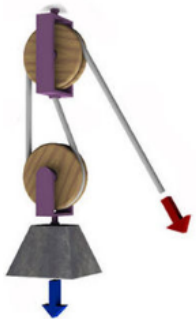
SIMPLE MACHINES:

1) LEVER
2) RAMP
3) PULLEY

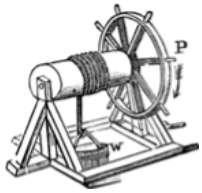
} Basic Simple Machines

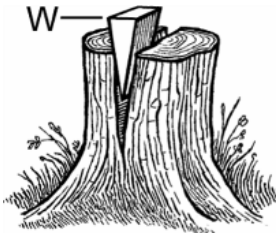
4) WEDGE (Ramp)

5) SCREW (Ramp)



6) WHEEL & AXLE (Lever)





Feb 11-11:12 AM

Simple machines allow us to use ***less force***, but still do the same amount of work. The smaller force has to be used over ***longer distance***.

IMA = IDEAL MECHANICAL ADVANTAGE

$$\mathbf{IMA} = \frac{d_{INPUT}}{d_{OUTPUT}}$$

has to do with:
DESIGN
GEOMETRY

d = distance

IMA tells you how many times smaller the force is when using simple machine.

Feb 11-11:16 AM

MA - MECHANICAL ADVANTAGE (actual)

$$\mathbf{MA} = \frac{F_{OUTPUT}}{F_{INPUT}}$$

has to do with: actual forces

Always: $IMA > MA$ (because of friction...)

Feb 11-11:21 AM

Efficiency:

$$\mathbf{e} = \frac{MA}{IMA} \times 100$$

$$\mathbf{e} = \frac{W_{OUT}}{W_{IN}} \times 100$$

$$\mathbf{e} = \frac{F_{OUT} \cdot d_{OUT}}{F_{IN} \cdot d_{IN}} \times 100$$

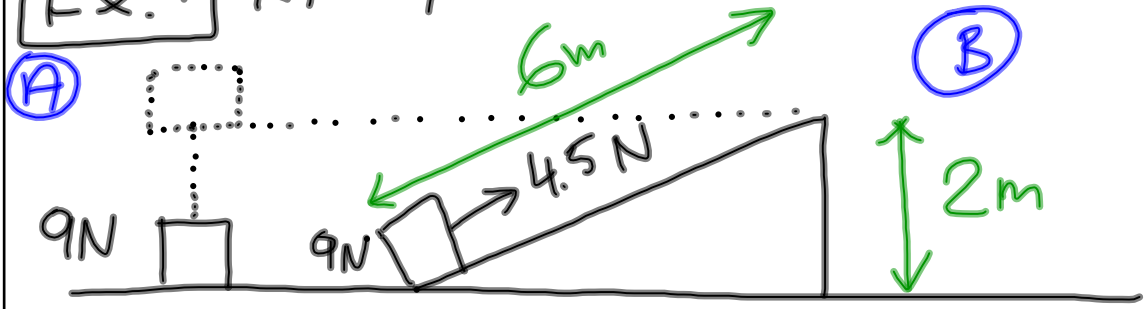
Jan 7-2:46 PM

$$\mathbf{e} = \frac{MA}{IMA} \times 100 \quad \text{and} \quad IMA > MA$$

$$e < 100\%$$

Jan 7-2:52 PM

Ex. 1 RAMP V=CONST.



$$IMA = \frac{d_{IN}}{d_{OUT}} \qquad IMA = 3$$

$$IMA = \frac{6}{2}$$

Jan 8-11:14 AM

$IMA = \frac{d_{IN}}{d_{OUT}}$ $IMA = \frac{6}{2}$

$IMA = 3$

Since IMA = 3, the F_{IN} should be 3 times smaller (9N/3 = 3 N), but in reality we need F_{IN} = 4,5 N because we have to overcome friction!

$MA = \frac{F_{OUT}}{F_{IN}}$ $MA = \frac{9}{4.5}$

$MA = 2$

$IMA > MA$ ✓

$e = \frac{MA}{IMA} \times 100$

$e = \frac{2}{3} \times 100$

$e = 66.7\%$ $e < 100$ ✓

Jan 8-12:58 PM

(2) $F_A = 200N$

$m = 50kg$

$g = 10 \frac{m}{s^2}$

$IMA = ?$

$MA = ?$

$e = ?$

Homework

Jan 9-2:31 PM

answers
IMA = 3
MA = 2.5
e = 83.3%

Jan 9-2:40 PM