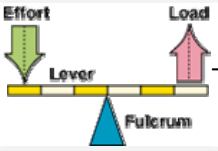
Grade 8 - Unit 4 – **Mechanical Systems** Concepts

Simple Machines

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

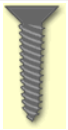
Levers



Inclined Plane (Ramp)

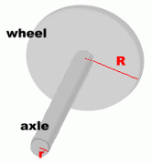
Wedge

Screw



Pulley

Wheel and Axle

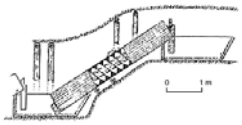


Machines from the Past

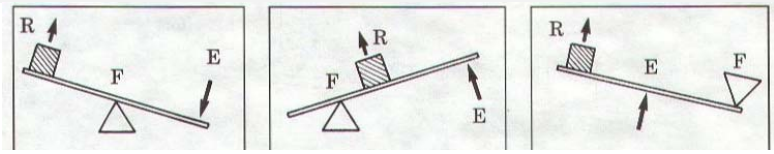
Aqueduct

Sakia

Archimedes Screw



1st Class Lever *2nd Class Lever* *3rd Class Lever*



Work = **F**orce x **d**istance

Mechanical Advantage	Speed Ratio
MA = Output force / Input force	**SR** = Input distance / Output distance

Efficiency = MA / SR x 100

Machine Efficiency

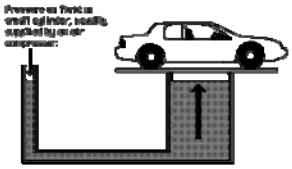
Efficiency = $\frac{\text{Work}_{output}}{\text{Work}_{input}}$ x 100

Pascal's Law

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

Pressure = **F**orce / **A**rea

Hydraulics	Pneumatics



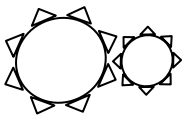
Force of the small piston / Area of the small piston = Force of the large piston / Area of the large piston

Complex Machines

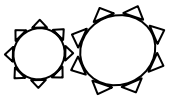
System

Subsystems

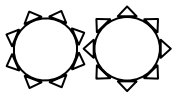
Gears Multiplying



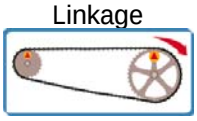
Reducing



Parallel



Linkage



Transmission

Mousetrap Vehicle

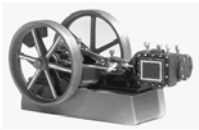
Evaluation Criteria

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

Societal and Technological Impact of Machines

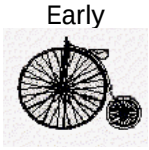
Block and Tackle

Steam Engine



Bicycles

Early

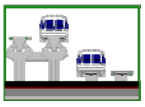


Modern

Egg Beater

Pop Can Tab

MagLev Trains



Robots