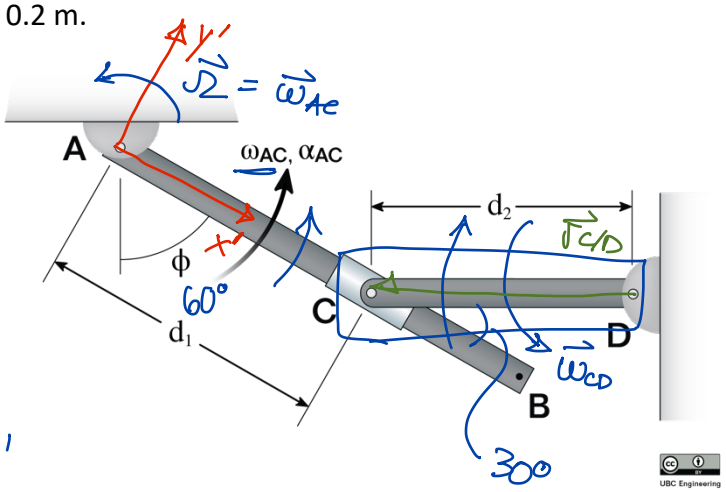
A collar which is pinned to rod *CD* slides along rod *AB*. At the instant shown, when $\phi = 60^o$, the angular velocity of rod *AB* is 2 rads/s in the direction shown. Find the rate at which *C* travels along rod *AB*, and the angular velocity of rod *CD*. Assume d_1 = 0.3 m and d_2 = 0.2 m.



$$\vec{v}_C = \cancel{\vec{v}_A}^{\,0} + \vec{\omega}_{AB} \times \vec{r}_{C/A} + (\vec{v}_{C/A})_{rel}$$

$\vec{\omega}_{AB} = \vec{\Omega}$

$\vec{\omega}_{AB} = 2 \text{ rad/s } \hat{k}'$

$\vec{r}_{C/A} = 0.3 \text{ m } \hat{\imath}'$

$(\vec{v}_{C/A})_{rel} = (v_{C/A})_{rel}\ \hat{\imath}'$

$$\Rightarrow \vec{v}_C = \underbrace{2 \cdot 0.3}_{0.6 \text{ m/s}} \text{ m/s } \hat{\jmath}' + (v_{C/A})_{rel}\ \hat{\imath}'$$

$$\vec{v}_C = \cancel{\vec{v}_D}^{\,0} + \vec{\omega}_{CD} \times \vec{r}_{C/D}$$

Assume $\vec{\omega}_{CD} = \omega_{CD}\ \hat{k}'$

$$\vec{r}_{C/D} = 0.2\,(-\cos 30\ \hat{\imath}' - \sin 30\ \hat{\jmath}')$$

$$\Rightarrow \vec{v}_C = \omega_{CD} \cdot 0.2\,(\cos 30\ \hat{\jmath}' + \sin 30\ \hat{\imath}')$$

$\vec{v}_C = \vec{v}_C$

Components

$\hat{\imath}'$: $(v_{C/A})_{rel} = 0.2\,\omega_{CD} \sin 30$

$\hat{\jmath}'$: $0.6 = 0.2\,\omega_{CD}(-\cos 30)$ $\Rightarrow \omega_{CD} = \dfrac{-3}{\cos 30}$

$$\boxed{\vec{\omega}_{CD} = \frac{-3}{\cos 30}\ \hat{k}}$$

$$\Rightarrow (v_{C/A})_{rel} = 0.2\left(\frac{-3}{\cos 30}\right)\sin 30$$

$$\boxed{(\vec{v}_{C/A})_{rel} = -0.6 \tan 30\ \hat{\imath}'}$$