

I. Forces and Machines

A. Machines – device with parts that work together to accomplish a task

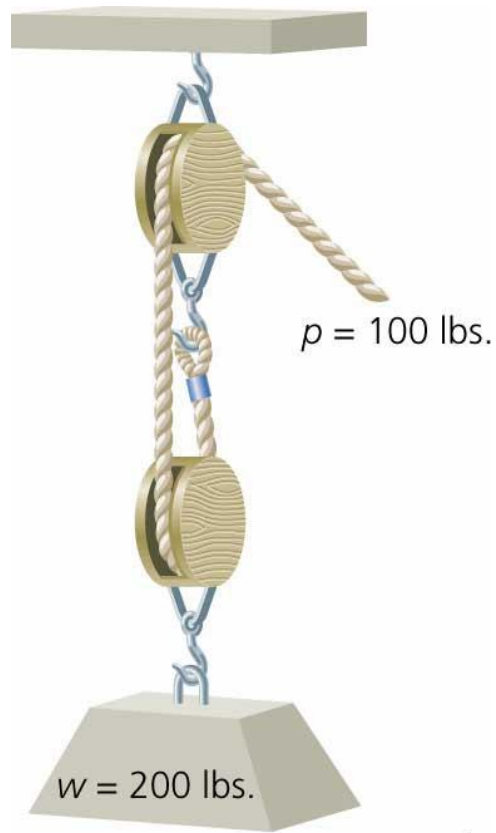
B. Mechanical advantage is a ratio of output force to input force.

C. Simple Machines – an unpowered mechanical device that maneuvers forces and can be combined to form more complex machines

1. wheel and axle

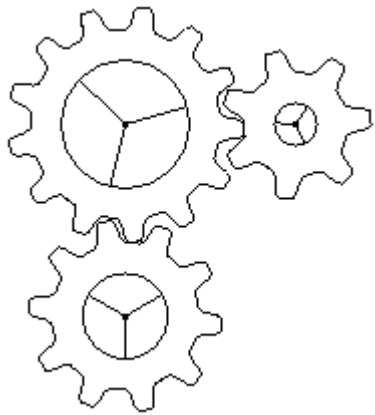


2. block and tackle (pulley system)



3. ramp (inclined plane)

4. gears



5. lever

C. Force – a push or pull on an object that can possibly make it move

1. units – newtons

2. mechanical advantage – is the ratio of output force to input force

II. Lever

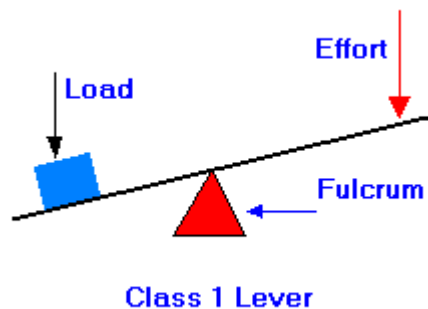
A. Fulcrum – the actual lever rotates around a fixed point called a fulcrum

B. input arm – side of the lever where the input force is applied

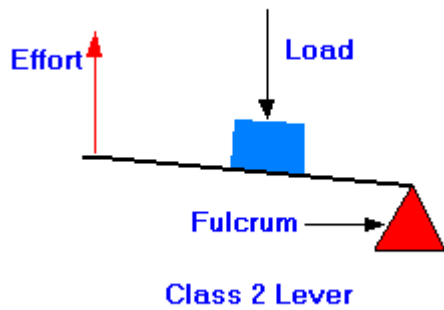
C. output arm – side of the lever that acts on the desired object

D. Three classes:

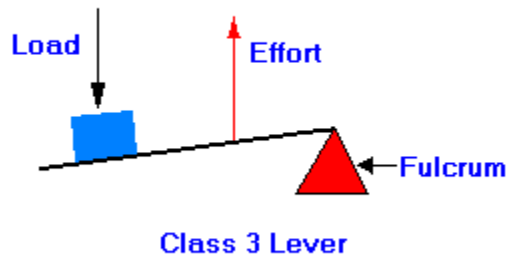
1. first class



2. second class

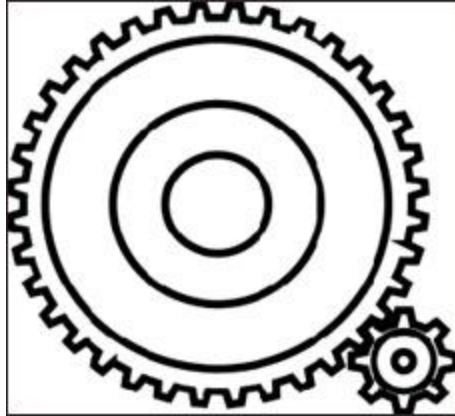


3. third class – the input force is larger than the output force here



III. Gears

- A. Use – transmit rotating motion from one object to another
- B. Gears can change the force and speed needed by certain machines



If the large gear is the Input Gear and the small Gear is the Output Gear, then the smaller gear will turn faster than the larger one.

C. input gear – gear which force is applied to

D. output gear – gear which turns the action of the desired object

E. Gear ratio – because smaller gears turn faster, they must have fewer number of teeth in them.

IV. Work

A. Work – scientists describe it as any situation where a force has moved an object over some distance; measured in joules (J)

1. the amount of work output can never exceed the work input
2. efficiency of a machine – the ratio of input to output work

3. friction – force that opposes the desired input force, causes loss of work

4. $Work = (Force)(distance) = Fd$

B. Power – is the amount of work done in a certain amount of time

1. may be measured in watts or horsepower

2. calculated by dividing work by time

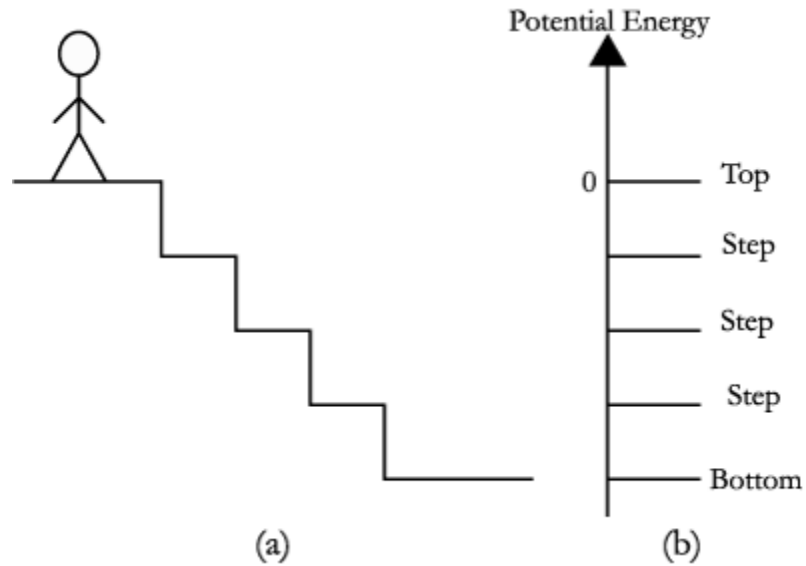
$$Power = \frac{Work}{time} = \frac{W}{t}$$

C. Energy – anything that has the ability to do work.

1. Potential – derived from the position of an object relative to the Earth's surface; higher an object off the ground, larger PE is

a. formula: $PE = mgh$

b. m is mass, g is acceleration due to gravity, and h is the height is object is off the ground.



2. Kinetic – energy of motion

a. formula: $KE = \frac{1}{2}mv^2$

b. increases with mass and speed

3. Law of conservation of energy – energy can only get converted from one form to another.