Simple Machines: Engineering Challenge!

How can one person easily lift a 500 lbs. piano? We have the how and why behind the simple machines that help you do just that! Think like a mechanical engineer to create a design concept, build and test your own machines, and see what you can lift at home!

Mechanical Engineering and Simple Machines:

Mechanical engineering combines physics, material sciences, and mathematical principles to design, build and maintain machines and tools that help make our world move and improve the conditions the life.

Subdisciplines of mechanical engineering:

1. **Mechanical Manufacturing Engineering:** These engineers have the important job of understanding, and improving, product quality of complex industrial and infrastructure systems.
2. **Mechatronic Engineering:** These engineers create robot-type smart machines that can make their own decisions and be conscious of their surroundings.

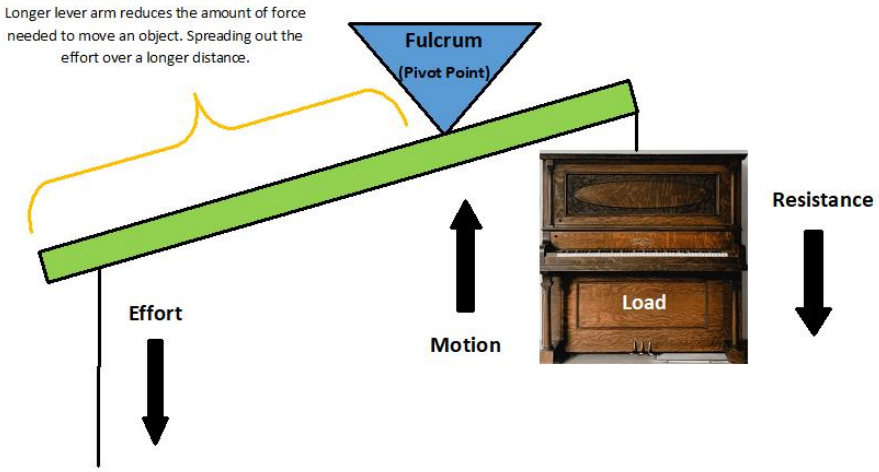
Mechanical engineers work with highly complex systems and machinery, but can often involve simple machines in what they do. Simple machines have a few working parts that provide a mechanical advantage to make aspects of our lives easier. These include the wheel and axel, levers, pulleys, or an inclined plane.

How do they work?

A **lever** is a rigid bar resting on a pivot, used to help move a heavy load with one end when pressure is applied to the other. There are three classes of levers, and we see examples of all in everyday objects!

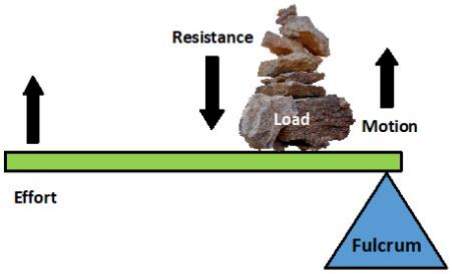
<u>Class 1 Lever:</u>

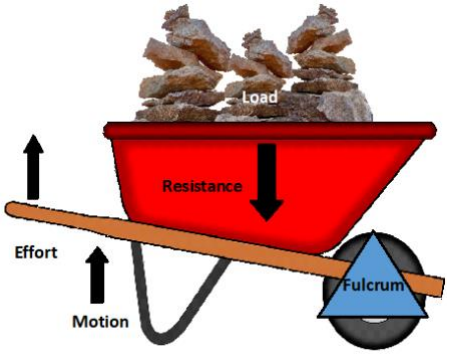
Examples: teeter-totter, piano pulley exhibit, scissors



Class 2 Lever:

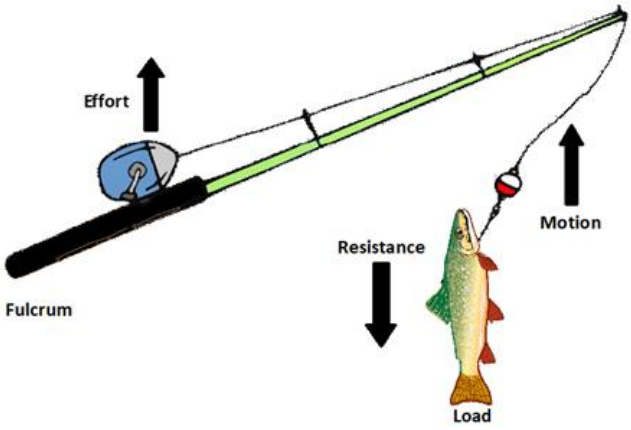
Example: wheel barrow



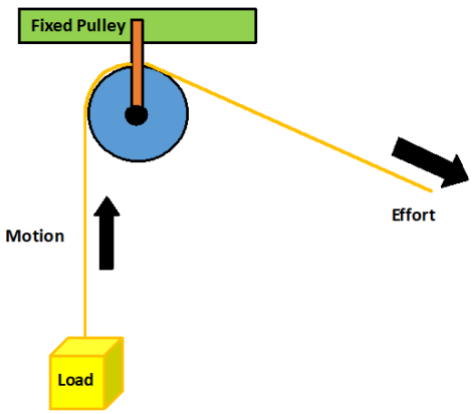


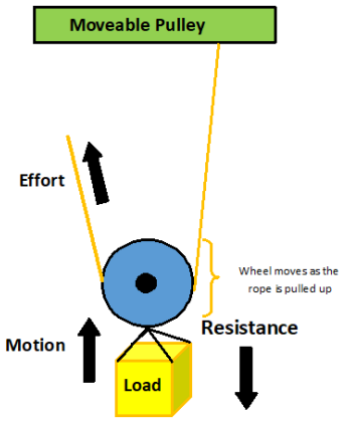
Class 3 Lever:

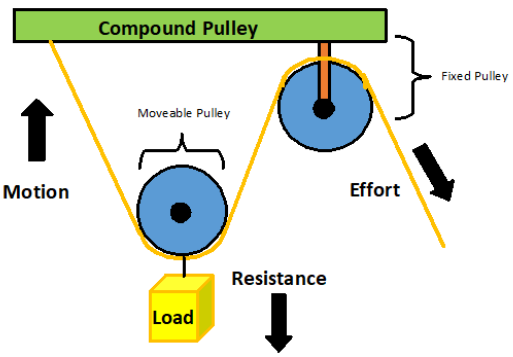
Examples: human arms and legs, fishing rods, tweezers



A **pulley** is a wheel and axel that guides or changes the direction of a rope, or reduce the force needed to move a load. Engineers can even use multiple pulleys to increase the mechanical advantage! There are three types of pulleys: fixed, moveable and compound. Each wheel rotates appropriately with the rope being pulled to reduce friction and increase mechanical advantage.







DISCOVERY AT HOME

FORT COLLINS MUSEUM OF DISCOVERY

Supplies:

Use what you have available at home

- Cardboard
- Writing utensils
- Glue or tape
- Random objects of varying weights
- Paper tubes
- String or yarn
- Sticks and rocks
- Wire coat hanger
- Spools

Instructions:

1. Find something in your house that you want to use as your load (an object to lift) this could be heavy or light.
2. Use what you now know about simple machines, and engineer a way to move or lift your object effectively.
3. Continue your research into other simple machines to assist in your design concept. Will you use pulleys, levers, wheels and axels, wedges, or maybe a combination?