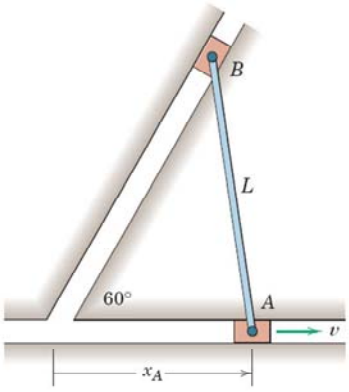
Absolute Motion: Another Exercise



Slider ***A*** moves horizontally with a constant speed ***v***.

Determine the ***angular velocity*** of bar ***AB*** in terms of the ***linear position*** of displacement x_A.

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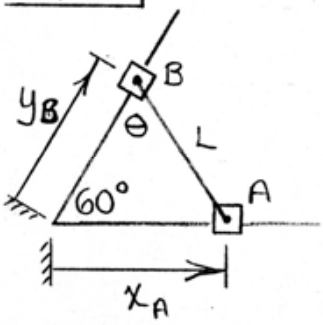

$$\frac{x_A}{\sin\theta} = \frac{L}{\sin 60^\circ} \qquad (1)$$

$$x_A = \frac{2}{\sqrt{3}} L \sin\theta$$

$$\dot{x}_A = v = \frac{2}{\sqrt{3}} L \cos\theta\, \dot{\theta} \qquad (2)$$

We need $\cos\theta$ in terms of x_A.

From (1): $\sin\theta = \frac{\sqrt{3}}{2}\frac{x_A}{L}$

Then $\cos\theta = \sqrt{1-\sin^2\theta} = \sqrt{1-\frac{3}{4}\frac{x_A^2}{L^2}}$

(2): $\dot{\theta} = \omega = \frac{\sqrt{3}\,v}{2L\cos\theta} = \frac{\sqrt{3}\,v}{2L\sqrt{1-\frac{3}{4}\frac{x_A^2}{L^2}}}$

$(0 \le x_A \le L)$