on a particle that moves once around a circle of radius 5 m centered at the origin.
   d) Explain if the force is conservative or not.

4. A block slides on the frictionless loop-the-loop track shown below. Find the minimum height H at which it can be released from rest and still make it around the loop.



5. A small block of mass ‘m’ is placed inside an inverted cone that is rotating about a vertical axis such that the time for one revolution of the cone is ‘T’. The walls of the cone make an angle β with the vertical. The coefficient of static friction between the block and the cone is μ_s. If the block is to remain at a constant height ‘h’ above the apex of the cone, what the minimum and maximum values of T?