

$$\text{rev} := 360 \cdot \text{deg}$$

Mass: $m_s := 16 \cdot \text{kg}$

Angular velocity: $\omega := 10 \cdot \frac{\text{rev}}{\text{min}}$

Radius to COM: $r := 6 \cdot \text{m}$

Moment of inertia: $I := m_s \cdot r^2$ $I = 576 \text{ m}^2 \cdot \text{kg}$

Angular momentum: $L := I \cdot \omega$ $L = 603.186 \frac{\text{m}^2 \cdot \text{kg}}{\text{s}}$

Kinetic energy: $E_{ko} := \frac{I \cdot \omega^2}{2}$ $E_{ko} = 315.827 \text{ J}$

Change the radius
to 1/2 original r: $r := 3 \text{ m}$

New angular velocity
to conserve momentum
(equals 4 x's original): $\omega := 40 \cdot \frac{\text{rev}}{\text{min}}$

New moment of inertia: $I := m_s \cdot r^2$ $I = 144 \text{ m}^2 \cdot \text{kg}$

New angular momentum
(equal to original): $L := I \cdot \omega$ $L = 603.186 \frac{\text{m}^2 \cdot \text{kg}}{\text{s}}$

New kinetic energy
(equal to 4 x's original): $E_{ke} := \frac{I \cdot \omega^2}{2}$ $E_{ke} = 1.263 \times 10^3 \text{ J}$

Delta kinetic energy $w := E_{ko} - E_{ke}$ $w = -947.482 \text{ J}$