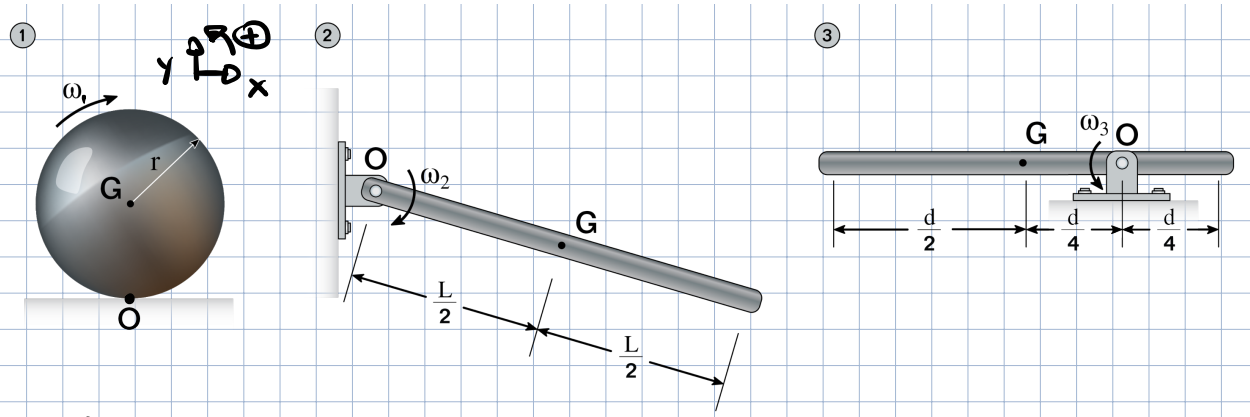
In each of the following scenarios find the angular velocity of the rod or disc given they have the same angular momentum about point O of 0.1 kg m^2/s.

Scenario 1: The disc has radius r = 45 cm, mass m = 600 g

Scenario 2: rod has length L = 90 cm, mass m = 350 g

Scenario 3: rod has length d = 67 cm, mass m = 630 g



$\vec{H} = I\vec{\omega}$

① $H_{o,1} = I_{o,1}\,\omega_1 = 0.1\ \frac{kg\,m^2}{s}$

$\hookrightarrow I_{o,1} = \left(\frac{1}{2}m_1r^2 + m_1r^2\right)$

$\rightarrow \omega_1 = \left(0.1\ \frac{kg\,m^2}{s}\right) \Big/ \left(\frac{1}{2}(0.6\,kg)(0.45\,m)^2 + (0.6\,kg)(0.45\,m)^2\right)$

$\omega_1 = 0.55\ rad/s \rightarrow \boxed{\vec{\omega}_1 = -0.55\ rad/s\ \hat{k}}$

② $H_{o,2} = I_{o,2}\,\omega_2 = 0.1\ \frac{kg\,m^2}{s}$

$\hookrightarrow I_{o,2} = \frac{1}{3}m_2\ell^2$ $\hookrightarrow L$

$$\rightarrow \omega_2 = \left(0.1 \frac{kg\,m^2}{s}\right) / \left(\frac{1}{3}(0.35\,kg)(0.9\,m)^2\right)$$

$$\omega_2 = 1.06 \frac{rad}{s} \rightarrow \boxed{\vec{\omega}_2 = -1.06 \frac{rad}{s}\,\hat{k}}$$

③ $H_{o,3} = I_{o,3}\,\omega_3 = 0.1 \frac{kg\,m^2}{s}$

$\rightarrow I_{o,3} = \frac{1}{12} m_3 d^2 + m_3 \left(\frac{d}{4}\right)^2$

$$\rightarrow \omega_3 = \left(0.1 \frac{kg\,m^2}{s}\right) / \left(\frac{1}{12}(0.63\,kg)(0.67\,m)^2 + (0.63\,kg)\left(\frac{0.67\,m}{4}\right)^2\right)$$

$$\omega_3 = 2.42 \frac{rad}{s} \rightarrow \boxed{\vec{\omega}_3 = 2.42 \frac{rad}{s}\,\hat{k}}$$