A-Day: due Mon., 11/5 (Assigned 11/1)
B-Day: due Tues., 11/6 (Assigned 11/2)

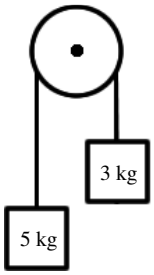
2007 Forces 5

Variable	Units	Name	Notes
r	m	Distance	Distance btwn object centers
G	n/a	Gravitational constant	6.673×10^{-11} (use EE key)

Equation:
$F_g = G\frac{m_1 m_2}{r^2}$

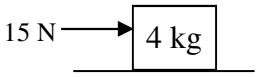
1. Normal force is always in what direction: x or y?
2. What does ΣF_y mean (exactly)?

Diagram 1



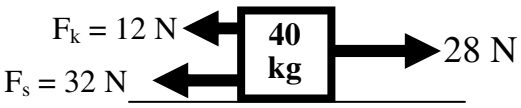
3. Use diagram 1 for the following questions.
   A. For the right side, is positive up or down?
   B. For the left side, is negative up or down?
   C. What is the weight of the object on the left?
   D. The weight of the 3kg object is positive or negative?
   E. The tension on the 5 kg object is positive or negative?
   F. Find the acceleration of the system (follow the notes exactly).

4. A 4 kg mass is being pushed at constant velocity to the right with a 15 N force.
   A. What is the acceleration of the mass?
   B. If it takes 15N to keep the object moving, what is F_k?
   C. Since the mass is moving only in the x-direction, what is the a_y?
   D. Calculate F_N.



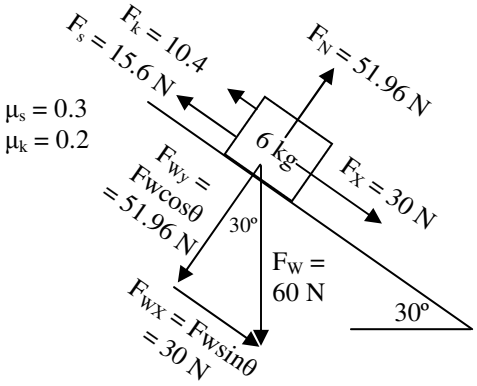
   E. Calculate μ_k.

5. For the 40 kg mass at the right.
   A. How much force is needed to start the object sliding?
   B. How much force is necessary to keep this object sliding?
   C. Assuming the object is sliding, which way is it accelerating?
   D. If the object stops, will the 28 N force be able to start it moving again?
   E. How much additional force would be needed?



   F. Find the normal force for the object.

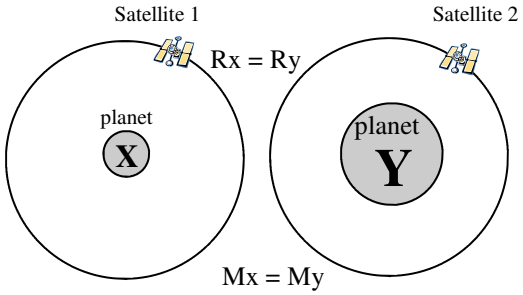
   G. Find μ_k.



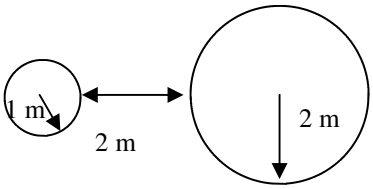
6. On the diagram at the right:
   A. Where did 30 N come from?
   B. What is the weight?
   C. Where did F_N come from?
   D. Does the object slide (and why)?
   E. Find the acceleration of the object down the ramp.

7. The two satellites are identical (same mass, same orbit). The masses of the planets are equal, but planet X is smaller.
   A) For planet X: draw m_1, m_2, and r.
   B) Which is greater: the force of gravity between satellite 1 and planet X or the force of gravity between satellite 2 and planet Y?

   C) Since Planet X is smaller, it is more _____.
   D) If the satellites were to land on the planet surfaces, which probe will be the heaviest?



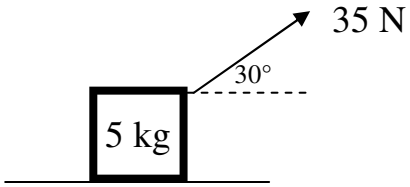
8. For the following masses, what would you use for r to calculate gravity?



9. A 3,500 kg object and a 12,000 kg object have 6 m separation between their centers. Calculate the force of gravity between them. (*Remember to use the "EE" key.)*

10. For 5 kg object at the right.
    A. Calculate the normal force.

    B. Calculate both static and kinetic friction.



$\mu_s = 0.4$
$\mu_k = 0.25$

    C. Will it slide (give proof)?

    D. If it does slide, find acceleration. If it doesn't slide, how much more force is necessary to make it slide?

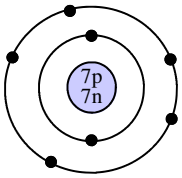
11. The outer most electrons of an atom are called:

12. How many valence electrons does oxygen have?

13. How many valence electrons make an atom "full"?

14. How many valence electrons does helium have?

15. How many valence electrons does this atom have?



16. What element is it?

17. Is it a neutral atom?