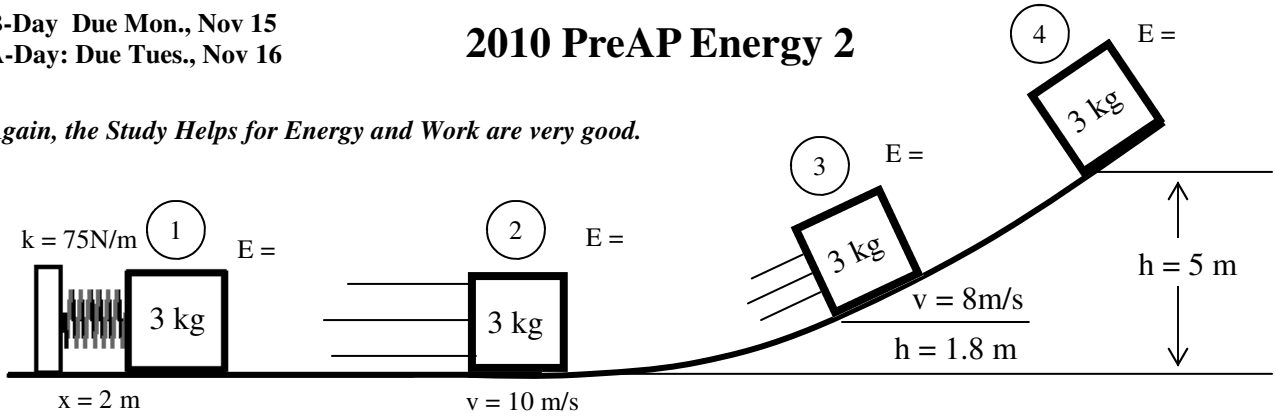
B-Day Due Mon., Nov 15
A-Day: Due Tues., Nov 16

2010 PreAP Energy 2

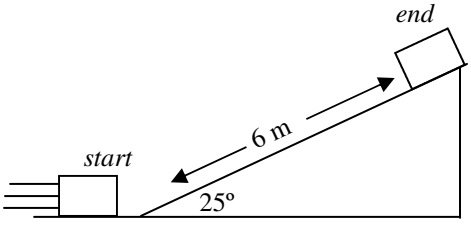
Again, the Study Helps for Energy and Work are very good.



1. A 3 kg object is against a compressed spring. When released the object moves up a ramp until it stops. Assume there is no friction on the surface and use g = 10 m/s^2.
   A. What kind of energy does the object have at
   Position 1: _____Position 2: _____Position 3: _____Position 4: _____
   B. Label the above diagram with the kind of energy or energies it has at each position.
   C. Calculate the energy at position 1:
   D. Calculate the energy at position2:
   E. * Calculate the total energy at position 3:
   F. Calculate the energy at position 4:
   G. Label the amount of energy at each position on the diagram above.
   H. How does the energy compare at each position?
   I. The energy of the object is not gained or lost, just t_____.
   J. So does the energy of the system change?
   K. If there was absolutely no friction on the surface or in the spring, how long would the mass go up and back?
   L. If there was friction, how would the final height of the object change?

   If the energy of an object is just changing to different kinds, like above, the energy of the system stays the same. To change the energy of system requires an outside force like friction, which does work on the object.

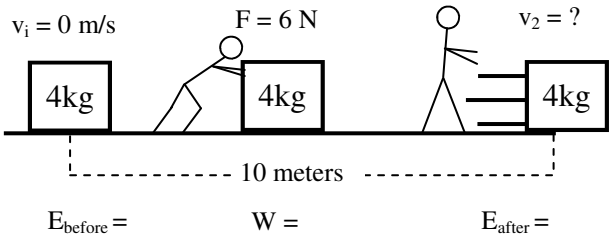
2. +W, –W, or no Work (0)?
   A. ____ When the energy is just transferred.
   B. ____ When an object loses energy.
   C. ____ When an object gains energy.
   D. ____ When energy doesn't change.
   E. ____ An object slows down.
   F. ____ An object is raised up.
   G. ____ An object rolls down a hill.
   H. ____ An object at rest on a hill.
   I. ____ Compressing a spring.
   J. ____ Sitting on an object.
   K. ____ Lowering an object down to the ground.
   L. ____ Speeding up an object.
   M. ____ Friction acting on an object.
   N. ____ Holding onto an object.



3. A 2 kg object moves up a 6 m long ramp, which is tilted at an angle of 25º.
   A. What kind of energy did it start with?
   B. What kind of energy did it end up with?
   C. *Calculate its final energy (*remembering that h is vertical*).
   D. If there is no friction on the ramp, how much kinetic energy did it have at the bottom?
   E. *Calculate what velocity it must have had at the bottom of the ramp.

Let's learn the difference between positive and negative work.

4. Slim Jim pushes on an object for 10 m with a 6 N force.



A. Since the object is on the ground and at rest to begin with, how much energy does it have?

B. Is the object gaining or losing energy?

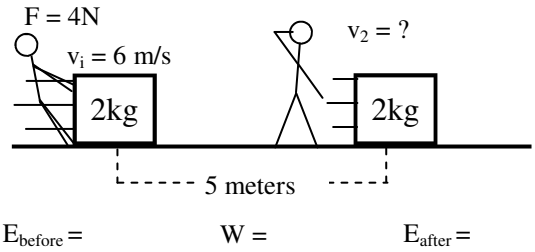
C. Calculate the work Jim gives the object realizing that in this example F and d are both +.

This is positive work: F and d are in the same direction and the object gains energy.

D. * How much energy does Jim give the object?

E. * Calculate the final velocity of the object.

5. Slim Jim pulls on an object with 4 N for 5 m. The object slows down but is still moving afterwards.



A. Calculate its initial energy.

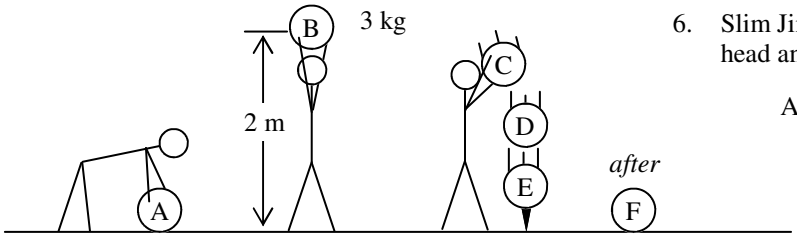
B. Is the object gaining or losing energy?

C. Calculate the work Jim does on the object realizing that in this example F is –.

This is negative work: F and d are in opposite directions and the object loses energy.

D. * How much energy is left afterwards?

E. Calculate the final velocity of the object.



6. Slim Jim lifts a 3kg ball from the ground. He lifts it above his head and drops it onto a spike.

A. What kind of energy or energies does the ball have:

At A:	At B:
*At C:	At D:
*At E:	At F:

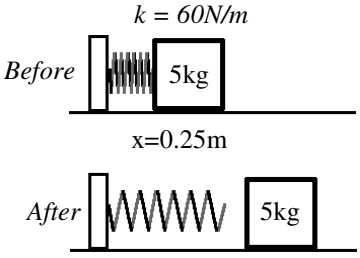
B. Calculate the energy the object has at position B.

C. How much work did Jim have to do on the object between A and B?

D. How much energy must the object have at E just before it hits the spike?

E. *Where does all the energy go?

F. *If the spike is 0.15 m long, how much force was exerted by the ball on the spike as it stops?



7. A 5kg object compresses a spring 0.25m.

A. Calculate the energy it has when the spring is compressed.

B. What kind of energy does the object have when released?

C. If there was no friction on the surface, how much energy does the mass have after released?

D. Calculate the velocity of the object afterwards.

Q1E: E_{total} = KE + PE.
Q3C: PE = mgh = 2(10)(6)sin25º = 50.7 Joules Q3E: KE = 50.7 Joules, v = 7.1 m/s
Q4D: Energy it gains = work done = 60 Joules
Q4E: v = 5.48 m/s
Q5D: 36-20 = 16 joules, so now you can calculate the velocity of the object.
Q6A: at C: it has both KE and PE since it is above the ground and starting to move (fall). It does have more PE at this point. At E : all KE.
Q6E: negative work done by the spike.
Q6F: W = Fd F = W/d = −400 N