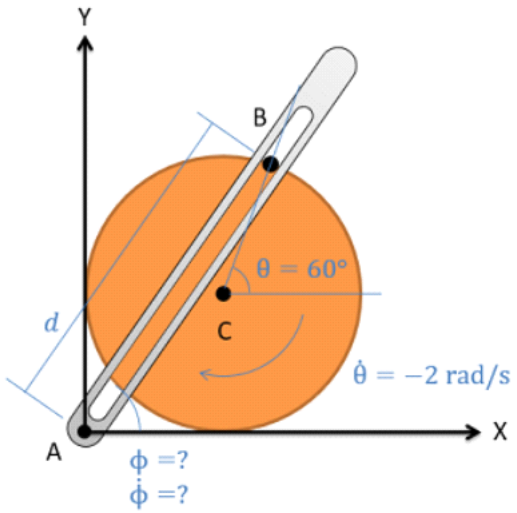
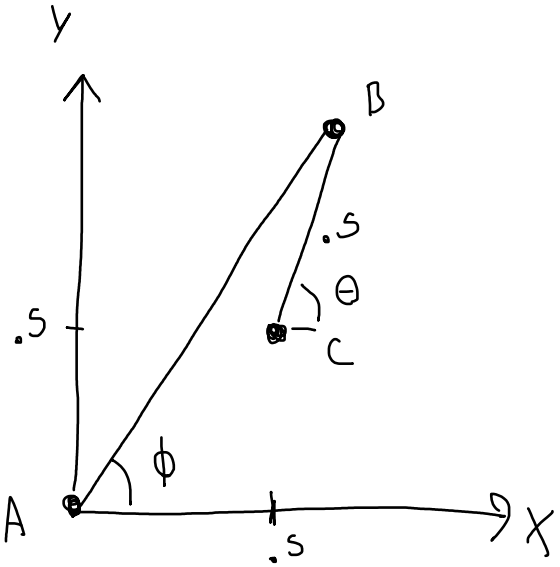
# Problem 4

The crank-rocker mechinism as shown below consists of a crank rotating about its fixed center at C at a constant rate of 2 rad/s clockwise and a rocker AB fixed at it's base at A. A pin at point B is fixed to the edge of the crank and can slide along the frictionless slot in AB. In the current state, what is the angular velocity of rocker AB?




$\theta = 60^\circ$

$\dot{\theta} = -2 \text{ rad/s}$




$$X_C = .5 = d\cos(\phi) - .5\cos(\theta)$$

$$Y_C = .5 = d\sin(\phi) - .5\sin(\theta)$$

Find $d$ & $\phi$

$$.5 = d\cos\phi - .5\cos(60)$$

$$.5 = d\sin\phi - .5\sin(60)$$

$$.5 = d\cos\phi - .5\cos(60) \rightarrow d\cos\phi = .75$$

$$.5 = d\sin\phi - .5\sin(60) \rightarrow d\sin\phi = .933$$

$$\frac{\cancel{d}\sin(\phi)}{\cancel{d}\cos(\phi)} = \tan(\phi) = \frac{.933}{.75}$$

$\phi = 51.2°$ $\quad\quad$ $\theta = 60°$

$d = 1.197\,m$ $\quad\quad$ $0$

$$X_c = .5 = d\cos(\phi) - .5\cos(\theta)$$

$$Y_c = .5 = d\sin(\phi) - .5\sin(\theta)$$

$\theta = 60°$

$\dot{\theta} = -2$ rad/s

$\phi = 51.2°$

$\dot{\phi} = ?$

$d = 1.197\,m$

$\dot{d} = ?$

$$\dot{X}_c = 0 = \dot{d}\cos(\phi) - d\sin(\phi)\dot{\phi} + .5\sin(\theta)\dot{\theta}$$

$$\dot{Y}_c = 0 = \dot{d}\sin(\phi) + d\cos(\phi)\dot{\phi} - .5\cos(\theta)\dot{\theta}$$

$$0 = .626\dot{d} - .933\dot{\phi} - .866$$

$$0 = .797\dot{d} + .75\dot{\phi} + .5$$

$$\dot{d} = 1.382 + 1.489\dot{\phi}$$

$$0 = .779(1.382 + 1.489\dot{\phi}) + .75\dot{\phi} + .5$$

$$\boxed{\dot{\phi} = -.825 \text{ rad/s} \leftarrow \text{clockwise}}$$