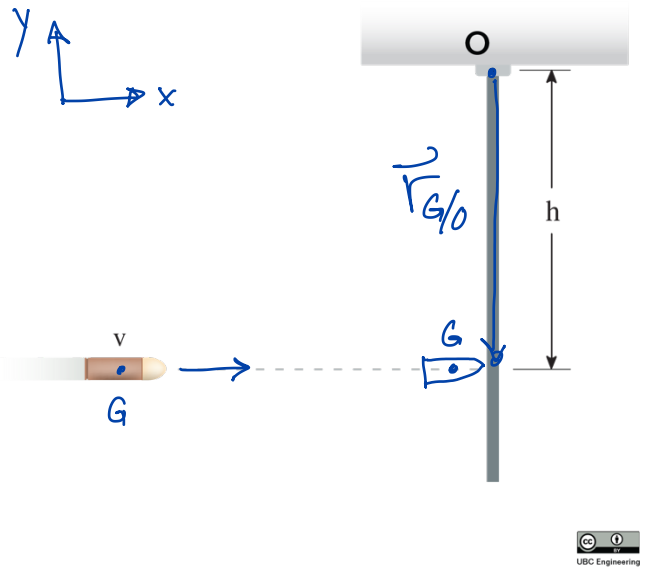
Consider the bullet shown with mass m_b = 0.025 kg and velocity just prior to impact with the rod of v_1 = 400 m/s. Find the linear momentum and angular momentum about O for the bullet. The distance h = 0.6 m.



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Bullet is a point mass

$\vec{v} = \vec{v}_G$

$I_G = 0$

linear momentum:

$\vec{J} = m\vec{v}_G$

$= 0.025\,kg\,(400\,m/s\,\hat{i})$

$\boxed{\vec{J} = 10\,kg\,m/s\,\hat{i}}$

$J_x = 10\,kg\,m/s$

$J_y = 0$

angular momentum

$\vec{K}_G = I_G^{\,0}\vec{\omega} = 0$

$\vec{K}_O = I_G^{\,0}\vec{\omega} + \vec{r}_{G/O} \times m\vec{v}_G$ ← subscripts must match

$m\vec{v}_G = \vec{J}$

can't use $I_O / \vec{v}_O$ version because $\vec{v}_O$ doesn't make sense

$\vec{r}_{G/O} = -h\,\hat{j}$

$\vec{K}_O = -0.6m\,\hat{j} \times 10\,kg\cdot m/s\,\hat{i}$

$\boxed{\vec{K}_O = 6\,kg\,m^2/s\,\hat{k}}$