The mass center $G$ of the slender bar of mass 0.8 kg and length 0.4 m is falling vertically with a velocity $v = 2$ m/s at the instant depicted. Calculate the angular momentum $H_0$ of the bar about point $O$ if the angular velocity of the bar is (a) $\omega_a = 10$ rad/s clockwise and (b) $\omega_b = 10$ rad/s counterclockwise.

\[ m = 0.8 \text{ kg} \]
\[ l = 0.4 \text{ m} \]
\[ V_g = 2 \text{ m/s} \]

\[ I_a = \frac{1}{12} m l^2 \text{ for a slender rod} \]
\[ = \frac{1}{12} (0.8)(0.4)^2 \]
\[ I_i = I_a = 0.01067 \text{ kg m}^2 \]
\[ d = 0.3 \text{ m} \]

Find $H_0$ if

a) $\omega_a = 10$ rad/s

\[ H_0 = I \omega + mVd = (0.01067)(10) - (0.8)(2)(0.3) \]
\[ = -0.1067 - 0.48 \]
\[ = -0.5867 \]

b) $\omega_b = 10$ rad/s

\[ H_0 = I \omega + mVd = (0.01067)(10) - (0.8)(2)(0.3) \]
\[ \text{same as part a) } \]
\[ = +0.1067 - 0.48 \]
\[ = -0.3733 \]

\[ H_0 = -0.5867 \text{ kg m}^2/\text{s} \]
\[ H_0 = -0.3733 \text{ kg m}^2/\text{s} \]