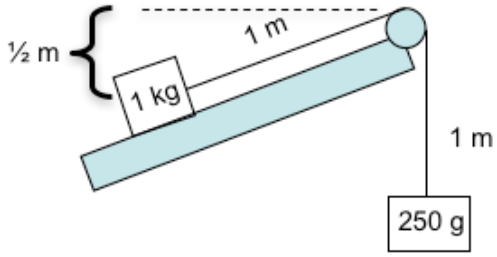
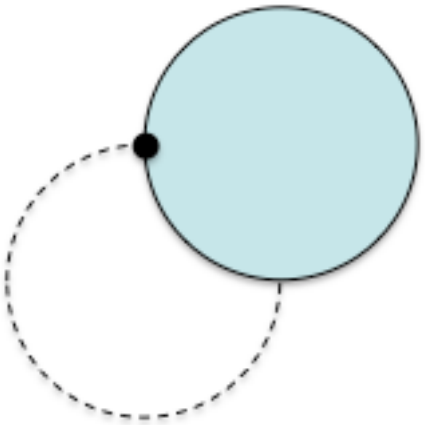
Problem Set #7 due beginning of class, Monday, May 15. Remember to start each question with a description of what concept is central to your strategy and *why*.

1. Please do Examples 1-4 in 6.0 Systems
2. Please do Examples 1-3 in 6.1 Rotational Systems
3. Please do Example 1 in 6.2 Center of Mass
4. Please do Example 1 in 6.3 Parallel Axis Theorem
5. Consider the system at right where the 1 kg box is on a very slippery table inclined such that if the system moves one meter, the box changes elevation by half a meter.
    a) How does this change the energy balance equation you set up for problems in 6.0?
    b) Can you tell me which way the system will acceleration (if at all)? How can you be sure?



6. A disk of uniform mass, total mass m_o, and radius, R is secured to a wall with a frictionless pivot that allows rotation as shown at right. It is started in the higher position where the center of the circle is at the same height as the pivot and allowed to drop and swing. We want to find the force on the pin when the disk is swinging at the bottom. In order to solve this complicated, multidimensional problem, please consider:

a) What is the complete energy transition happening as the disk rotates from top to bottom?
b) What is the complete dynamics going on when the disk is at the bottom of the swing? Is the force on the pivot just equal to *mg*?
c) Find the force on the pivot when the disk is in full swing at the bottom. Include direction.



7. You need to build a massive slingshot that propels a 100 kg object (you in a capsule) at 13 km/s so you can go into space (infinity)! For ***<u>each question</u>***, start with a statement of which of the 4 mechanics concepts is central to this problem and why.
    a) How fast will you be going when you get to deep space?
    b) How fast will you be going when you are 1 earth radius above the earth's surface?
    c) If you passed near the moon, what effect would this have on your speed? I'm just looking for *speed* here. Direction is not what I'm asking about. Support your answer with a concept.
    d) If your slingshot is a massive spring that compresses 10 m, please find the spring constant that gives you a speed of 13 km/s.
    e) What would be the maximum acceleration of your body at launch? How would this work for you?