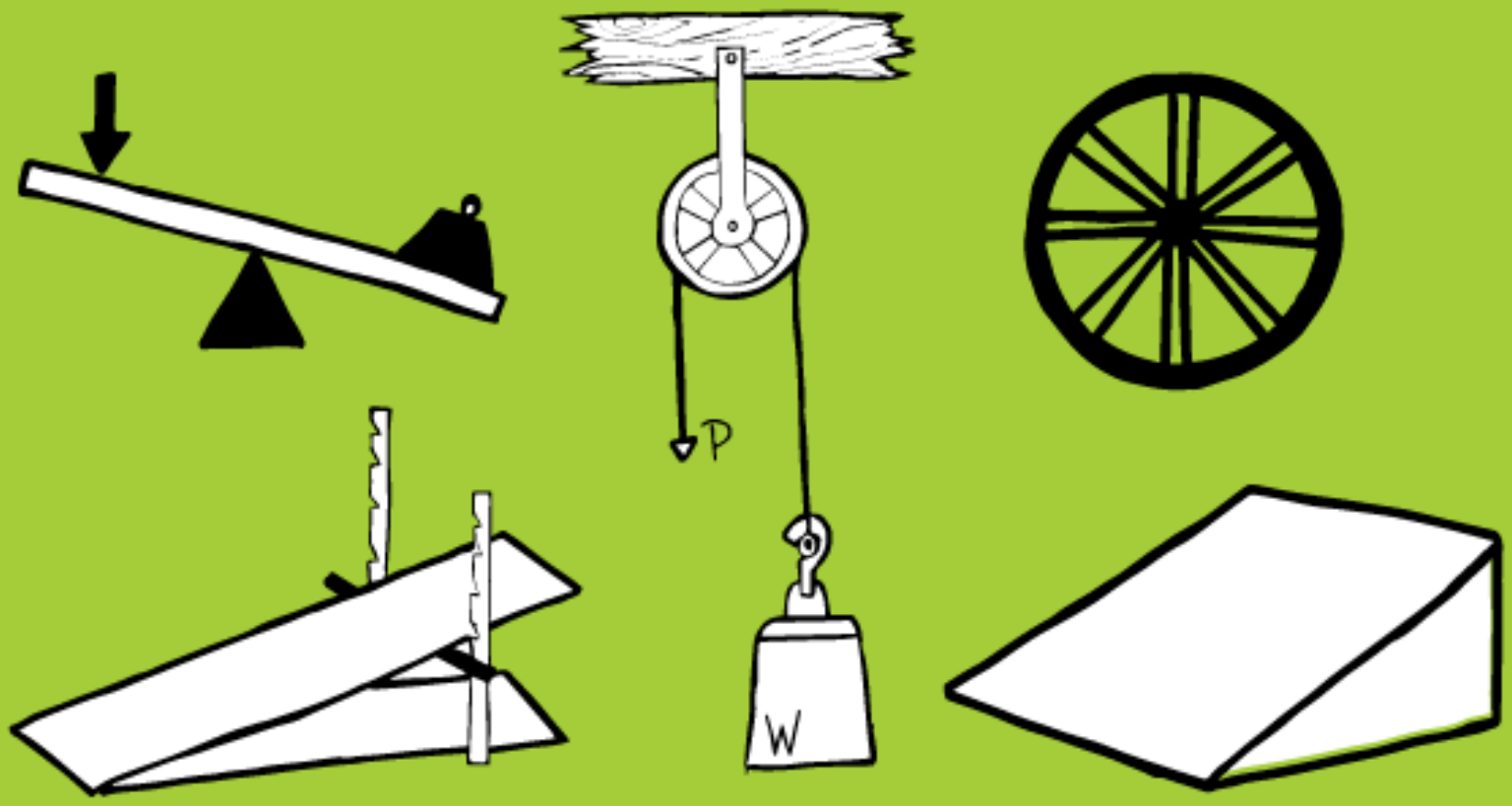
simple machines



What is Work?

Question What is work?	**Answer** Work is done when an object moves in the same direction in which the force is exerted.
How can you calculate work?	Work = Force X Distance
What is power?	Power is the rate at which work is done.

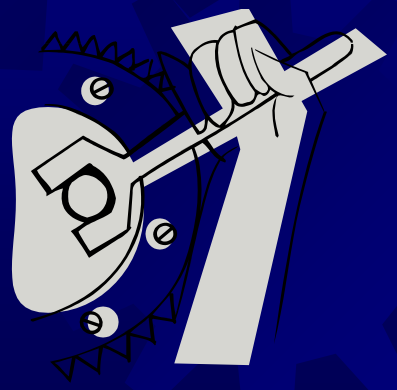
Mechanical Advantage

The mechanical advantage of a machine helps by…

changing the amount of force you exert	changing the distance over which you exert your force	changing the direction of the force

A Simple Machine

- Simple machines help us do work.
- Machines make work easy.

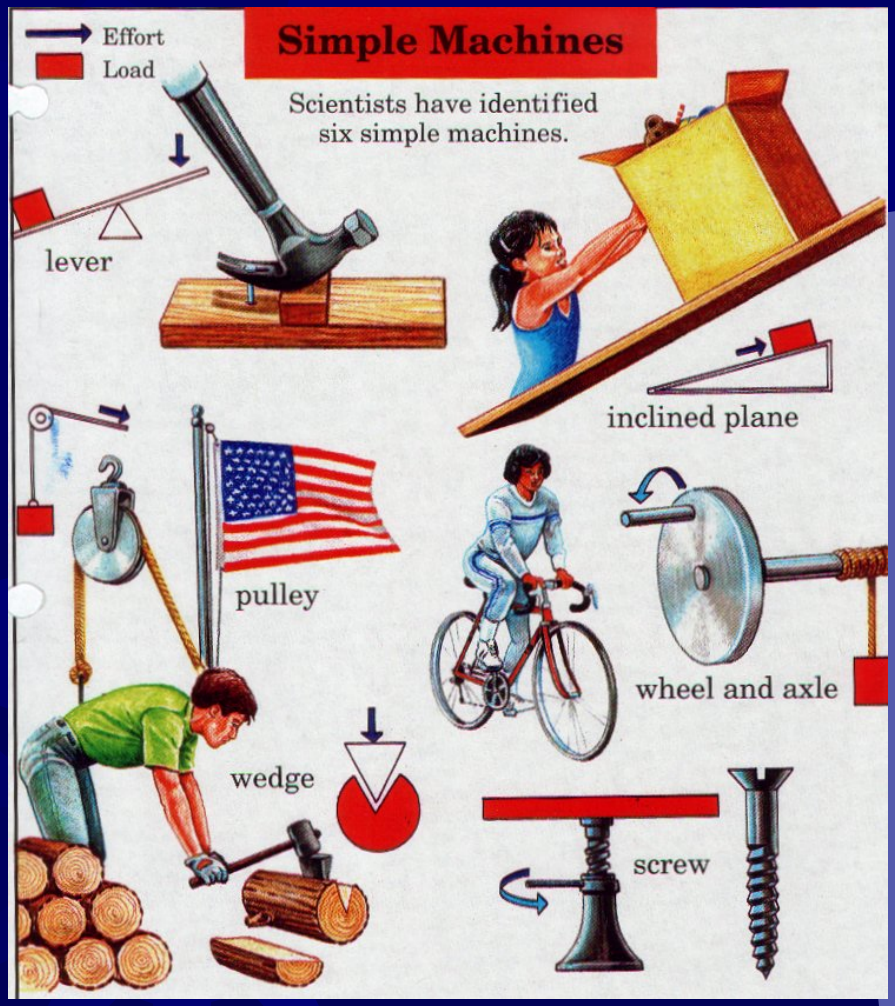


Simple Machines

- Simple machines either change the amount of force on an object or change the direction of the force.
- Machines do not diminish the amount of work we do—they just make it easier by changing the direction of the movement.
- Two or more SIMPLE machines make a COMPLEX machine.

What is a Simple Machine?

- Simple machines have few or no moving parts.
- There are **6** kinds of simple machines.



Types of Simple Machines

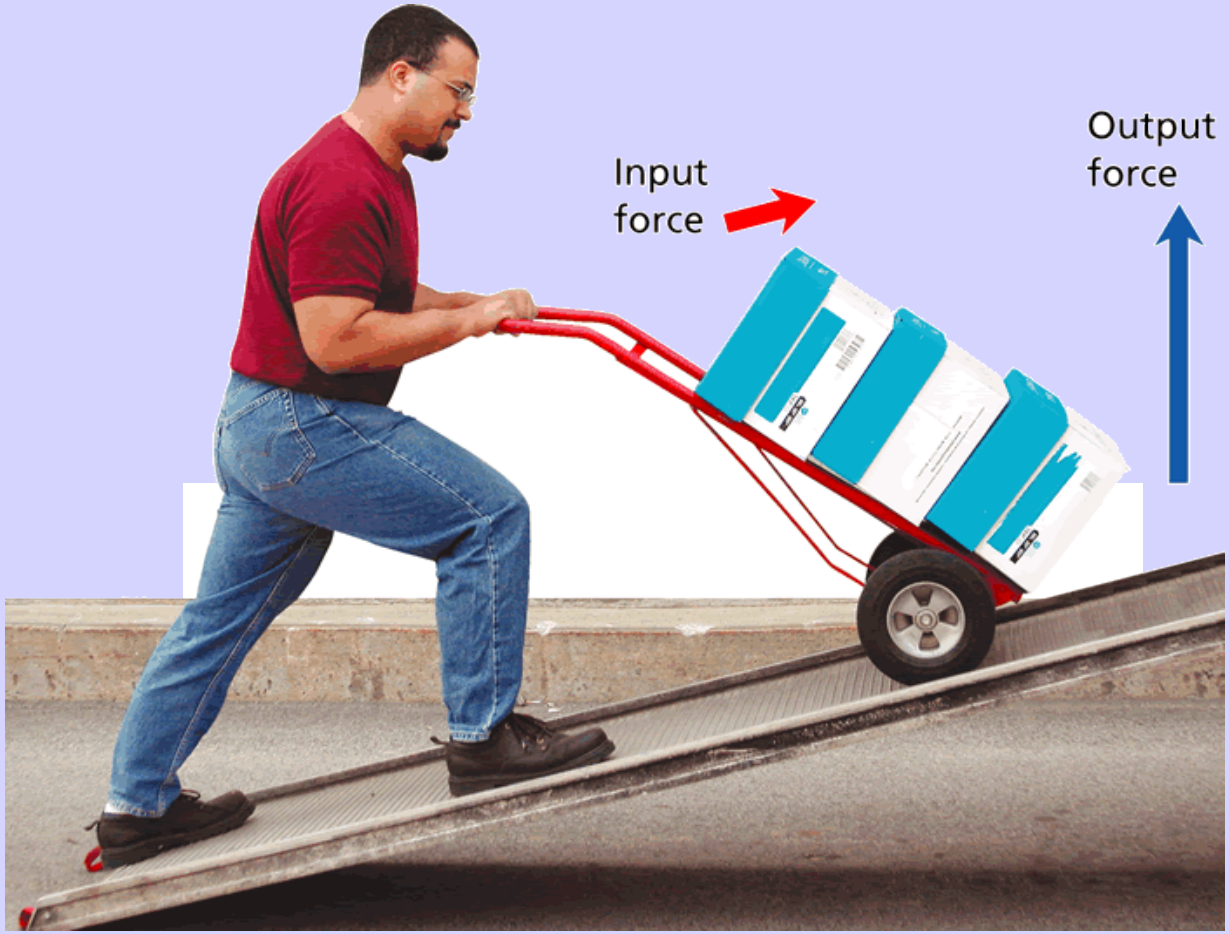
1. Inclined plane	4. Wheel and axle
2. Wedge	5. Pulley
3. Screw	6. Lever

Inclined Plane

- An inclined plane is like a flat board that is higher on one end.

- Inclined plane makes work easier.

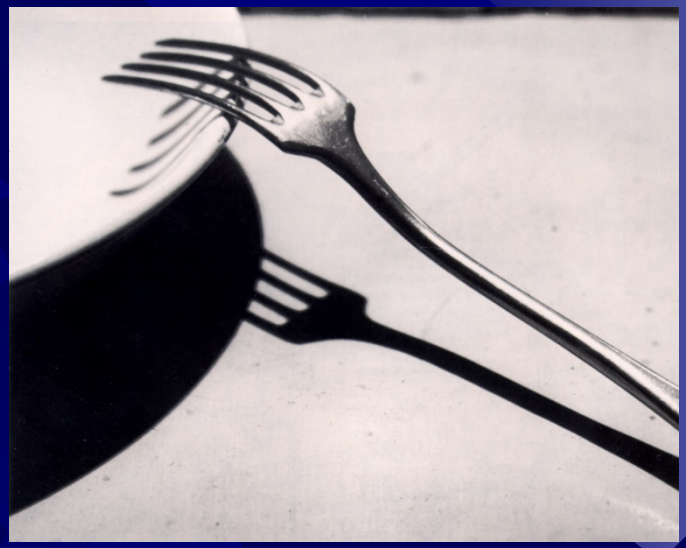
An inclined plane is a flat, sloped surface



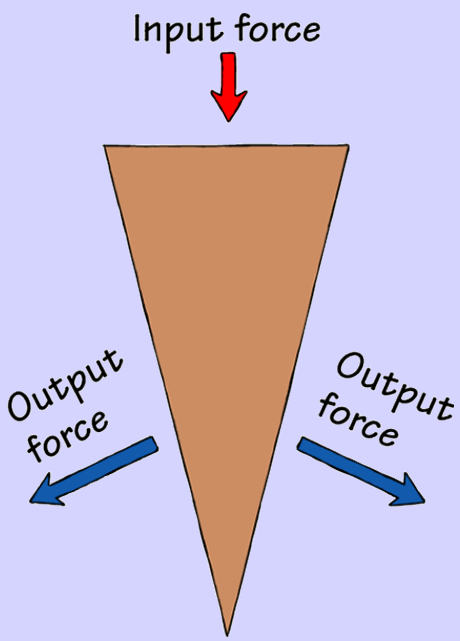
Can you think of some other inclined planes?

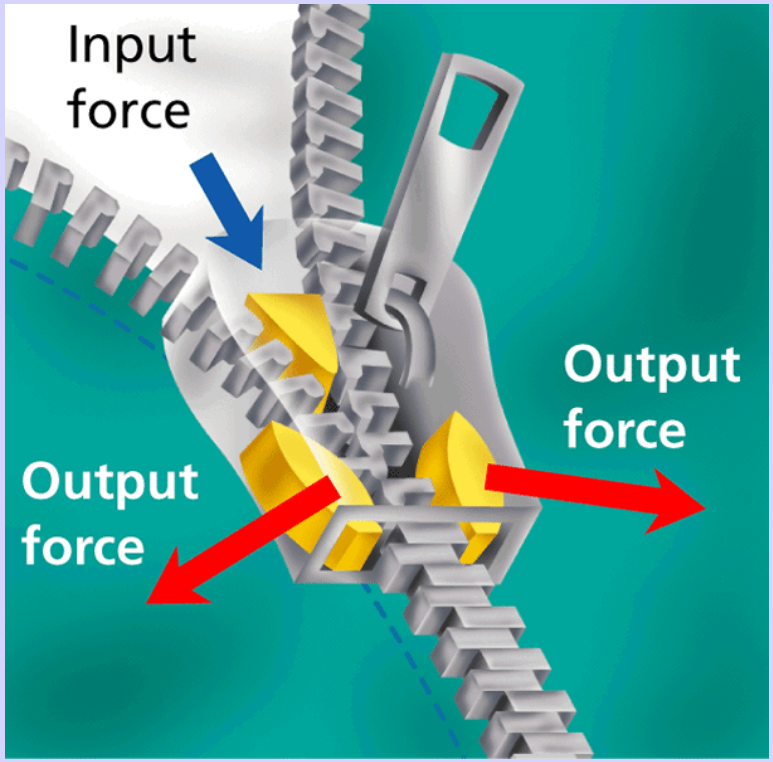
A Wedge

- A wedge is two inclined planes pushed together like a V.
- It pushes things away from each other.
- It splits things.



A wedge is a device that is thick at one end and tapers to a thin edge at the other end.





Can you think of some other wedges?

A Screw

- A screw is an inclined plane wrapped around a shaft or cylinder (the inclined plane allows the screw to move itself when rotated).
- It holds things together and can make them go up and down.

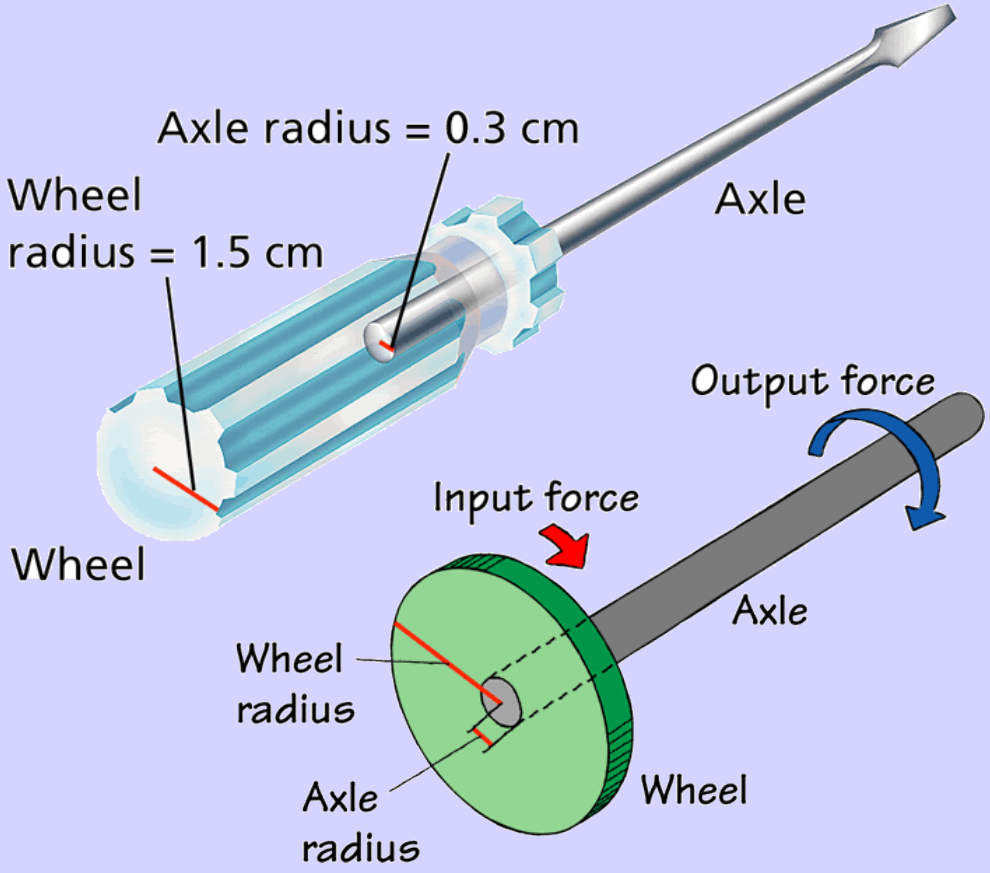
- A screw can be thought of as an inclined plane wrapped around a cylinder.

Can you think of some other screws?

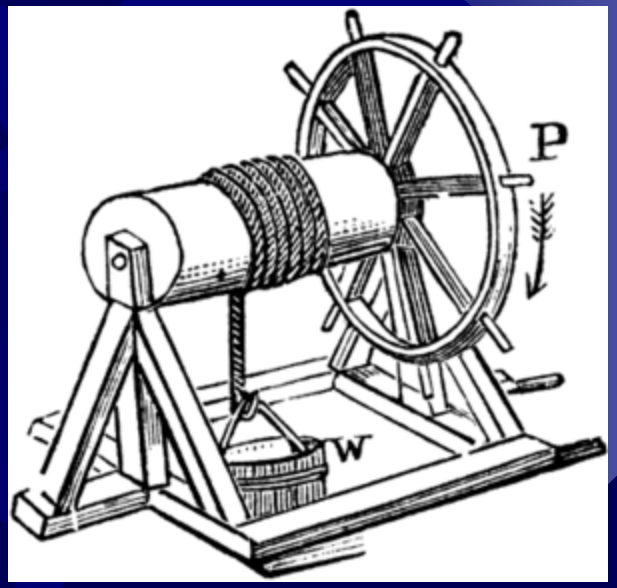
A Wheel and Axle

- A wheel and axle is a pole that goes through the wheel which allows the wheel to turn

A wheel and axle is a simple machine made of two circular or cylindrical objects fastened together that rotate about a common axis.

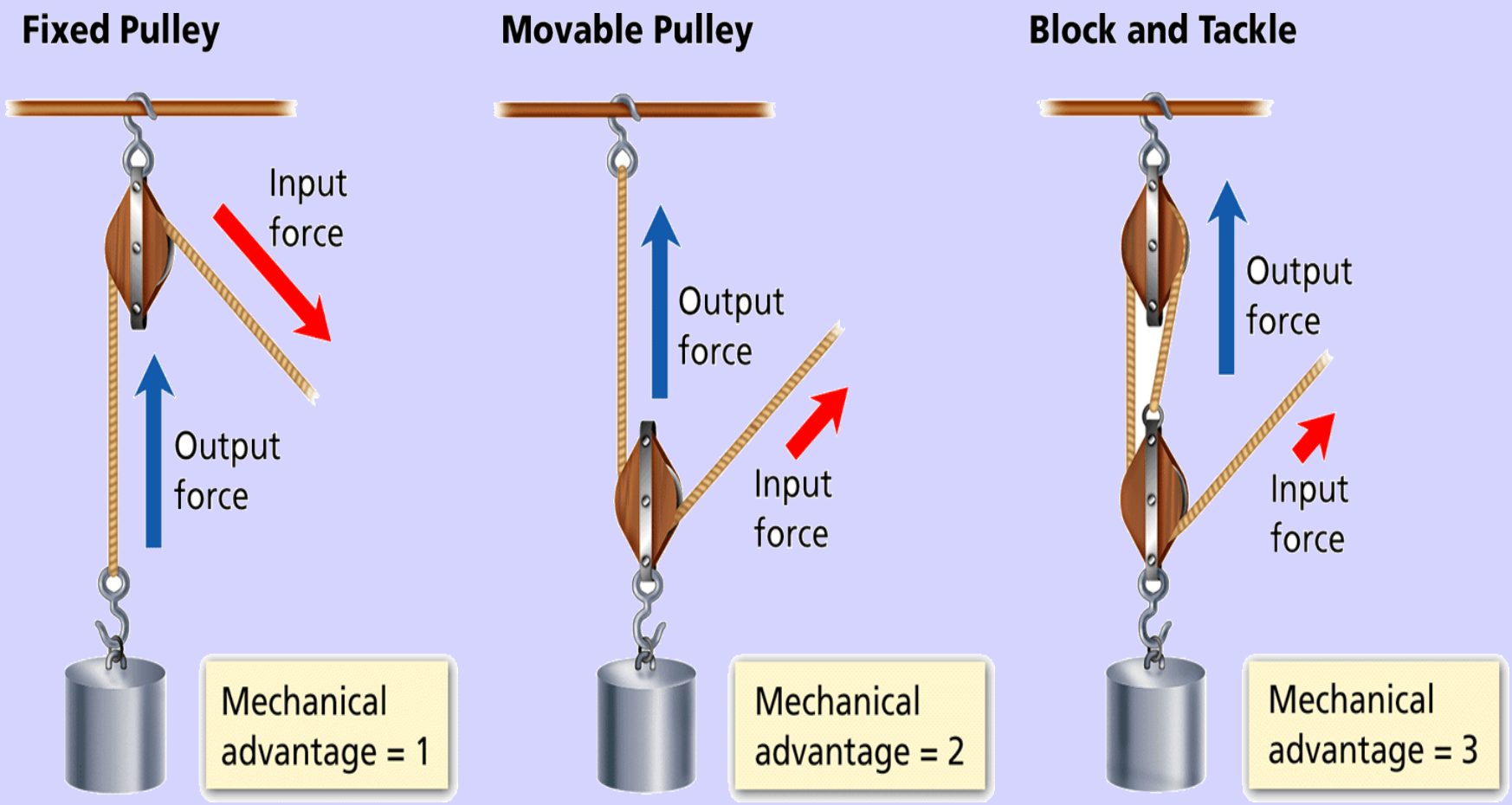


Can you think of some other wheels and axles?



A Pulley

- Pulleys are wheels and axles with a groove around the outside
- A pulley needs a rope, chain or belt around the groove to make it do work

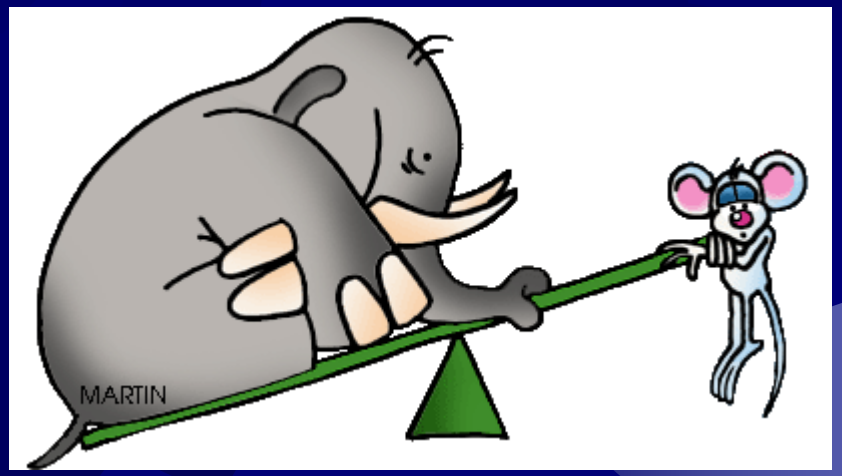

Fixed Pulley
Input force
Output force
Mechanical advantage = 1
Movable Pulley
Output force
Input force
Mechanical advantage = 2
Block and Tackle
Output force
Input force
Mechanical advantage = 3

Can you think of some other pulleys?

A Lever

- A lever is a board on top of something else.
- It can balance things or move them.

Can you think of some other levers?



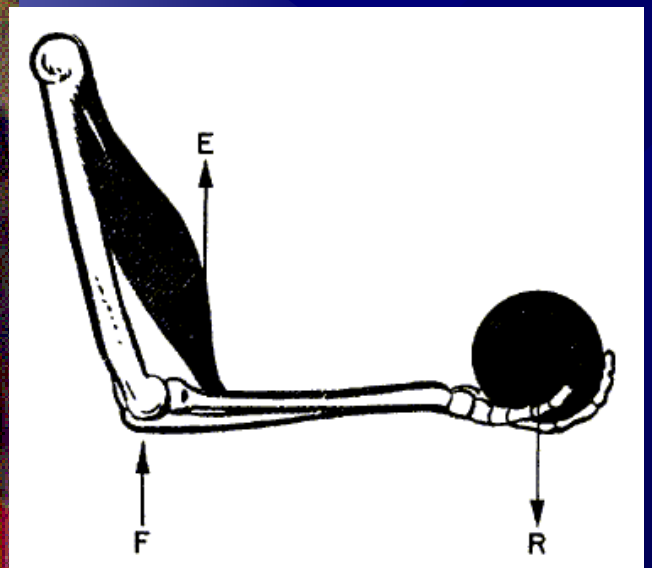
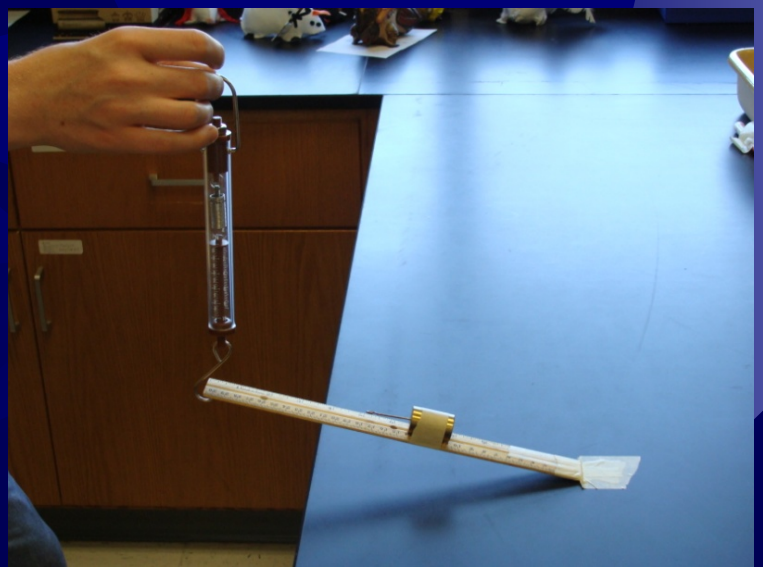


Figure 1-6.-Your arm is a lever.



Simple Machines

- Simple machines can be put together in different ways to make complex machinery

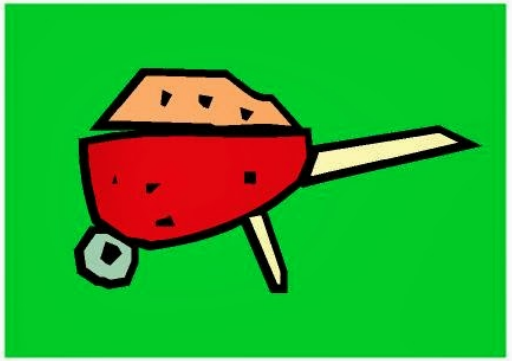
Simple Machines

Lever

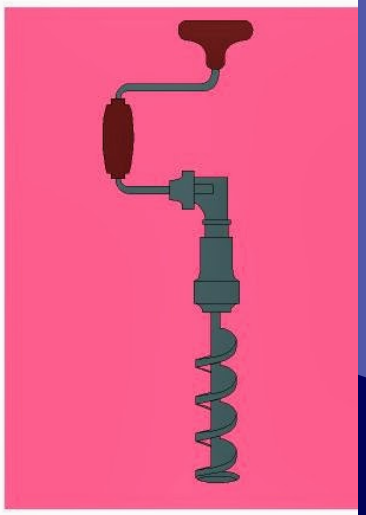
Inclined Plane

Wedge

Pulley



Wheel and Axle

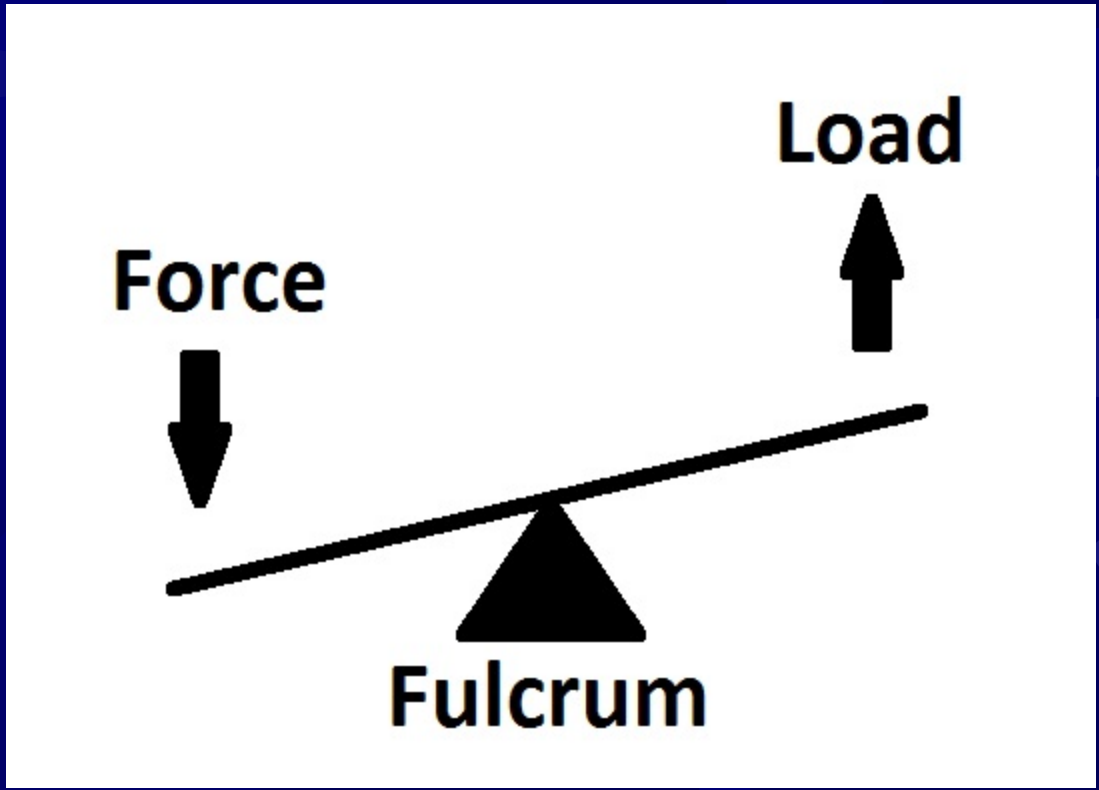


Screw

Levers

Lever:

It is a rigid bar (straight or curved) that rotates around a fixed point called a fulcrum, and is affected by an effort force and a resistance force.



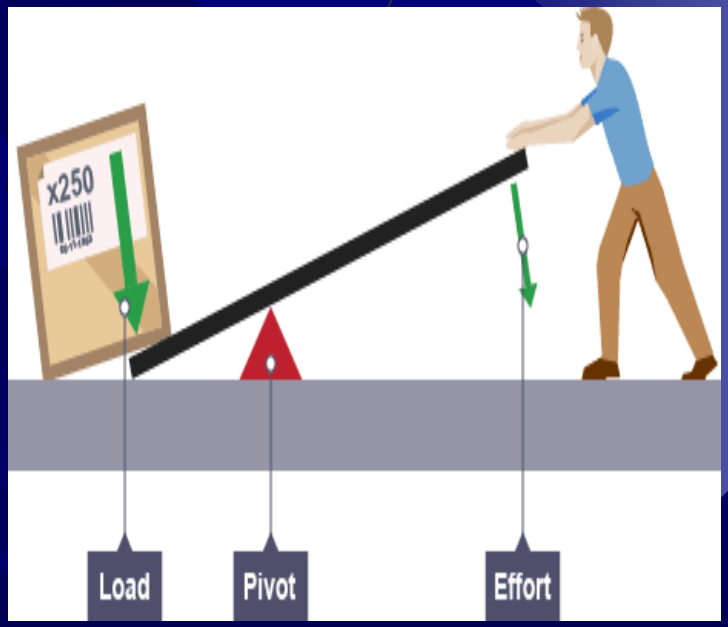
The structure of levers:

A lever consists of:

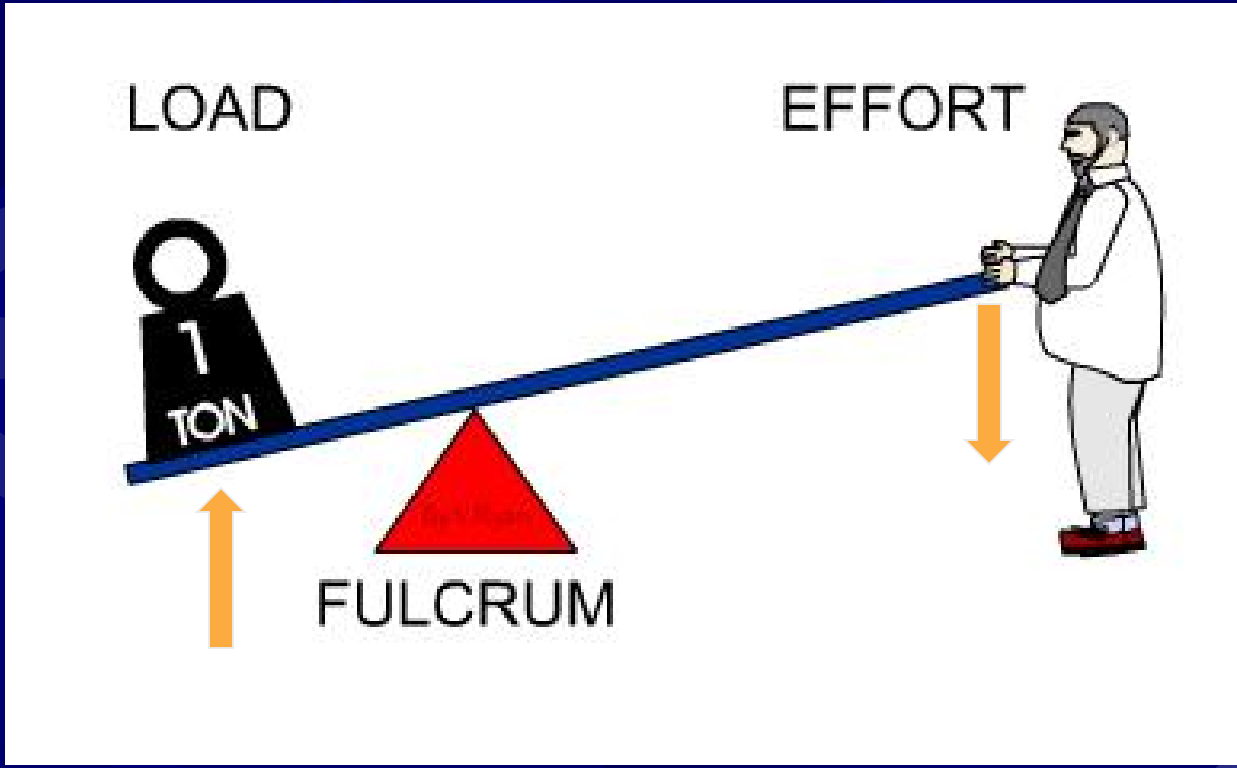
- **1 – A resistance force (or load)** that results from the weight of the body that we want to move.
- **2 – An force (effort)** that is exerted by a person to equilibrate the resistance.
- **3 – A Fulcrum** that is a fixed point, where the bar rotates on.

The Importance of Levers:

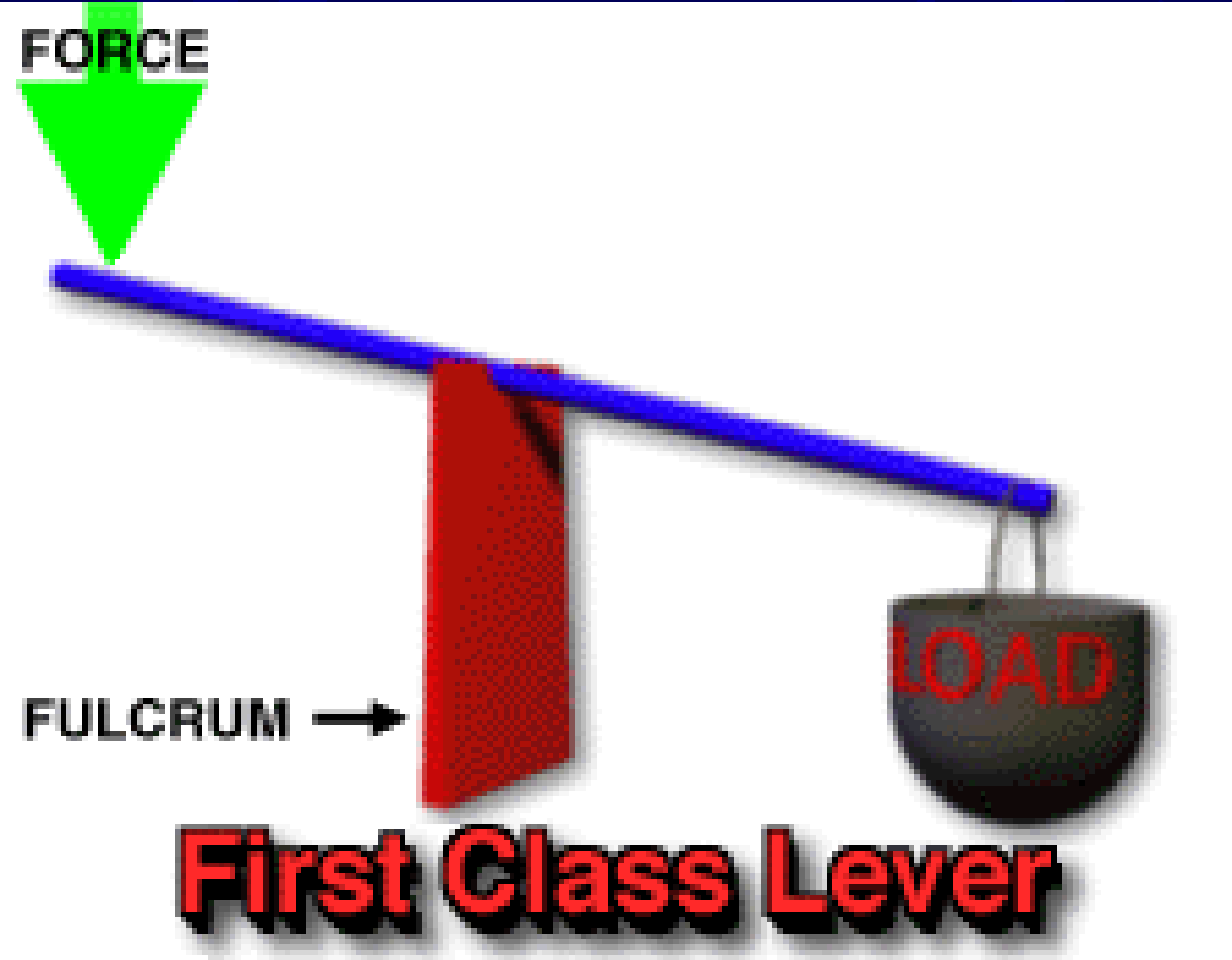
- Increases force
- Increases distance
- Increases Speed
- Increases accuracy
- Increases safety
- Moves an object from one place to another



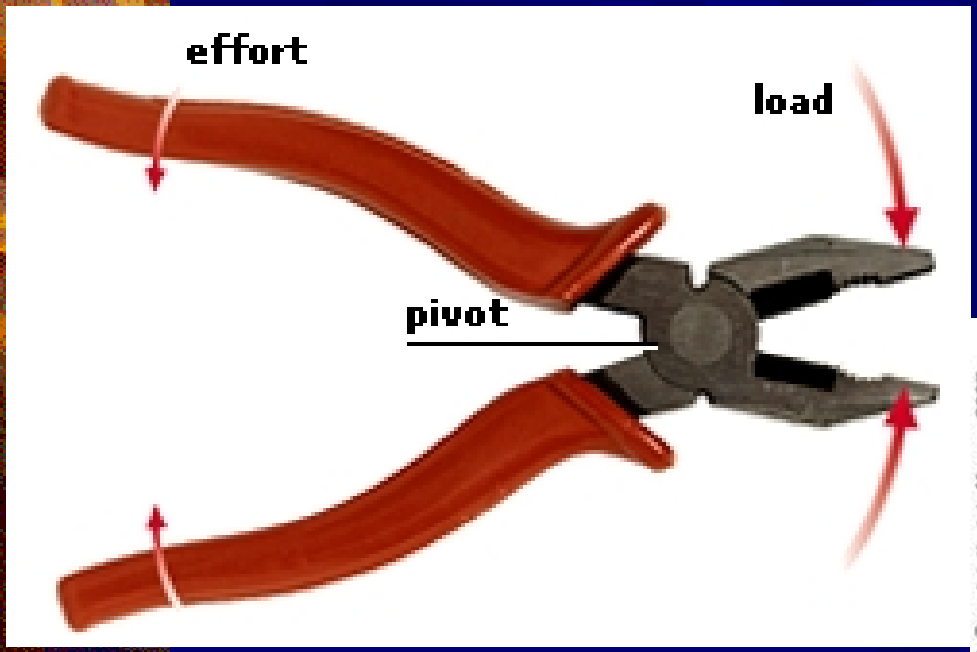
First Class Lever

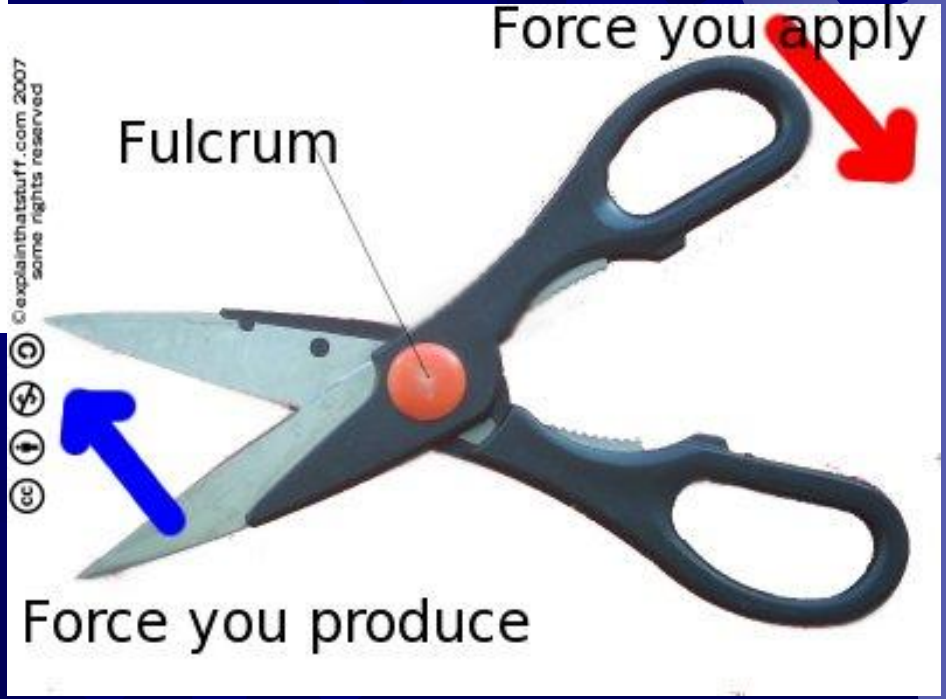


The fulcrum is located between the load and the effort. In first class levers, the direction of the effort is opposite the direction of the load. In other words, the effort must push down on the lever to move the load upwards.

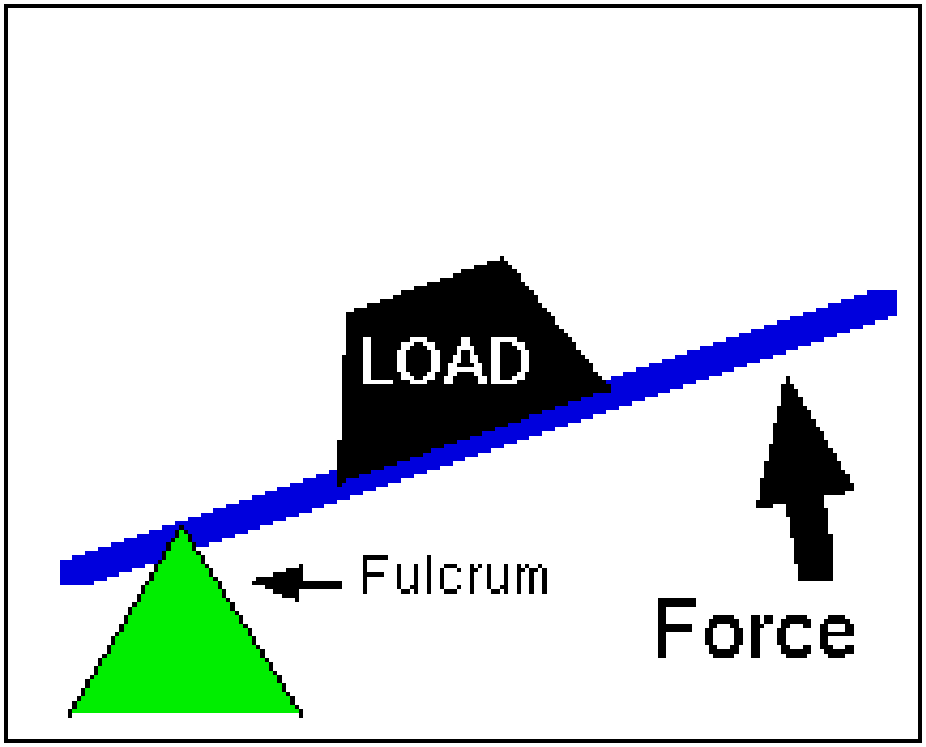

FORCE
FULCRUM
LOAD
First Class Lever

First class Levers



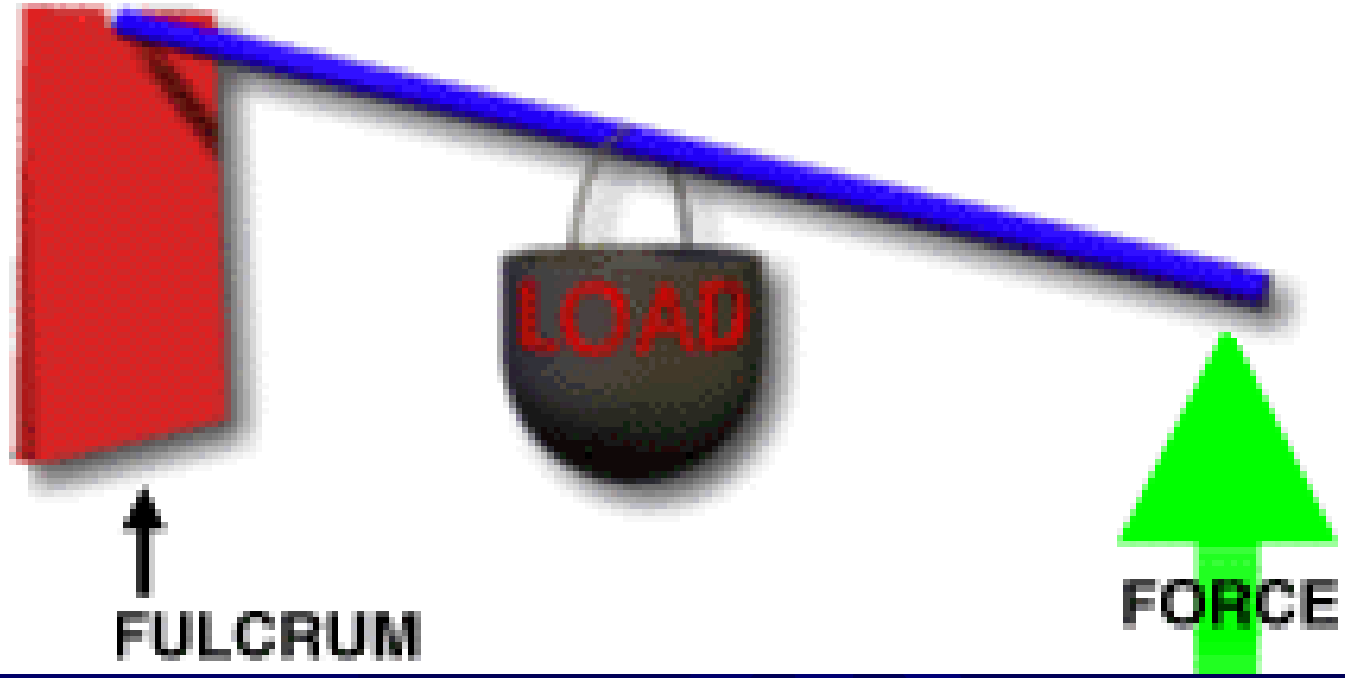


Second Class Lever

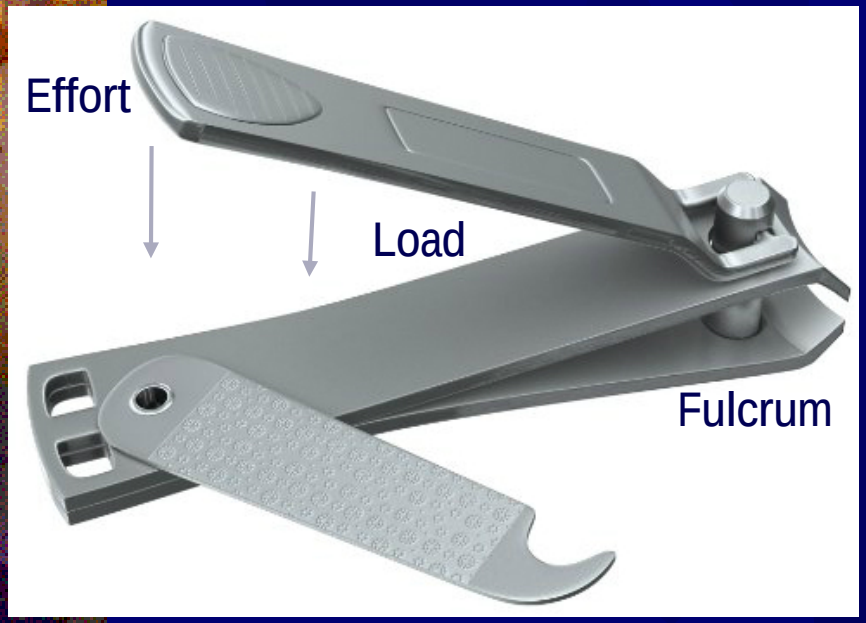


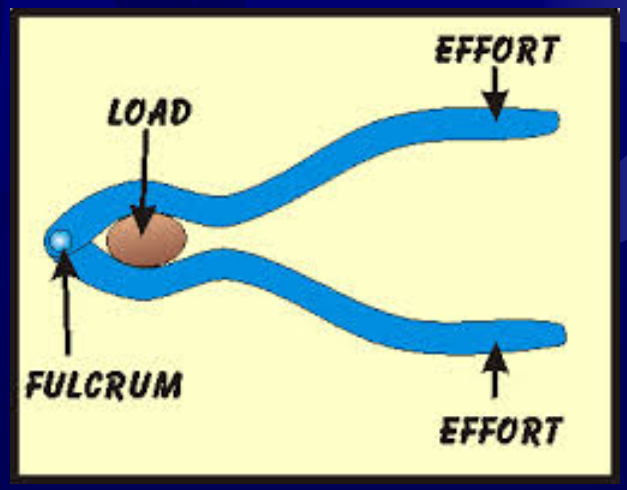
In a second class lever, the load is located between the effort and the fulcrum. In second class levers, the direction of the effort and the load are the same. In order to move the load upwards, the effort must be applied upwards as well.

Second Class Lever

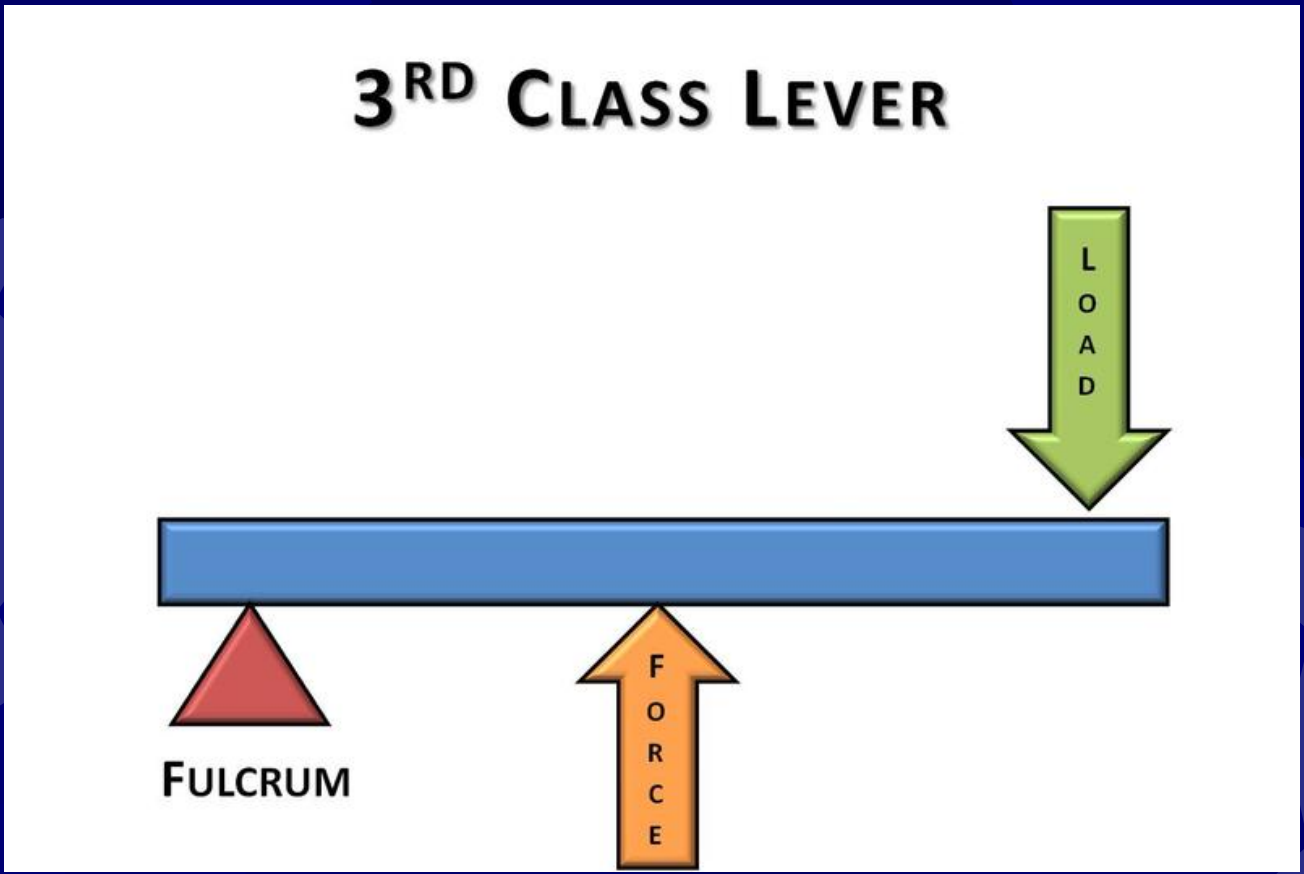


Second Class Levers



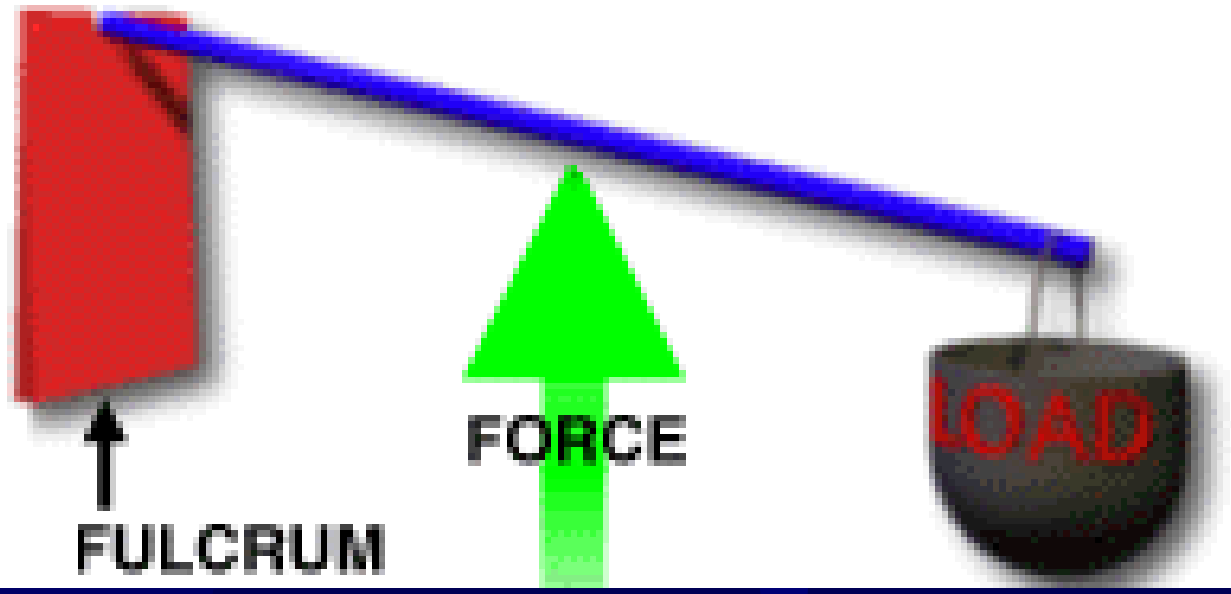


Third Class Lever

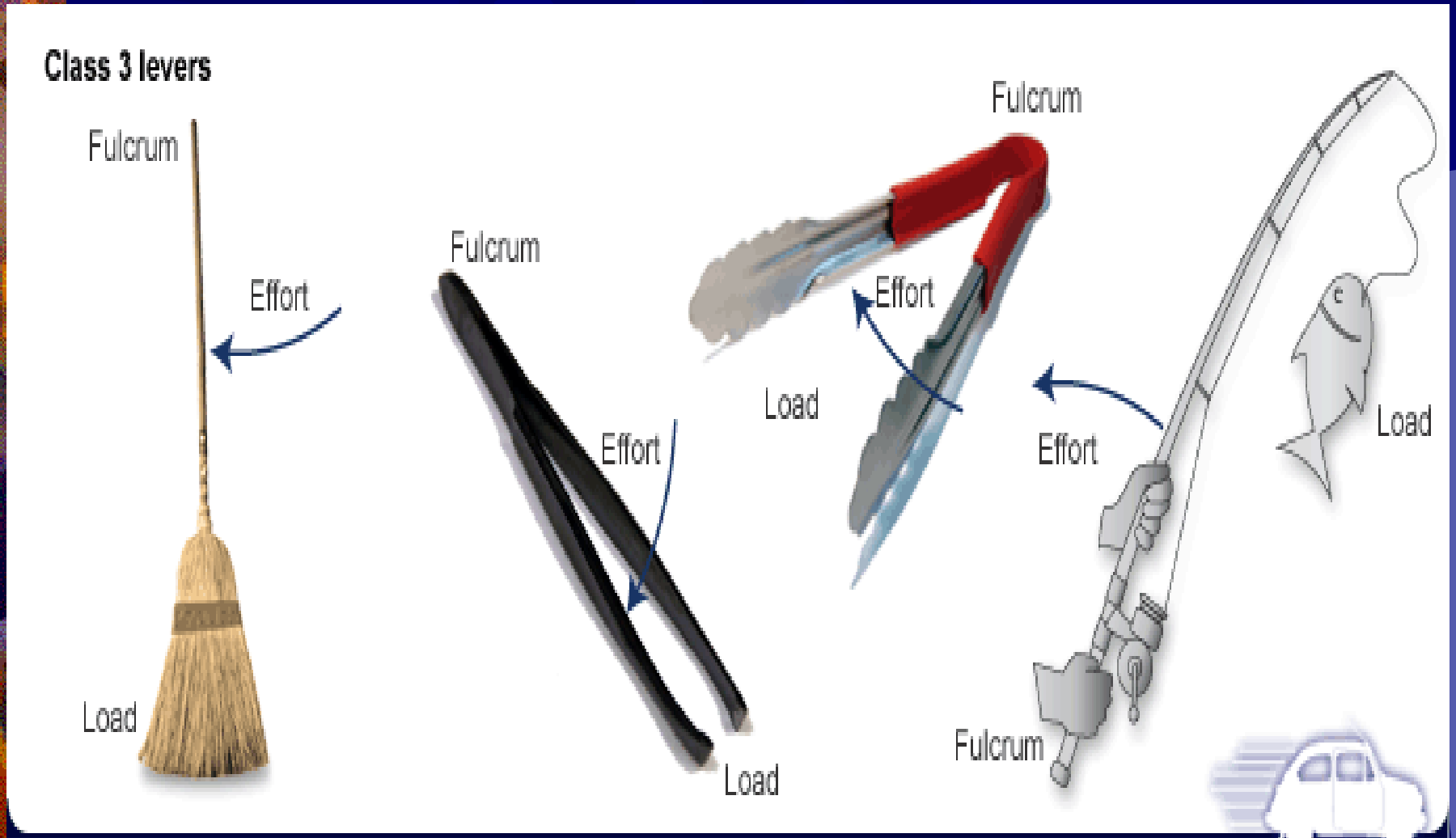


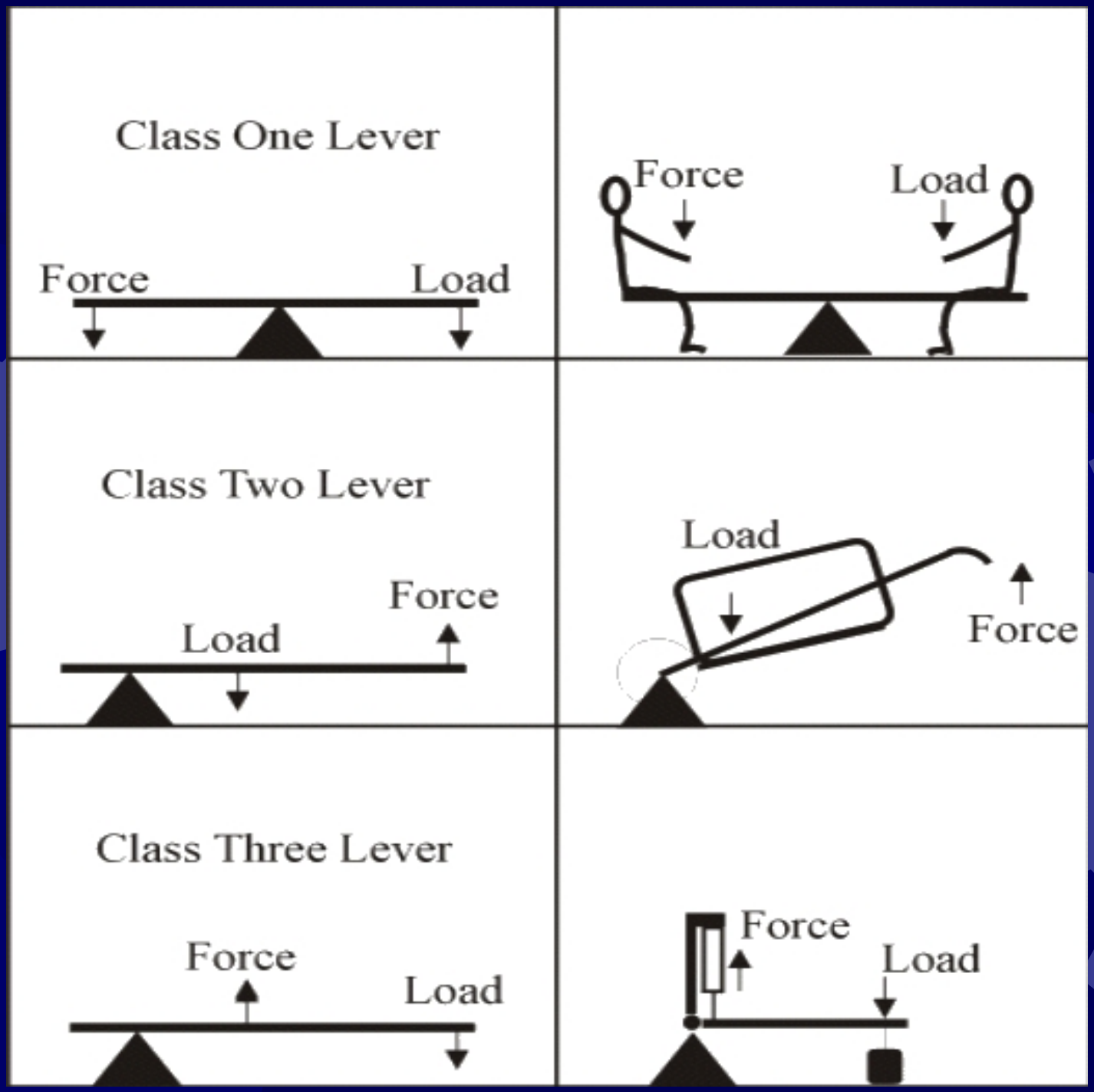
The effort is between the load and the fulcrum. In this type of lever, no matter where the force is applied it is always greater than the force of load. The load moves in the same direction as the applied force.

Third Class Lever

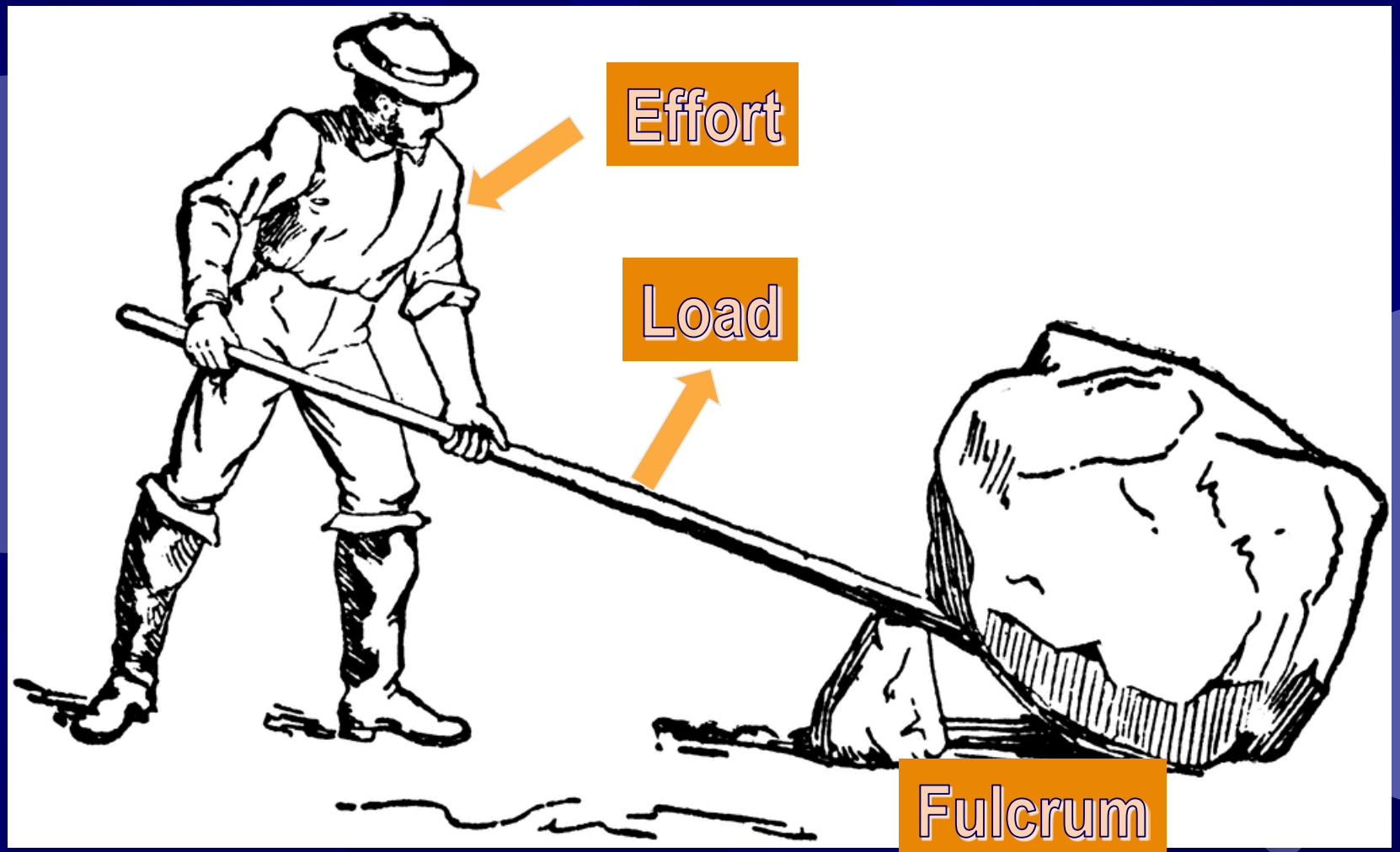


Third Class Levers




Class One Lever
Force
Load
Force
Load
Class Two Lever
Force
Load
Load
Force
Class Three Lever
Force
Load
Force
Load

Which Class?

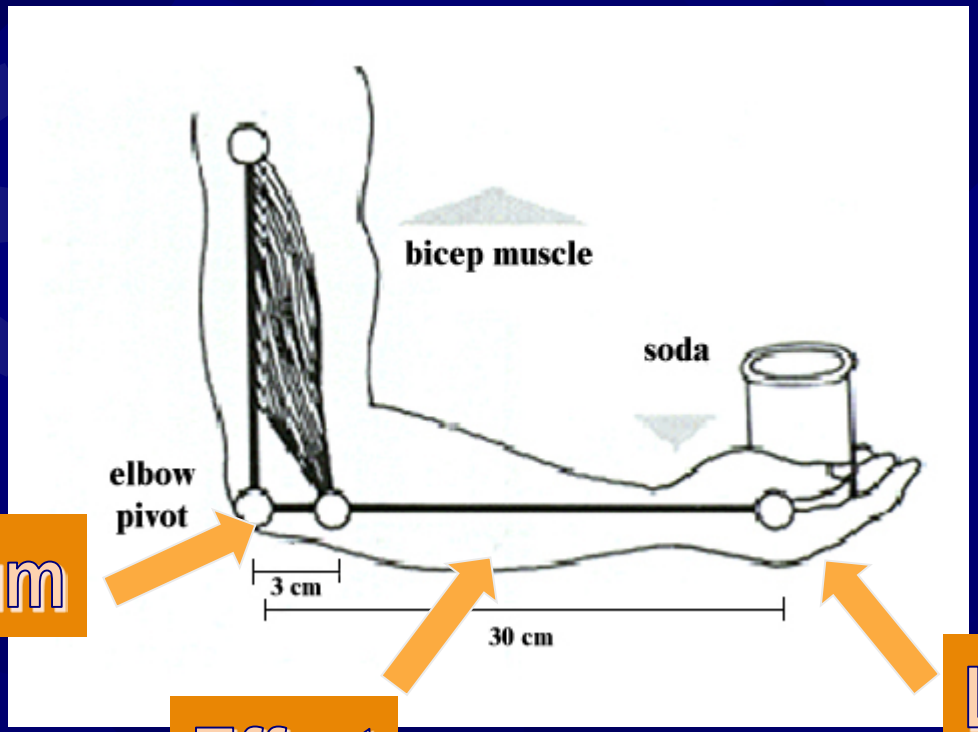


First Class

Which Class?

Second Class

Which Class?



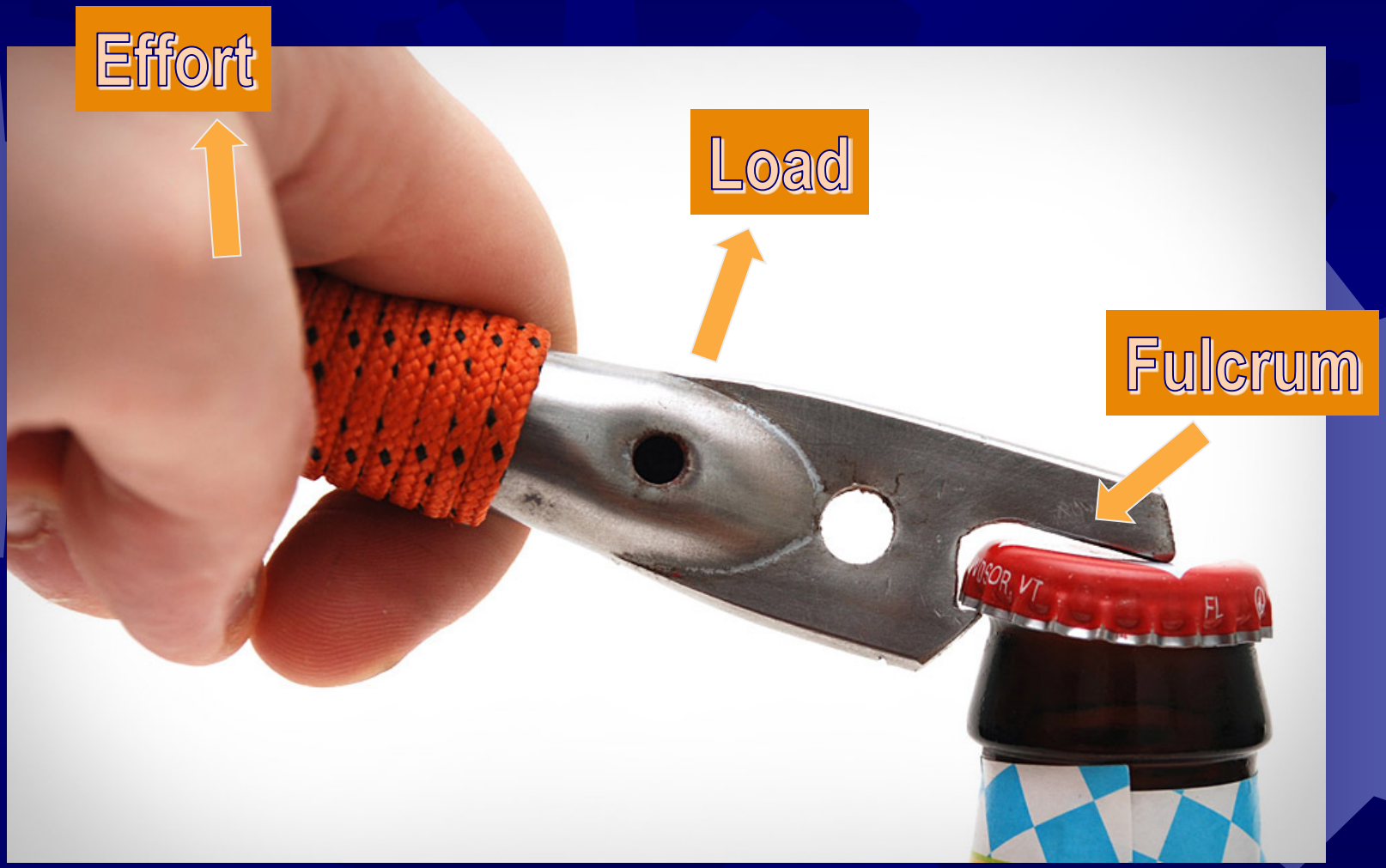
Fulcrum

Effort

Load

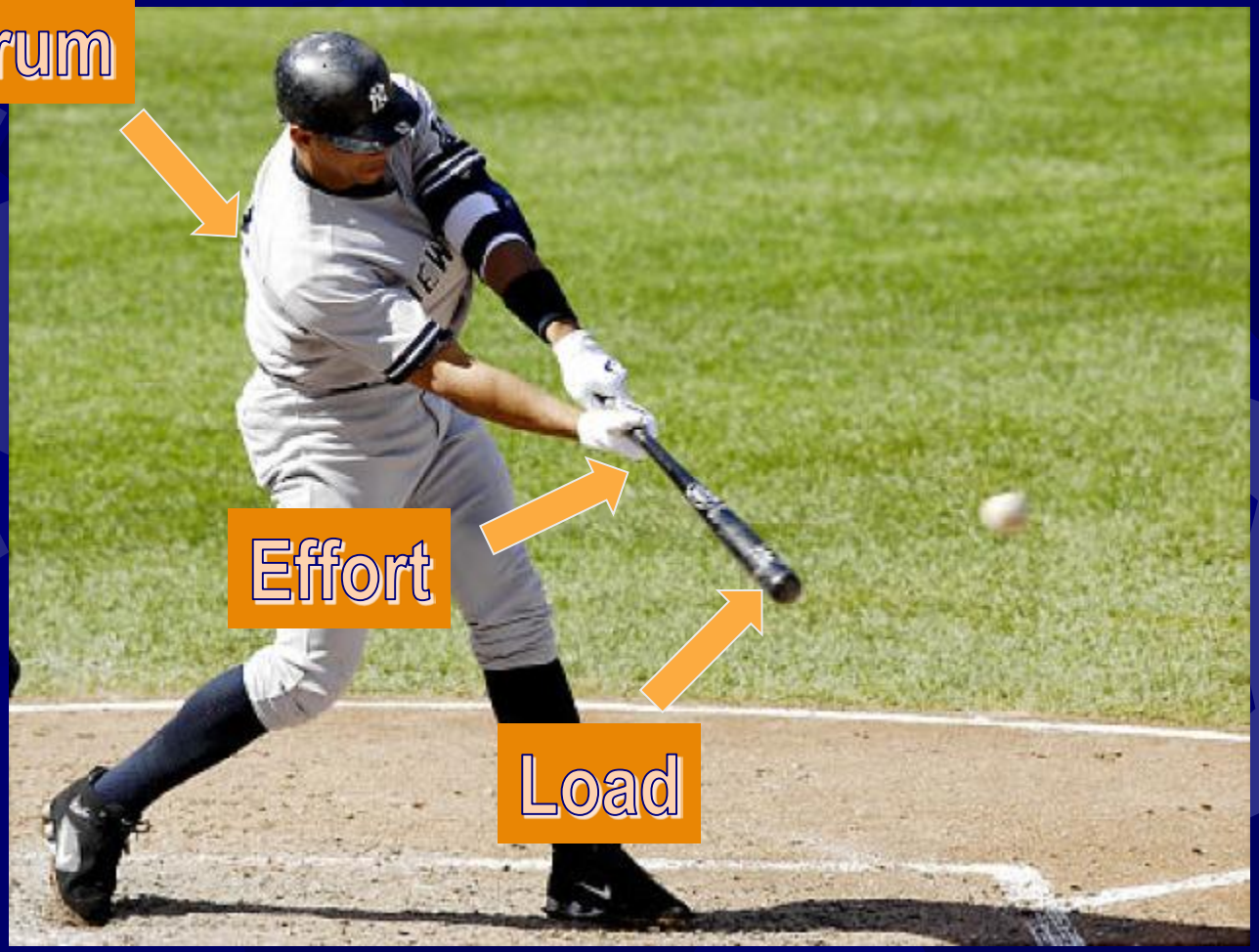
Third Class

Which Class?



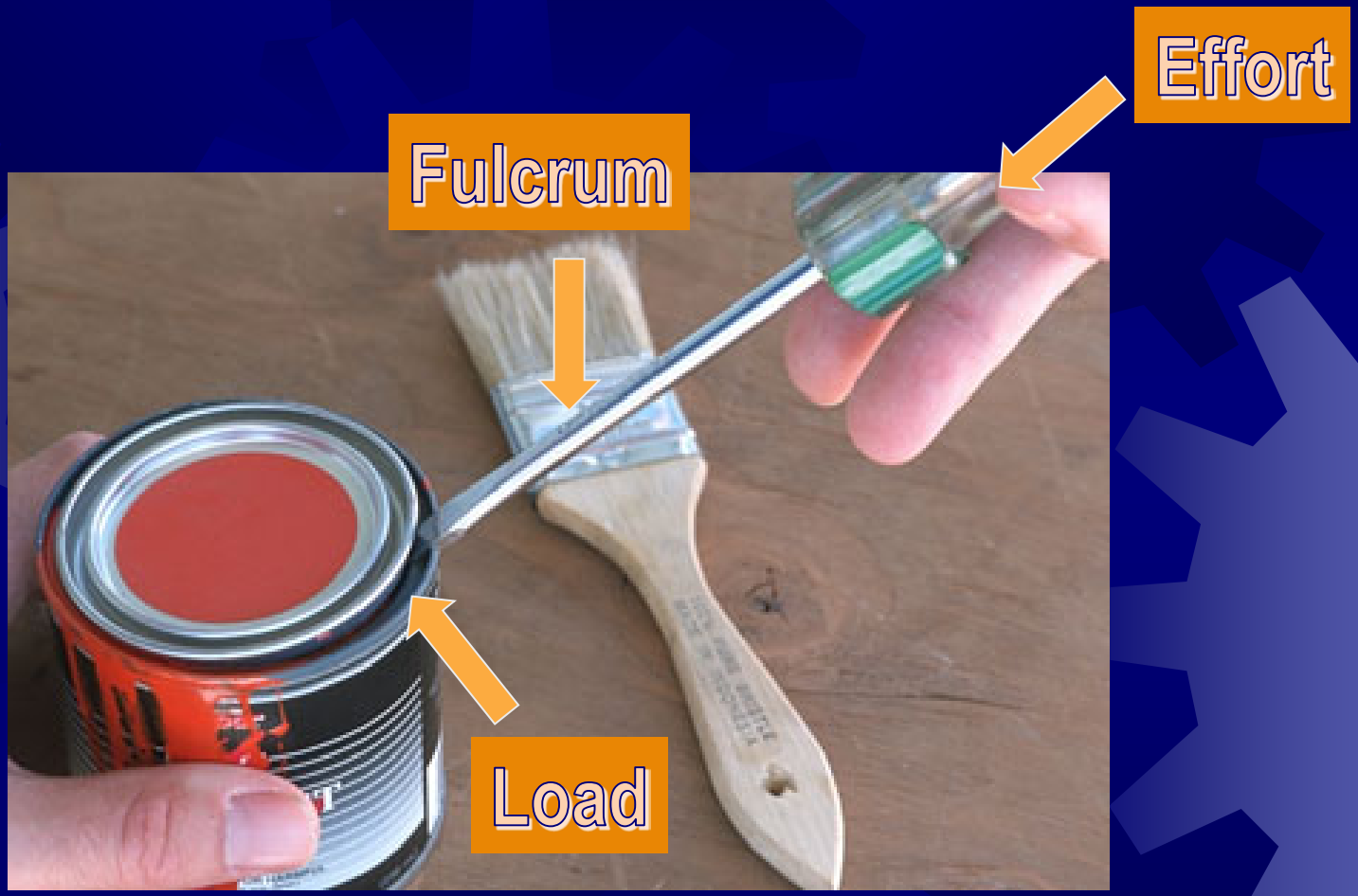
Second Class

Which Class?



Third Class

Which Class?

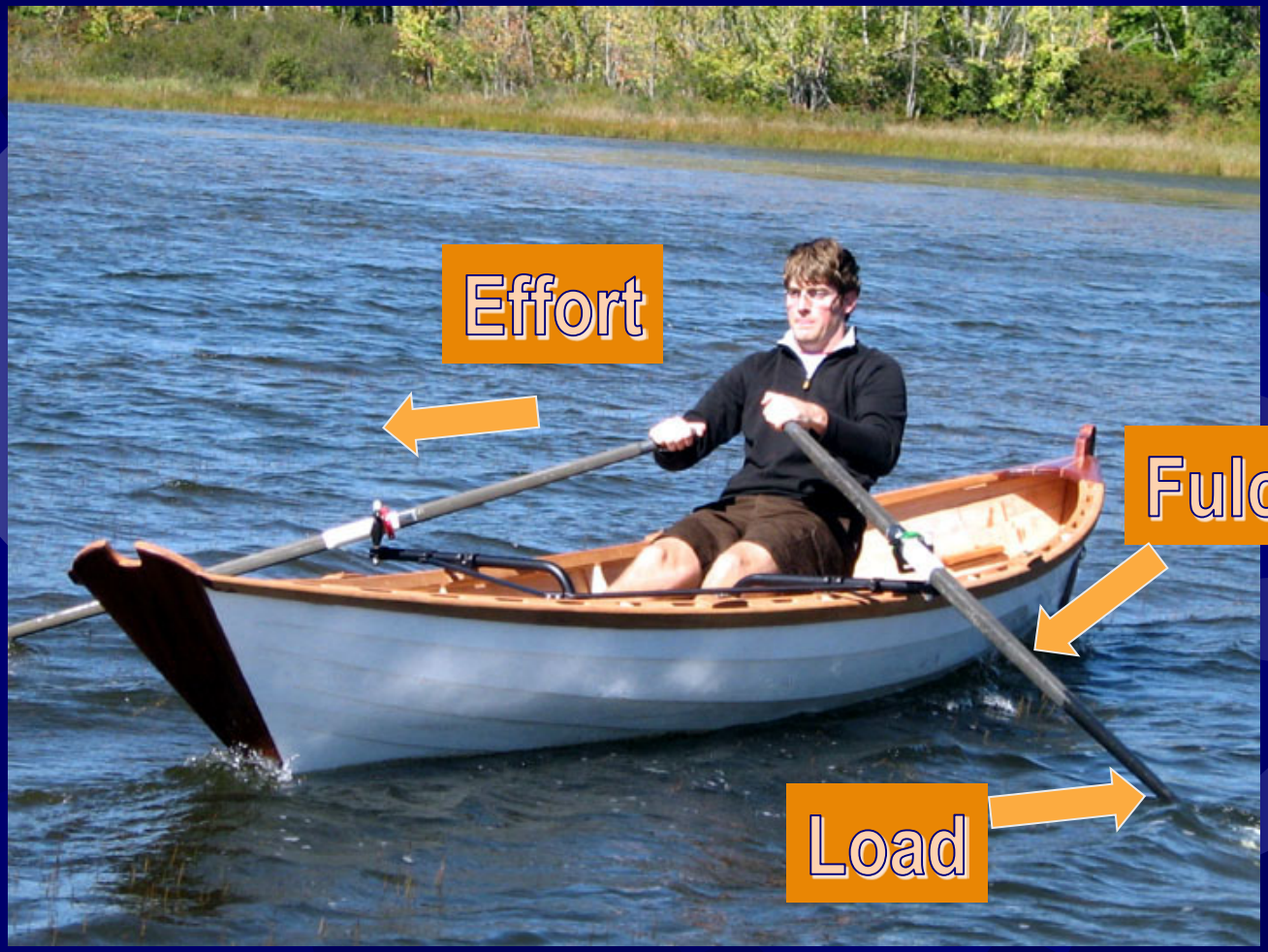


First Class

Which Class?

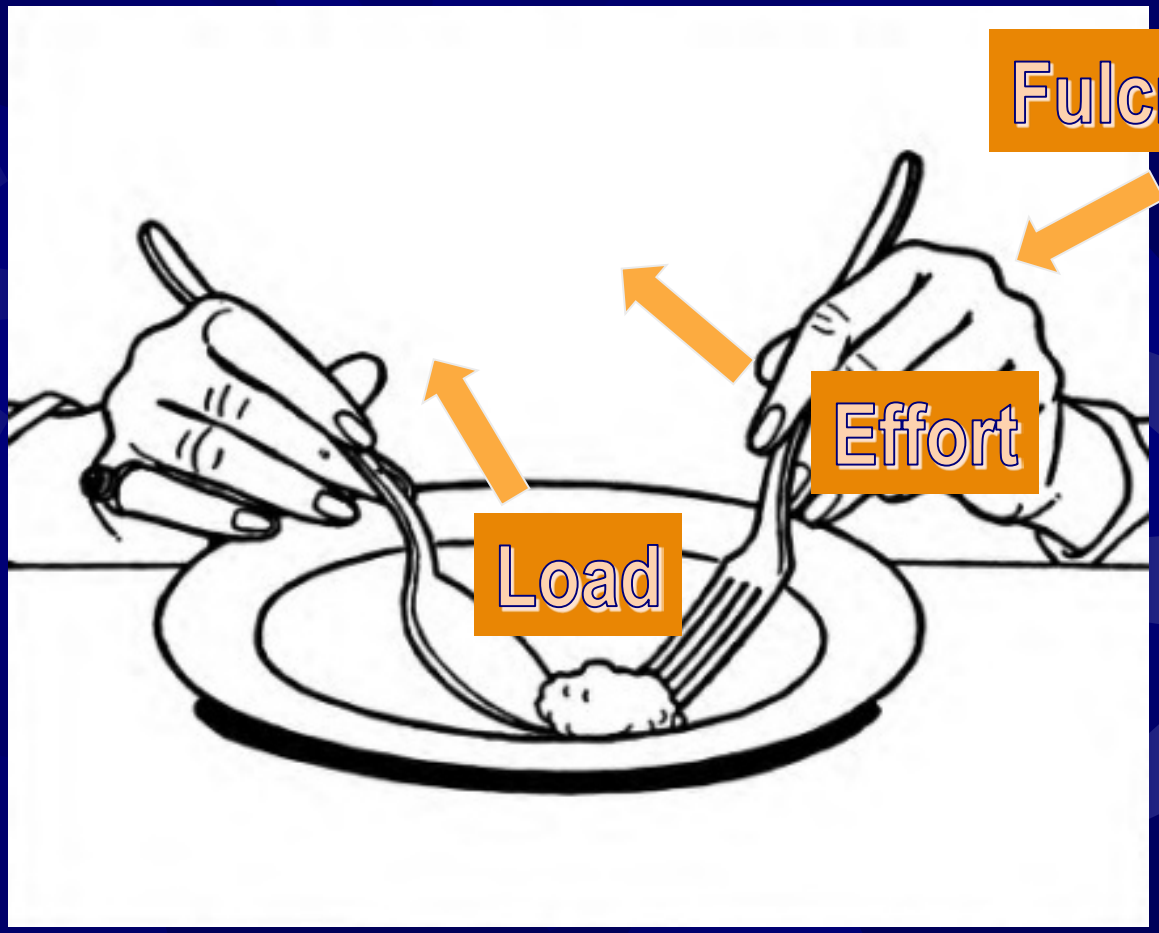
Second Class

Which Class?



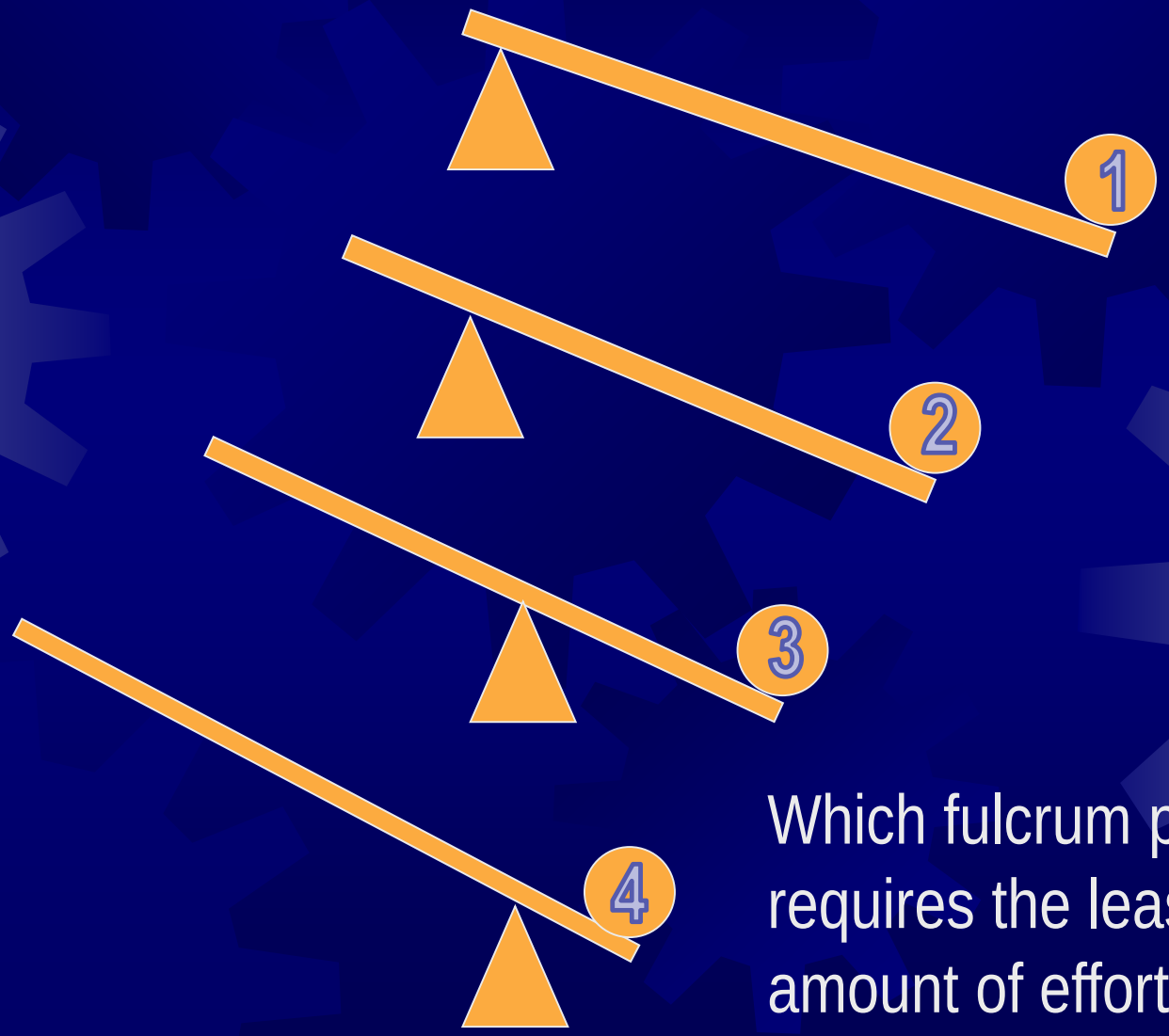
First Class

Which Class?



Third Class

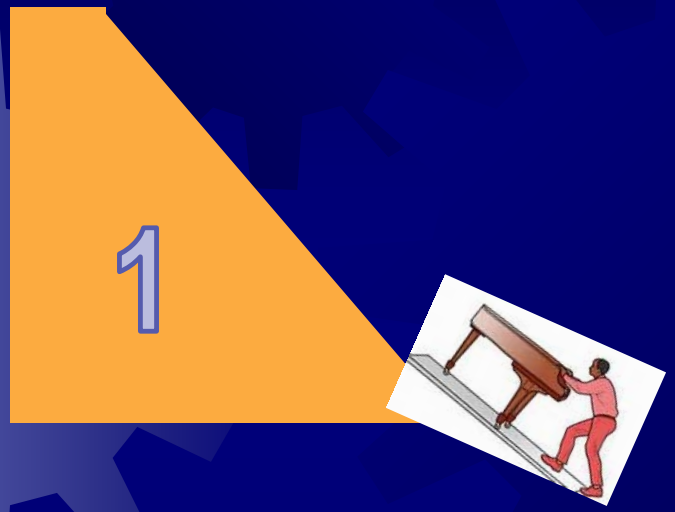
Levers and Effort



Which fulcrum position requires the least amount of effort?

4

Inclined Plains and Effort



Which inclined plain requires the least effort? 3