Activity - Simple Machines

Problem: To identify simple machines and to give examples in everyday usage.

Discussion: When studying work and energy no study is complete without considering "simple machines". A machine is a device that allows one to do work easier or faster. In most cases it allows man to do a difficult task with less force than would be needed without the aid of a machine. One example is the ramp on a moving van. The ramp allows you to raise heavy objects up into the truck with less force than would be needed to lift them.

Be careful not to fall into the misconception that simple machines give you more "energy" or allow you to do less "work". This is NOT true (recall the Law of Conservation of Energy)! The guiding principle behind simple machines is that the work you put in must equal the work you get out (in an ideal, frictionless world). So how does the task get "easier"? Think back to the ramp on a moving van. It allows you to apply less force to raise a heavy object. But you must raise it over a **longer distance**.

$$W_{ramp} = F \cdot d \qquad W_{lift} = F \cdot d$$

With the ramp you gain force at the expense of distance but the total work (energy) is conserved. This is all true for an ideal world, of course. In the real world the work you get out will always be less than the work you put in. Some of the work(energy) is lost to friction and other dissipative forces.

Questions: 1. Identify all the different types of simple machines that you can (Hint: there are six).

Discuss your results with the class before going on...

2. Give an example from everyday life of each type of machine listed in #1.

3. What kind of machine is...
   - a.) a car jack (scissors type)
   - b.) a door knob
   - c.) a *cherry picker* (engine lift)
   - d.) a tooth
   - e.) a stairway
   - f.) your arm

4. In all of the examples above what advantage does the machine give you? What disadvantages are related to it?