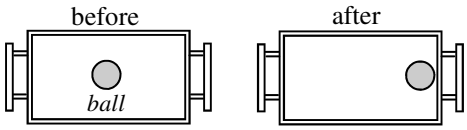
A-Day: Due Thur., 10/29
B-Day: Due Fri., 10/30

2009 PreAP Forces 5

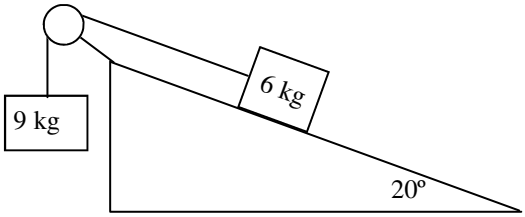
1. A 3.5 kg object is thrown 13 m/s at 20°. At the very top of its path:

   A. Its x-direction acceleration is:
   B. Its y-direction acceleration is:
   C. Its x-direction velocity is:
   D. Its y-direction velocity is:
   E. Its speed (total velocity) is:
   F. The force acting on it is:
   D. Is it at equilibrium?
   G. Why or why not?

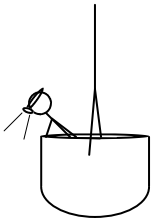


2. A ball begins in the middle of a cart. The cart is quickly moved and the ball ends up against the right lip of the cart.
   A. Which way was the cart moved?
   B. Why did the ball end up at the right end of the cart?

   C. Which of Newton's Laws does this show?



3. A. Draw all of the forces acting on the objects at the left. Assume there is no friction.
   B. Calculate the force of gravity pulling down the ramp on the 6 kg object.
   C. Using only the "T-direction" calculate the acceleration of the system and the tension in the rope.

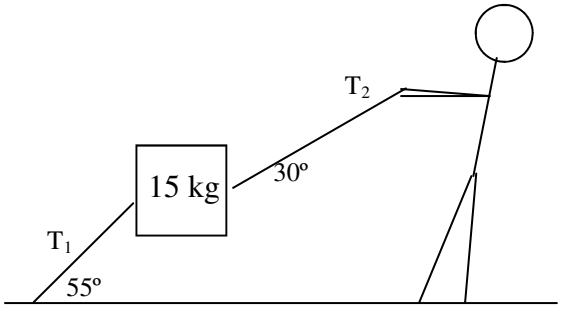


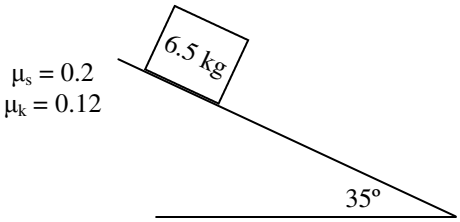
4. Slim Jim is also a cave explorer (known as a spelunker). A mining company asks our famous spelunker to explore part of their gold mine. Slim Jim is a slim 60 kg and the bucket is a hefty 980 kg.
   A. Calculate the tension in the rope when he begins to accelerate downward at $-1.5\ m/s^2$.

   B. Calculate the tension in the rope when the bucket is lowered at constant speed.

   C. When it starts to slow down (just before it stops) it has an acceleration of $+2.4\ m/s^2$. Calculate the tension in the rope

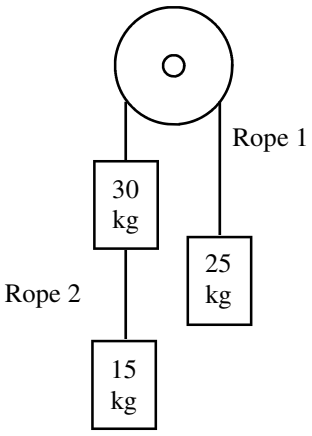
5. Slim Jim is suspending an object by two ropes. Calculate the tensions in the two ropes. (*Be sure you use all 3 forces.*)





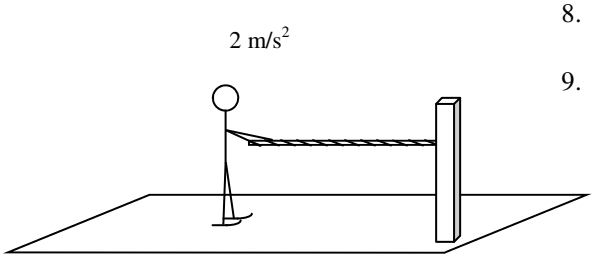
6. A. If the angle decreases, the force down the ramp:
   B. If the angle increases the normal force:
   C. Calculate if the object will slide, acceleration ,etc.

   D. If the object is 3.5 m up the ramp and starts at rest, how fast is it going at the bottom of the ramp?



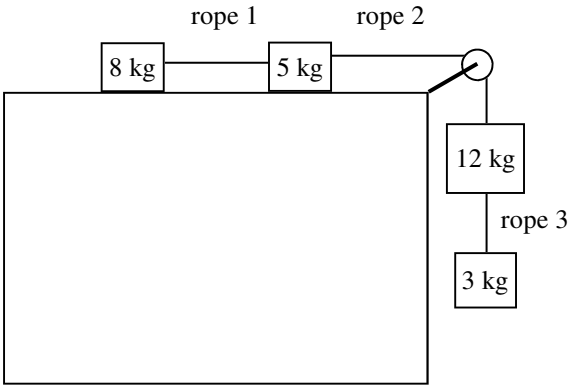
7. Now that you know the fast way of doing this…
   A. Calculate the acceleration of the system.

   B. Calculate the tension in rope 2.



8. Give Newton's Third Law:

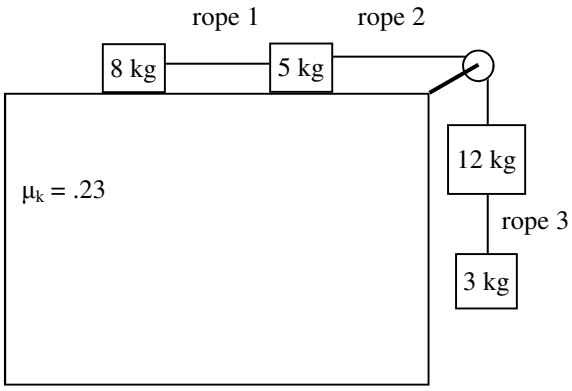
9. Slim Jim is learning to ice skate. Slim Jim pulls on a rope with 52 N of force and is ____ kg. (*You still know Jim's mass from his spelunking adventure.*)
   A. By Newton's Third Law, if Jim is pulling with on the rope with 52 N of force, with how much force is the rope pulling on Jim?
   B. Calculate the tension in the rope.



10. Assume there is no friction on the table at the left.
    A. Calculate the acceleration of the system.

    B. Calculate the tension in rope 3.

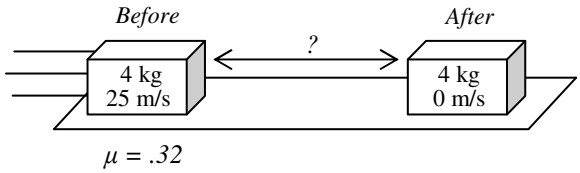
    C. Calculate the tension in rope 2.



11. Now there is friction on the table.
    A. Calculate the friction forces on the two masses on the table.

    B. Calculate the acceleration of the system.

    C. Calculate the tension in rope 1.



12. A 4 kg mass is moving 25 m/s on a surface. μ_k = .32 for this surface.
    A. Calculate the normal force on the object.

    B. Calculate the force of friction slowing down the box.

    C. Calculate the acceleration of the box.

    D. Calculate how far the box slides before stopping.

    E. If the mass of the box is doubled, calculate how far the box slides before stopping.