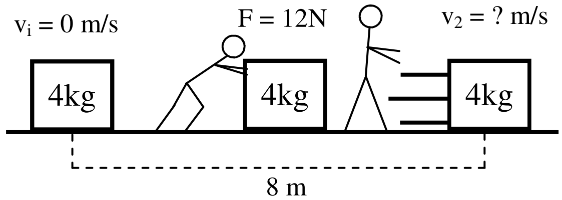
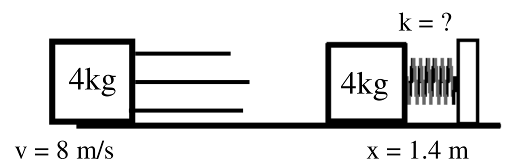
PreAP Energy 6

If the energy is just transferred, no work is done. OR no work is done if the energy of the system does not change.





1. A. Was work done or was energy just transferred?
   B. * Under the diagram, give the Conservation of Energy equation and calculate v_f of the object.

2. A. Was work done or was energy just transferred?
   B. Calculate KE for the object afterwards.
   (*Notice that KE can never be negative since v is squared.*)
   C. * Under the diagram, give the Conservation of Energy equation and calculate the spring constant of the spring.

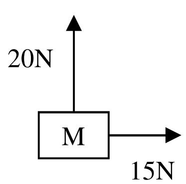
3. * 10 kg object is at rest on the ground. It is lifted up 8 m.
   A. How much minimum force was necessary to lift the object?

   B. How much work was done to lift the object?

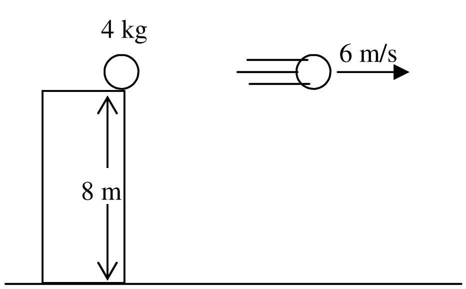
   C. If it was lifted up in 4 seconds, how much power was used to lift it?

So the "work" in the power formula could be the "energy" that the work created, since they have the same units. This is why it is often better to think that power = J/sec. Now, let me explain again the difference between scalars and vectors.

4. A scale has 4 kg of mass on it.
   A. If 2 kg is added, how much total mass is there?
   B. Then 3 kg is removed, how much total mass is there?
   Mass is a scalar. You just add and subtract mass. There is no direction. Energy is also a scalar.



5. Only two forces are acting on a mass, as shown at the left (like looking down at a box sliding on ice). Remember that forces are vectors. Since these vectors are at 90º to one another, calculate the net force on the object.



6. A 4kg ball is at the edge of an 8 m tall ledge.
   A. How much energy does it have on the ledge?

   B. Then it is hit perfectly horizontally so that it moves 6 m/s, while still 8 m above the ground. Calculate just its kinetic energy.

   C. How much total energy does it have?

   And as a scalar, you just add them together. Even though PE and KE are at right angles to each other you don't need Pythagorean theorem.

Quick lecture: Conservative vs. Nonconservative forces. With a conservative force the path doesn't matter. Gravity and springs are conservative forces. If you lift an object straight up or lift it at an angle, you end up with the same potential energy (if at same h) because gravity only acts vertically. When you are moving horizontally, gravity is not acting. And you can get the energy back out. This is why conservative force give us potential energy (like a spring). Friction is a nonconservative force. If you push something straight across a table it loses less energy than if it is pushed in a zigzag path. You are a nonconservative force: if you push an object in a straight path (neglecting friction) the object gains less energy than if you push it in a zigzag path. Why? Because in a zigzag path you are pushing for a greater distance, which is a greater amount of work, giving more KE and more velocity.

One more on the back

7. An object is dropped from 12 m. Calculate its velocity just before it hits the ground without using a kinematic equation.

1B: 6.9 m/s	2C: 130.6 N/m
3A: 100 N = mg	6C: 392 J