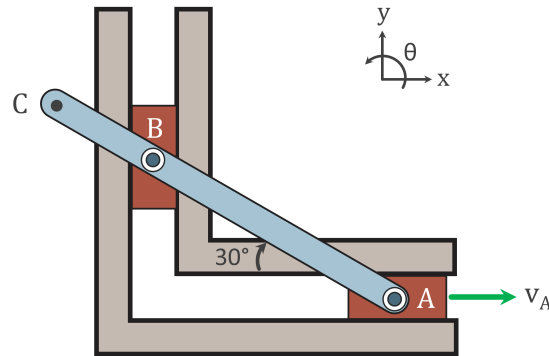




Linked Bodies



The angular velocity is 8 rad/s. Determine the velocity of block B in the path (the y-component). With $L_{AC} = 1$ m and $L_{AB} = 0.75$ m.

Using known expressions:

$$\mathbf{v}_{B/A} = \mathbf{v}_A + \boldsymbol{\omega} \times \mathbf{r}_{B/A} \quad (1)$$

Given:

Distance between A and C: $L_{AC} = 1$ m

Distance between A and B: $L_{AB} = 0.75$ m

Angle of the blue bar: $\theta = 30^\circ$

Velocity of A: $v_A = 3$ m/s

Angular velocity: $\omega = 8$ rad/s

Furthermore, point B can only move up and down, thus it has only a velocity term in the y-direction. Point A can only move left and right, thus it has only a velocity term in the x-direction. Inserting this in Equation 1 gives.

$$\mathbf{v}_{B/A} = \mathbf{v}_A + \boldsymbol{\omega} \times \mathbf{r}_{B/A} \Rightarrow \begin{pmatrix} 0 \\ v_B \\ 0 \end{pmatrix} = \begin{pmatrix} v_A \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ \omega \end{pmatrix} \times \begin{pmatrix} -\cos 30 \\ \sin 30 \\ 0 \end{pmatrix} L_{AB} \quad (2)$$

$$\begin{pmatrix} 0 \\ v_B \\ 0 \end{pmatrix} = \begin{pmatrix} v_A \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} -\sin 30 \\ -\cos 30 \\ 0 \end{pmatrix} L_{AB} \cdot \omega$$

From this follows that:

$$v_B = -\cos 30 \cdot L_{AB} \cdot \omega \quad \Rightarrow \quad v_B = -\frac{1}{2}\sqrt{3} \cdot \frac{3}{4} \cdot 8 = -3\sqrt{3} \text{ m/s} \quad (3)$$