PHYSICS

MECHANICAL ADVANTAGE AND EFFICIENCY

MECHANICAL ADVANTAGE

The advantage of using machines is that they help reduce the effort force needed to raise a load.

Actual Mechanical Advantage (AMA):

Ideal Mechanical Advantage (IMA):

In the case of static equilibrium (stationary), **IMA = AMA**

or

However, when there are moving parts, the effort force F_E increases to account for friction and **IMA is greater than AMA**.

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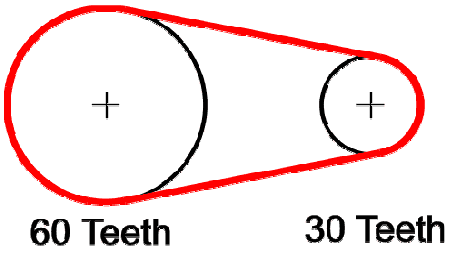
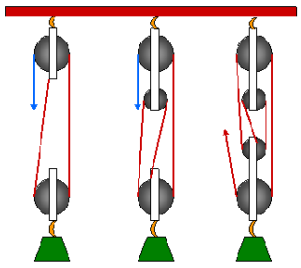
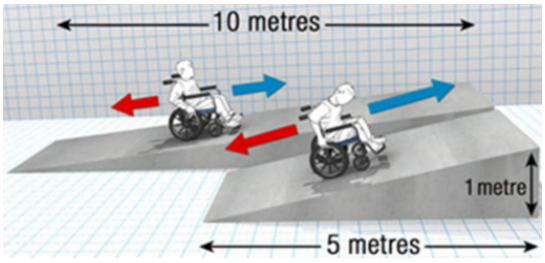
The IMA of certain machines can be modified as follows:

MACHINE	IMA	Ex.	IMA
Wheel and Axle	Ratio of the Radii, $\frac{r_E}{r_L}$		
Gears	Ratio of the teeth count, $\frac{N_E}{N_L}$		
Pulleys	The number of support strands (ones that pull up)		
Inclined Plane	***Length of inclined plane*** / *Height*		

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Ex 1. A person jumps on one end of a plank creating an effort force of 920 N at the end of the board 1.7 m from the fulcrum. A rock, located on the other end of the plank, 3.1 m from the fulcrum is catapulted with a load force of 460 N

a) *Calculate the AMA of the board*

b) *Calculate the IMA of the board*

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EFFICIENCY OF MACHINES

Percent Efficiency (% eff):

Machines that have a large amount of friction have a low percent efficiency.

Ex 2. A 14 N cart is pulled 1.2 m up a ramp with an effort force of 5.0 N parallel to the ramp, raising the cart 0.4 m above its initial level.

a) *Calculate the IMA*

b) *Calculate the AMA*

c) *Calculate the percent efficiency of the ramp*

PHYSICS

HOMEWORK

Pg. 93 #1-7

Pg. 95 #8-10

Pg. 96 #2,3,5,6,7,9