



Students have created a linkage system to test the conversion of rotational motion into translational motion. The linkage system consists of a disk, two arms, and a sliding block limited to horizontal movement. If the disk and block are connected by an arm of length $l = 1.5 \text{ m}$ at an angle of $\theta = 30 \text{ degrees}$, determine the magnitudes of the angular velocity of the arm BC as well as the velocity of the disk at point B. The sliding block moves at a velocity of $v = 3 \text{ m/s}$ to the left and the disk has a radius $r = 0.8 \text{ m}$.

$$y = l \sin \theta$$

$$x = l \cos \theta$$

$$\frac{dx}{dt} = -l \sin \theta \cdot \dot{\theta} \Rightarrow -3 = -1.5 \sin 30 \cdot \dot{\theta}$$

$$\dot{\theta} = \omega_{BC} = 4 \text{ rad/s}$$

$$\begin{aligned} \frac{dy}{dt} &= l \cos \theta \cdot \dot{\theta} \\ &= 1.5 \cos 30 \cdot 4 \\ &= 3\sqrt{3} \end{aligned}$$

$$V_B = 3\sqrt{3} \text{ m/s}$$