

Simple Machines & MA

- Work input: work done by user

$$W_I = F_{\text{effort}} \times \text{distance moved}$$
$$F_E \times D_E$$

- Work output: what you "get" from machine

$$W_O = F_{\text{resistance}} \times \text{distance}$$
$$F_R \times D_R$$

- Mechanical Advantage or MA

↳ $MA = 1$ → no advantage (change direction only)

↳ $MA > 1$ → makes work easier (↑ user force)

↳ $MA < 1$ → makes work harder (↑ user speed & distance)

- Ideal Mechanical Advantage (IMA)

↳ # of times a machine multiplies input force

$$\frac{D_E}{D_R}$$

- Actual Mechanical Advantage (AMA)

↳ same as IMA but includes friction

$$\frac{F_R}{F_E}$$

- Efficiency = $\frac{W_{\text{out}}}{W_{\text{in}}} \times 100$ or $\frac{AMA}{IMA} \times 100\%$