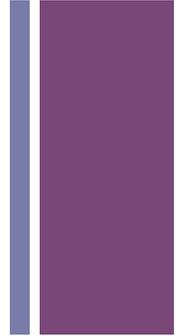


Simple Machines



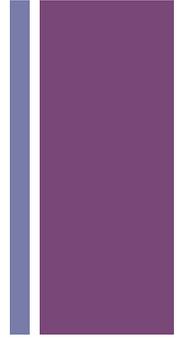
Simple Machines



- A device that helps make work easier by accomplishing one or more of the following functions:
 - Transferring a force from one place to another.
 - Changing the direction of a force.
 - Increasing the magnitude of a force.
 - Increasing the distance or speed of a force.

+

Simple Machines



- All machines are made up of some of the 6 simple machines:
 1. Wheel and axle
 2. Pulley
 3. Lever
 4. Wedge
 5. Screw
 6. Inclined plane

+ Simple Machines



**WHEEL &
AXLE**



LEVER



PULLEY



INCLINED PLANE

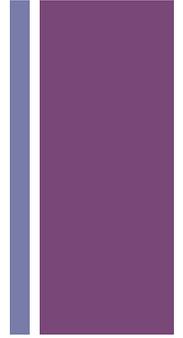


WEDGE



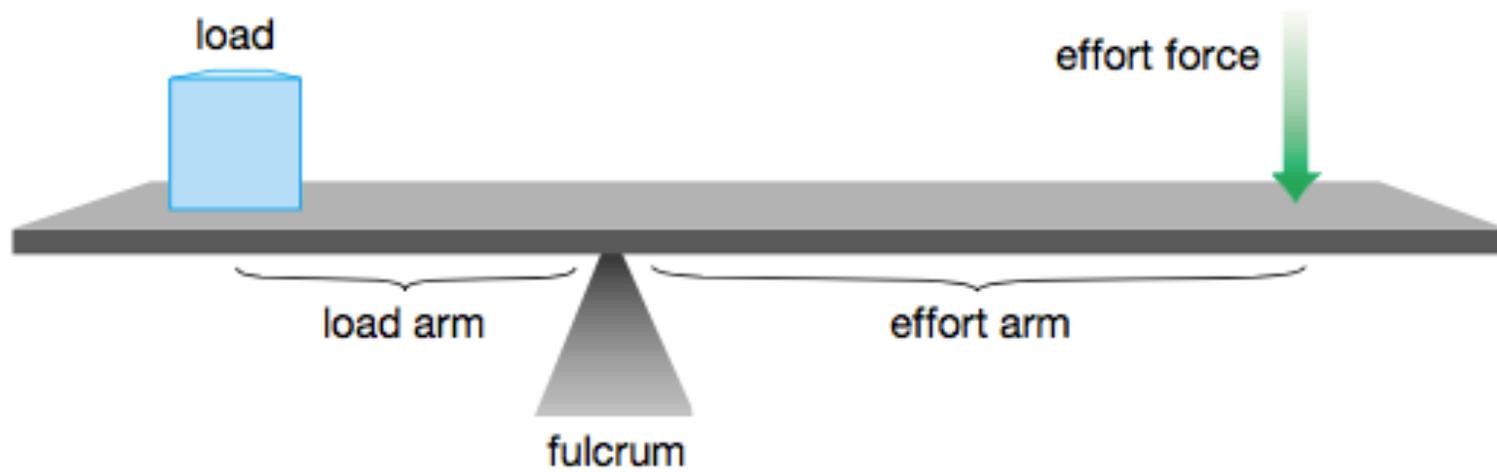
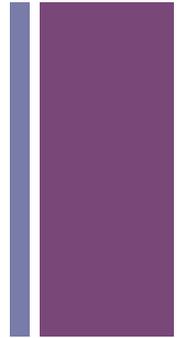
SCREW

+ Levers



- Simple machine that changes the amount of force you must exert in order to move an object.
- It consists of a bar that is free to rotate around a fixed point.
- Parts:
 - Fulcrum – fixed point that supports the lever and point of rotation.
 - Effort force – force that you exert on a lever in order to produce action.
 - Load – the mass of an object that is moved or lifted by the lever.
 - Effort arm – distance between the fulcrum and the effort force.
 - Load arm – distance between the fulcrum and the load.

+ Levers

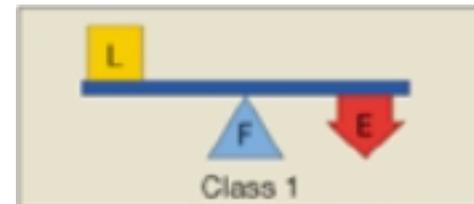


+ Levers

- There are 3 classes:

1. **Class 1** – the fulcrum is between the effort and the load.

Example: scissors.



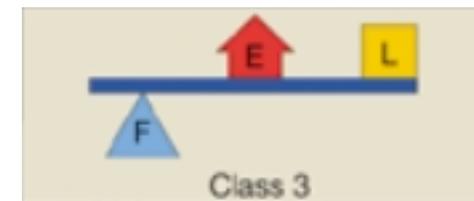
2. **Class 2** – the load is between the effort and the fulcrum.

Example: wheelbarrow.



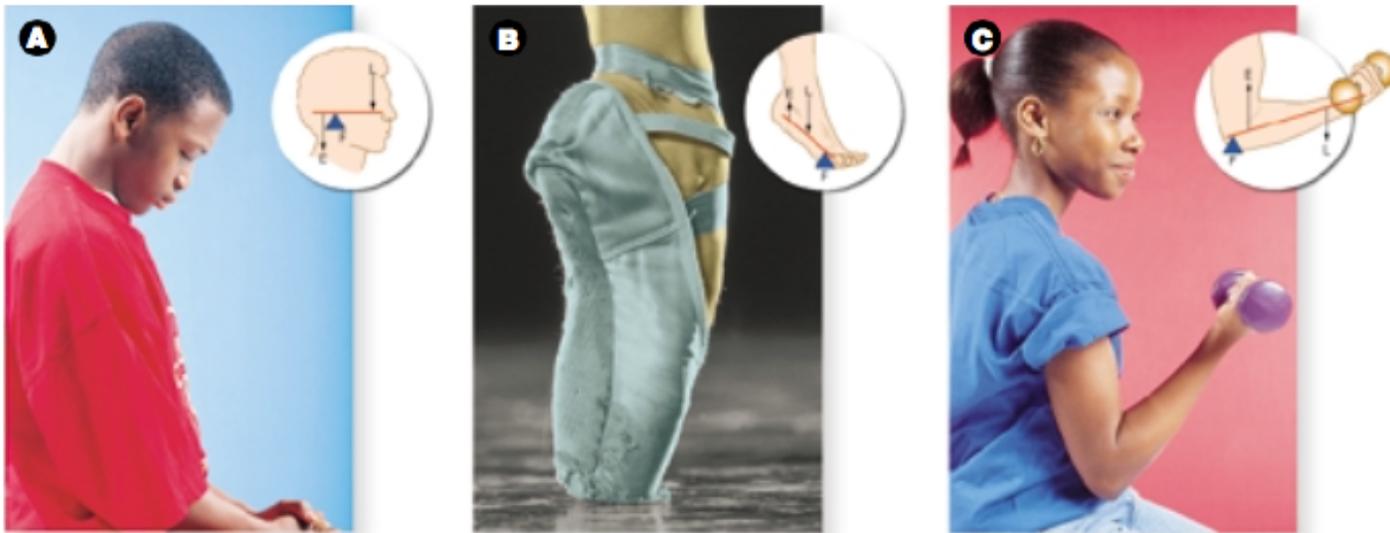
3. **Class 3** – the effort is exerted between the fulcrum and the load.

Example: hockey stick.



+ Levers

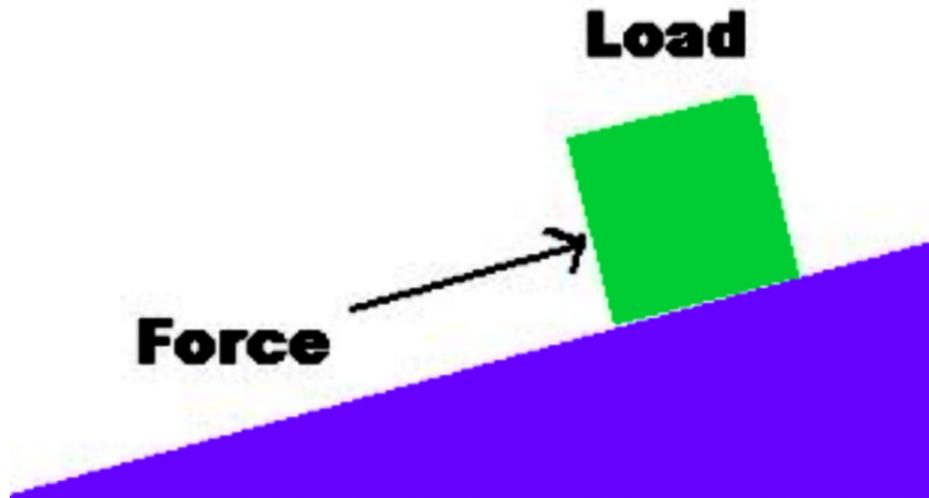
- Every time you move a finger, arm or toe, you are using a lever.
- Bones act as levers and each of your joints act as a fulcrum.
- Tendons attach muscles to bones and when the muscle contracts, the tendon exerts a force on the bone.



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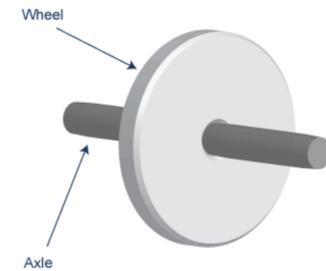
Inclined Plane

- Ramp or slope that reduces the force needed to lift an object.



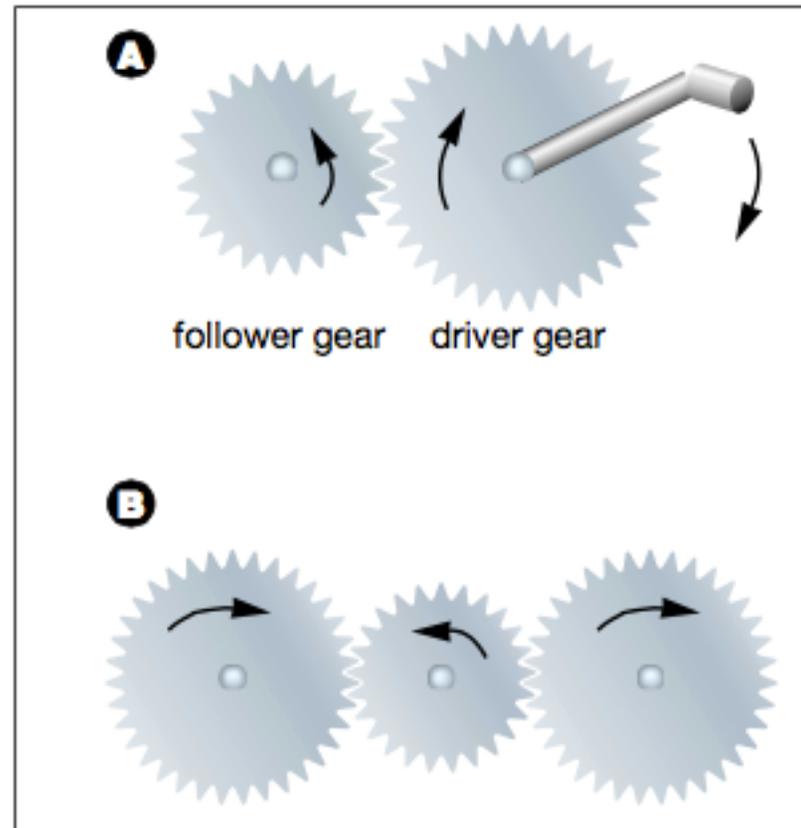
+ Wheel & Axle

- Two turning objects attached at their centers.
- One causes the other to turn.
- Variety of shapes and sizes.

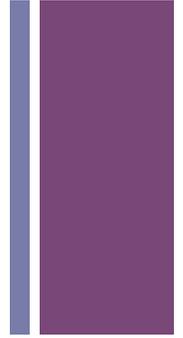


+ Gears

- A gear is a rotating wheel with teeth around its rim.
- Gear Train:
 - 2 or more gears.
 - Teeth of one fits into another.
 - First gear is called the driving gear.
 - Second gear is called the driven or following gear.



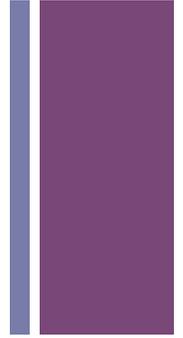
+ Sprocket



- A gear with teeth that fit into the links of a chain.
- Each link moves the same distance at the same time.



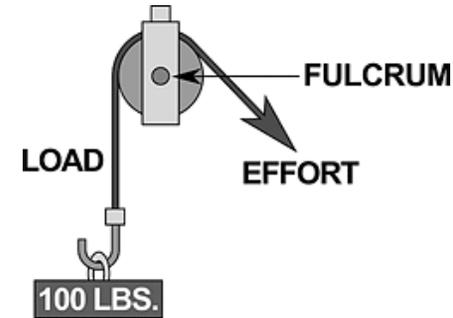
+ Speed Ratio



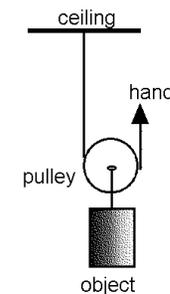
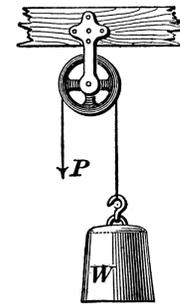
- Relation between the speed of rotations of the smaller gear and a larger gear.

$$\text{Speed Ratio} = \frac{\text{Number of Driver Gear Teeth}}{\text{Number of Follower Gear Teeth}}$$

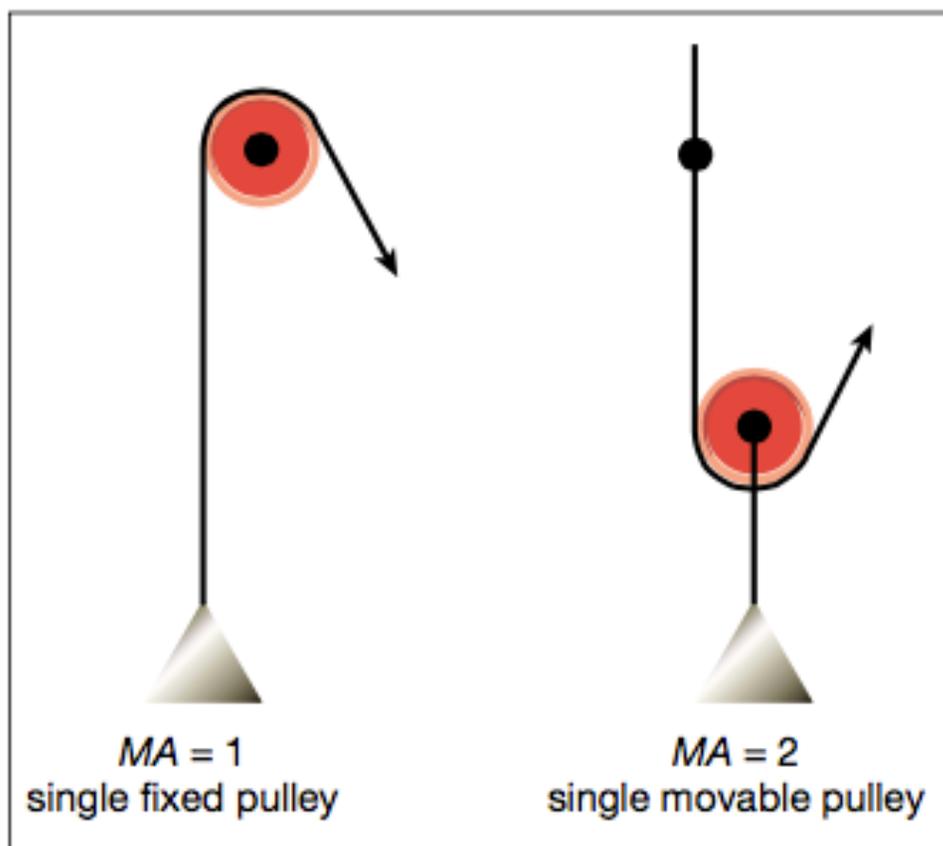
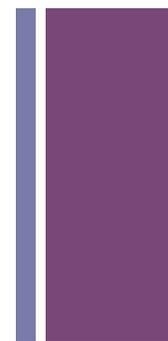
+ Pulleys



- A grooved wheel with a rope or chain running along the groove.
- Two types:
 - Fixed Pulley – attached to something that does not move.
 - Can change the direction of the effort force.
 - Moveable Pulley – attached to something (usually rope) that goes around the pulley.

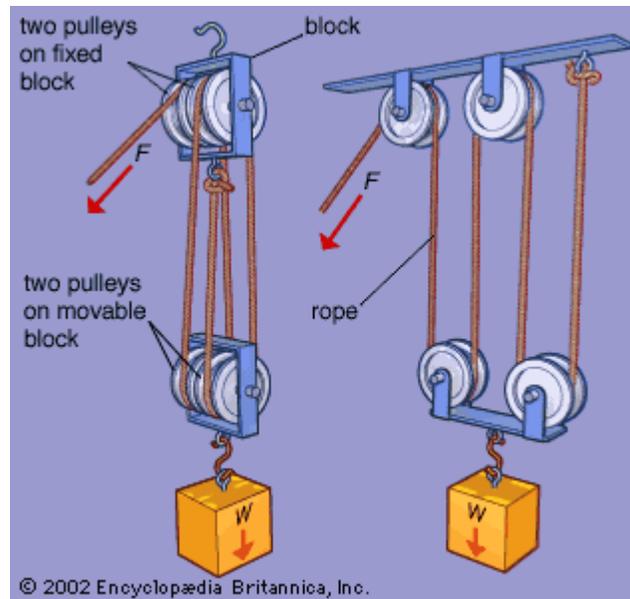


+ Pulleys



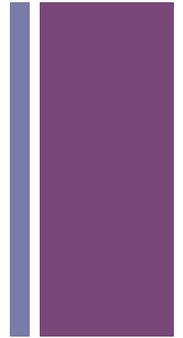
+ Pulleys

- Combine pulleys to help lift heavy objects.
- Block and Tackle
 - Complex pulley system of fixed and movable pulleys



+ Wedge

- Inclined plane used as a tool.
- Used to separate objects or hold objects in place.
- Examples: axe, knife, doorstop.



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Screw

- Adapted from an inclined plane.
- Inclined plane that winds around a cylinder.
- Used to hold objects together or raise/lower objects.
- Examples: jar lids, light bulbs, clamps, etc.

