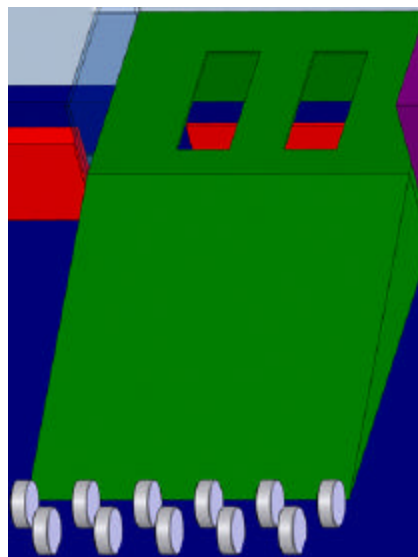**Problem Set 6: Static Equilibrium and Torque, Work-Kinetic Energy Theorem, Work Done by Friction and other Dissipative Forces**

Design Engineering Challenge: "The Big Dig" 2.007 Contest
Hockey Puck Handling *Strategies*

For the Spring 2004 contest table ("The Big Dig", see http://pergatory.mit.edu/2.007)
there are many instances where friction forces between an object and the table will
govern whether or not the object will be movable. Here we mainly focus on investigating
different strategies for handling hockey pucks and to where should they be directed:

1. The hockey pucks can be rolled into position if handled carefully, but if they tip
   over, they will have to be pushed. Draw the FBD of a hockey puck being pushed
   (slid on its face) and the FBD of a hockey puck being rolled on its edge.
2. How can you determine the coefficient of friction between the hockey puck and
   the ramp material?
3. How much work does it take to slide a hockey puck up the ramp?
4. How much work does it take to roll a hockey puck up the ramp?
5. Does it really matter, given the work required to increase the hockey puck's
   potential energy, whether you slide or roll the puck up the ramp?
6. How else might you get the hockey puck (s!) up the ramp quickly, and what
   would be the forces and powers involved?!
7. Guestimate what you think is a reasonable time for the motion of the hockey
   puck, given the total time for the contest, and now estimate what is the power
   required for the different strategies.
8. Remember the platter with the balls and shot-put? How much energy must be
   expended to get it spinning to the point where the hockey balls fly off? How
   much energy must be expended to get the shot-puts to fly off?
9. How does this compare to the energy to move a puck up the ramp, and does this
   give you any feeling for what is a more efficient way to score?

1.