

Description	Variable	Inputs	Calculated Values	Units
Mass of Weights	M		-	kg
Accel. of Gravity	g		-	m/2^2
Vertical Travel Of Weights	h		-	meters
Weight	$W = Mg$	-		Newtons
Compound Pulley Purchase	N		-	(unitless)
Tension on Pull Cable	$T = \frac{W}{N}$	-		Newtons
Drive Pulley Radius	r		-	Meters
Torque on Rotating Shaft	$\tau_1 = Fr = Tr$	-		(N)(m)
Planetary Gearset Reduction	γ		-	(unitless)
Torque on Cube	$\tau_2 = \frac{\tau_1}{\gamma}$	-		(N)(m)
# Of Shaft Rotations per Weight Drop	$\eta_1 = \frac{hN}{2\pi r}$	-		Total Rotations
# Of Cube Rotations per Weight Drop	$\eta_2 = \eta_1 \gamma$	-		Total Rotations
Moment of Inertia	I (see above)		-	(kg)(m^2)
Angular Acceleration of Cube	$\alpha = \frac{\tau_2}{I}$	-		rad / sec^2
Angle between Stops	θ		-	radians
Time between Stops	$t = \sqrt{\frac{2(\theta*\gamma)}{\alpha}}$	-		seconds
Final Angular Velocity of Cube	$\omega_f = \alpha t$	-		radians / sec
Radius of Fly. Pend. Arm	R		-	meters

Length of Pend. Rope	l		-	meters
Tangential Velocity of Ball	$v_t = R \frac{\omega f}{\gamma}$		-	meters / second
Angle Deflection of Pend. Rope	$\phi = \tan^{-1} \frac{(v_t)^2}{Rg}$		-	radians
Horizontal Deflection of Ball	$G = l \sin \phi$		-	meters

