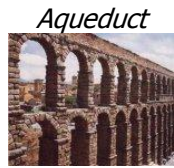


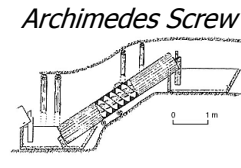
Mechanical Systems Concept Map

Simple Machines

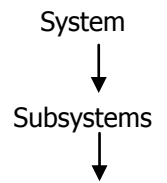
- ❖ change direction
- ❖ multiply force
- ❖ change speed
- ❖ transfer force



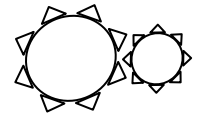
Machines from the Past



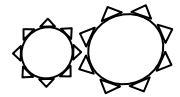
Complex Machines



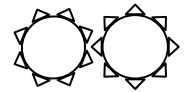
Gears Multiplying



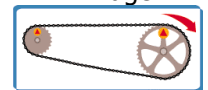
Reducing



Parallel

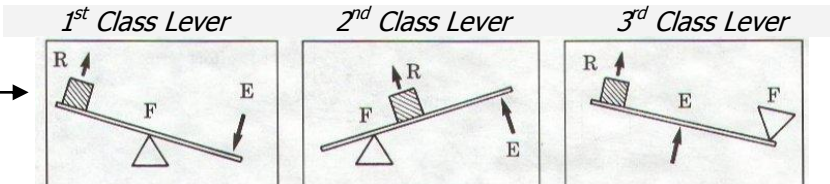
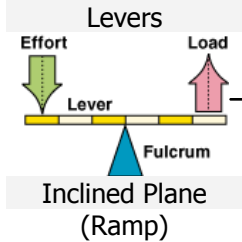


Linkage



Transmission

Mousetrap Vehicle



$$\text{Work} = \text{Force} \times \text{distance}$$

Mechanical Advantage

Speed Ratio

$$\text{MA} = \frac{\text{Output force}}{\text{Input force}}$$

$$\text{SR} = \frac{\text{Input distance}}{\text{Output distance}}$$

$$\text{Efficiency} = \frac{\text{MA}}{\text{SR}} \times 100$$

Machine Efficiency

$$\text{Efficiency} = \frac{\text{Work}_{\text{output}}}{\text{Work}_{\text{input}}} \times 100$$

Pascal's Law

Pressure is transmitted equally in all directions throughout an enclosed fluid.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Hydraulics

Pressure on fluid in small cylinder, usually supplied by an air compressor.

Pneumatics

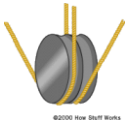
$$\frac{\text{Force of the small piston}}{\text{Area of the small piston}} = \frac{\text{Force of the large piston}}{\text{Area of the large piston}}$$

Evaluation Criteria

Efficiency	Effectiveness	Function	Design	Cost	Improvement
Safety	Convenience	Esthetics	Packaging	Environmental Impact	

Societal and Technological Impact of Machines

Block and Tackle



Steam Engine



Early



Bicycles

Modern



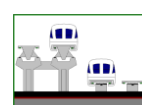
Egg Beater



Pop Can Tab



MagLev Trains



Robots

