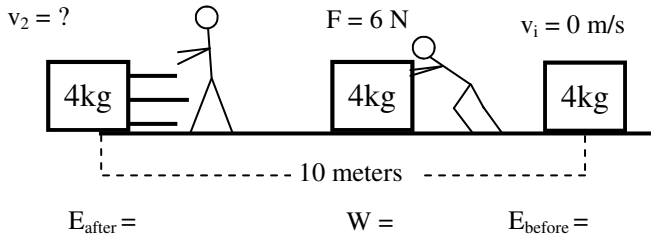
PreAP Energy 4

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

1. 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 start with?

B. Is the object gaining or losing energy?

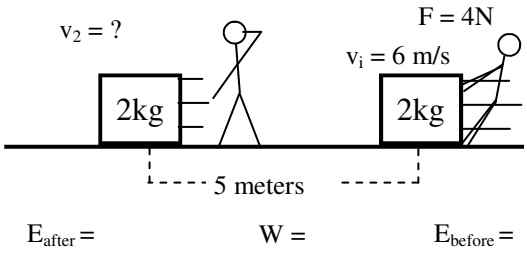
C. Calculate the work Jim gives the object realizing that in this example F and d are both −.

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.

2. 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?

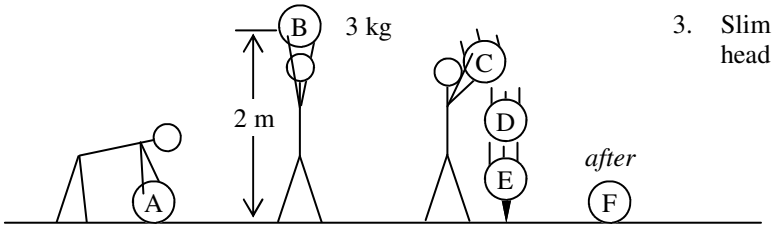
C. Calculate the work Jim does on the object realizing that in this example F is +.

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.

Work and energy are scalars, which have no direction. It really doesn't matter if F is + or −, only if F and d are in the same direction. If the energy of the object increases (in ANY direction), it is +W. If the object loses energy (in ANY direction) it is −W.



3. 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:

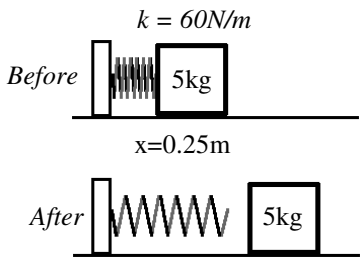
B. Calculate the energy the object has at position B.

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?



4. 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. **More on Back**

5. Match the Conservation of energy equations at the right with the following situations.

A.	___ * An object is thrown into the air. Find how high it goes.	1. KE −W = KE
B.	___ An object at rest is moved.	2. PE = PE + KE
C.	___ A moving object slows down due to friction.	3. KE = PE
D.	___ An object is dropped. How fast is it going part way down?	4. KE −W = 0
E.	___ A spring is compressed.	5. PEel = KE + PE
F.	___ A compressed spring shoots an object into the air.	6. 0 + W = KE
G.	___ A moving object is stopped.	7. 0 + W = PEel

1D: Energy it gains = work done = 60 Joules
1E: v = 5.48 m/s
2D: 36−20 = 16 joules, so now you can calculate the velocity of the object.
3A: 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.
3E: negative work done by the spike.
3F: W = Fd F = W/d = −400 N
4D: 0.866 m/s
5A: KE = PE