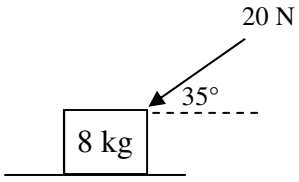
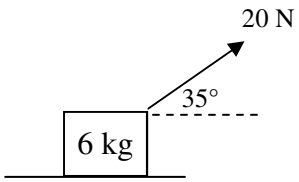
A-Day: Due Fri., 10/23
B-Day: Due Mon., 10/26

2009 PreAP Forces 3

I have to assume now that you can calculate friction, normal force, and weight.





1. So that we learn the words…
   A. ___Which mass has a force pushing "below the horizon"?
   B. ___Which mass has a force pulling "above the horizon"?

2. A 15 kg mass has a 45 N force pulling on it at an angle of 48° above the horizon. The mass is on a surface that has the following coefficients of friction: $\mu_s = 0.34$ and $\mu_k = 0.16$.
   A. Use the examples above to help you draw the diagram at the left.

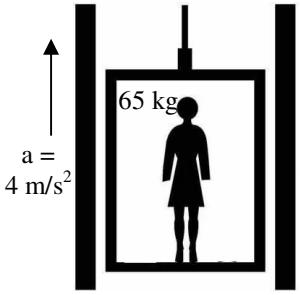
   B. Determine the normal force, giving your answer with the correct number of significant figures.

   C. Calculate static and kinetic friction for the object.

   D. If the object started at rest, decide if the object will move.

   E. If the object cannot move, how much additional force is necessary to start it moving.

   F. If the object was moving to begin with, calculate the magnitude of its acceleration (with sig figs).

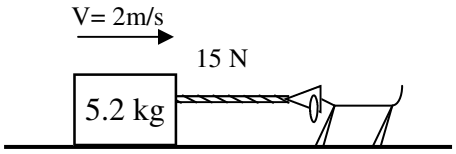


3. A. Calculate how heavy the 65 kg lady in the elevator feels.

   B. What would a scale (reading weight) read that is under her feet?

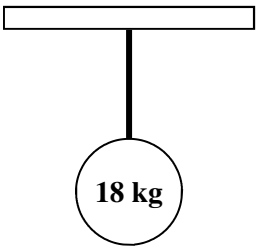
   C. What would a scale read if the elevator's cable was cut?

4. Slim Jim's dog "Bim" is pulling 15 N on a 5.2 kg mass at a constant velocity of 2 m/s. There is friction between the mass and the floor.
   A. Draw and label all of the forces acting on the mass.
   B. What is the acceleration of the object?
   C. Calculate the force of friction on the mass.

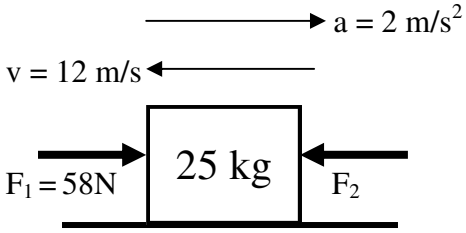


   D. Calculate the coefficient of friction of the floor.

More on Back

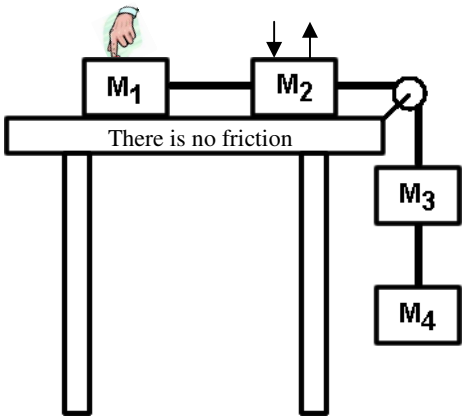


5. A 18 kg object is suspended by a rope.
   A. Draw and label all of the forces acting on the object.
   B. What is the acceleration of the object?
   C. Calculate the force exerted by the rope.

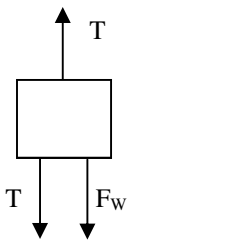


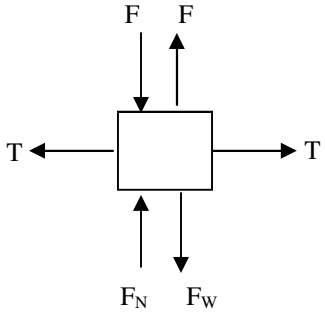
6. A 25 kg object has a velocity of −12 m/s and has an acceleration of +3 m/s^2.
   A. Is the object moving to the left, to the right, or at rest?
   B. Is the object speeding up or slowing down?
   C. Are the forces balanced or unbalanced?
   D. How do you know?
   E. Which force is greater: F_1 or F_2?
   F. Calculate the net force acting on the object.

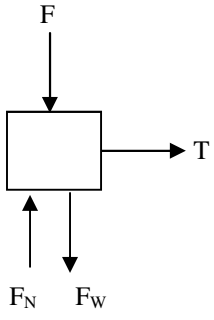
   G. Calculate the magnitude of force 2.

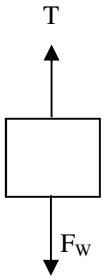


7. The force diagrams below are for the four masses at the left.
   A. Identify each one by putting the correct mass in the boxes below.

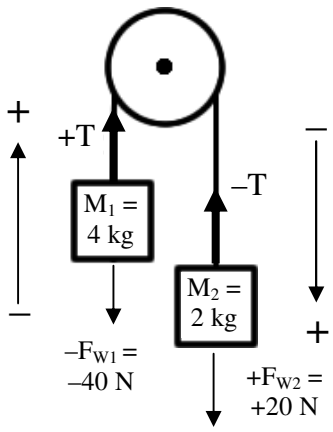


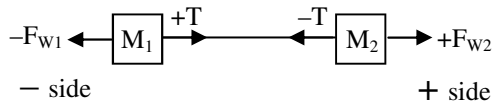






   B. Write the x and y-direction equations for M_2.

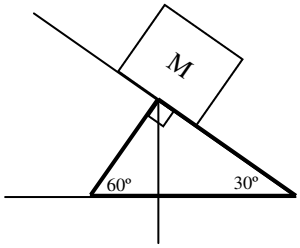


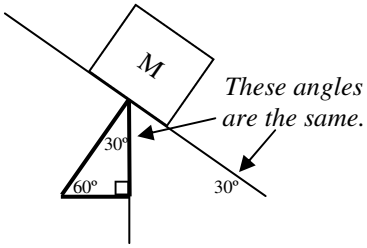


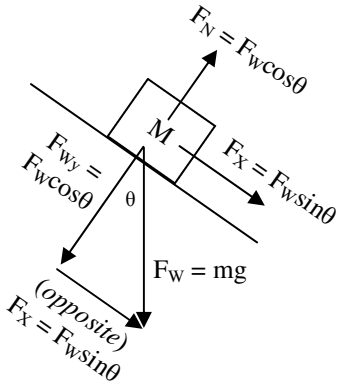
Imagine the connected masses at the left being strung out as you see above. The reason for this is that when objects are connected you have to have a common direction. We will choose up and to the right as positive.

8. Positive or negative:
   A. ___ The weight of the 2 kg object.
   B. ___ The weight of the 4 kg object.
   C. ___ The tension pulling up on the 4 kg object.
   D. ___ The tension pulling up on the 2 kg object.

   E. Keeping track of the positives and negatives, write the Newton's Second Law equation ($\Sigma F = ma$) for the 2 kg mass.







Sometimes we tilt our x and y-axis to make our job easier. Study the diagrams above carefully.

9. For ramps:
   A. To calculate the portion of the weight pulling down the ramp do we use sin or cos?
   B. The weight always points which way?
   C. The normal force is equal and opposite to which portion of the weight: sin or cos?
   D. Which way will friction point? Up or down the ramp?

10. Using the example at the bottom right to fill in the blanks on the diagram below.