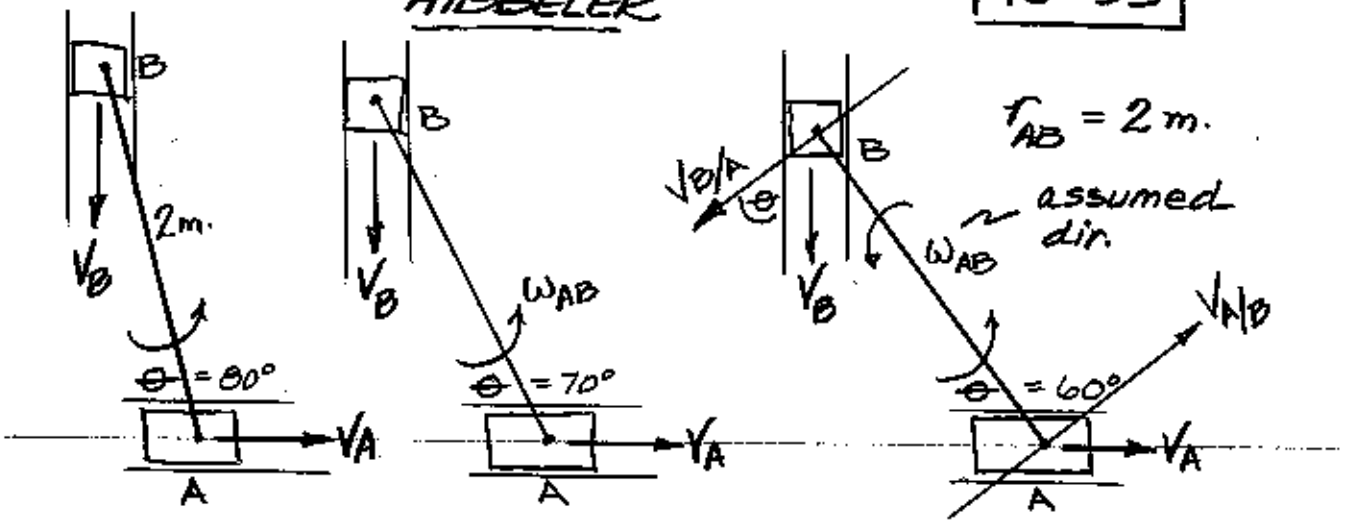
HIBBELER

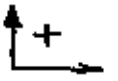
16-35



As BLOCK A MOVES TO THE RIGHT AT $8\ \frac{m}{s}$, BLOCK B IS MOVING DOWN AND THE ROD IS ROTATING.

DETERMINE V_B and ω_{AB} at the instant when $\theta = 60°$

SUGGESTION: USE VECTORS



CONSIDER A as the DRIVER or INPUT.
Then B is the DRIVEN or OUTPUT.
Rod AB is the COUPLER or CONNECTING LINK.

$$\vec{V}_B = \vec{V}_A + \vec{V}_{BA} \quad \text{or} \quad \vec{V}_{B/A} = \vec{V}_B - \vec{V}_A$$

OUTPUT = INPUT + COUPLER

RELATIVE MOTION.

$$V_B(-\hat{j}) = (8\hat{i})^{m/s} + r_{AB}\,\omega\left[-\sin\theta\,\hat{i} - \cos\theta\,\hat{j}\right]$$

$$-V_B\,\hat{j} = 8\hat{i} - 2\omega\sin 60°\,\hat{i} - 2\omega\cos 60\,\hat{j}$$

GROUP LIKE TERMS

$\hat{i}$: $\quad 0 = 8 - 1.732\,\omega \qquad \therefore\ \omega_{AB} = 4.62\ \frac{rad}{s}\ \circlearrowleft$

$\hat{j}$: $\quad -V_B = -2\left(4.62\ \frac{rad}{s}\right)\cos 60° \qquad \therefore\ V_B = 4.62\ \frac{m}{s}\ \downarrow$

POSITIVE ANSWERS MEANT THAT ASSUMED DIRECTIONS FOR V_B and ω WERE CORRECT.