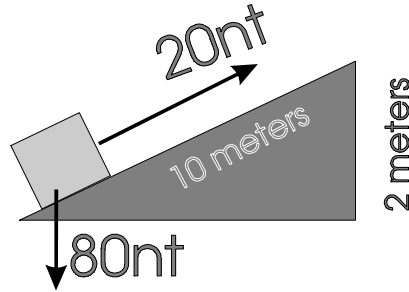


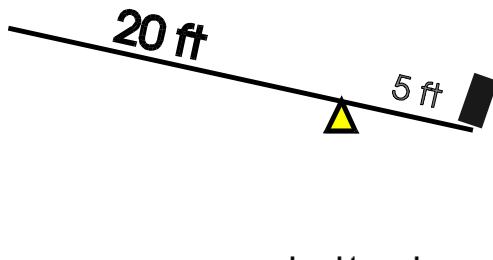
# Mechanical Advantage—*Theoretical*

Inclined Plane



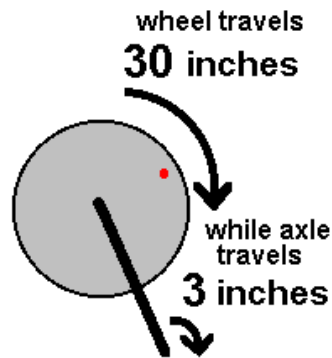
ratio of  
DISTANCES

Lever



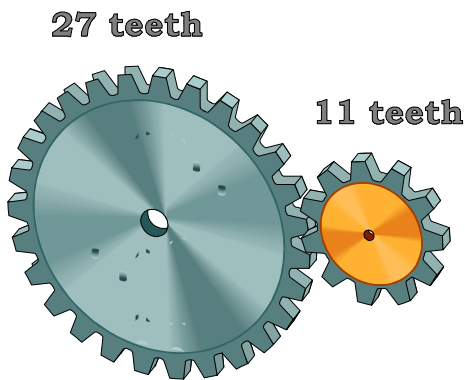
ratio of  
LENGTHS OF  
ARMS

Wheel & Axle



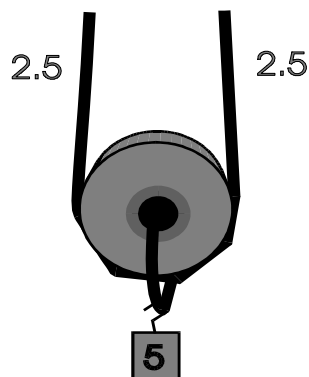
ratio of the  
CIRCUMFERENCES

Gear



ratio of  
NUMBER OF  
TEETH

Pulley



number of  
SUPPORT STRINGS

Theoretical Mechanical Advantage overlooks the effect of friction.

Actual Mechanical Advantage includes it.

	Theoretical MA on First page	Actual MA is Told by:	Actual MA
Inclined Plane	$10/2 = 5$	<b>Ratio of the forces actually used</b>	$80/20 = 4$
Lever	$20/5 = 4$		Not shown
Wheel & Axle	$30/3 = 10$		Not shown
Gear	$27/11 = 2.45$		Not shown
Pulley	2		Not shown

Note: Second lever shown has  $MA = 30/5 = 6$

Wheel & Axle MA depends on whether the force is being applied through the axle or the wheel.

In the example the wheel is being turned and has an MA of on the axle. If the axle were turned instead, the MA would be 1/10.

Gear MA also depends upon where the force is applied. If the large gear is forcefully turned, then the MA is 27/11 or 2.45. By applying the turning force to the small gear, the MA is the inverse, 11/27 = .407