# Dynamics Meriam 6ed, 3-332

Collar A is free to slide with negligible friction on the circular guide mounted in the vertical frame. Determine the angle θ assumed by the collar if the frame is given a constant horizontal acceleration a to the right.

$a = \text{constant}$

$\theta = ?$

F.B.D.
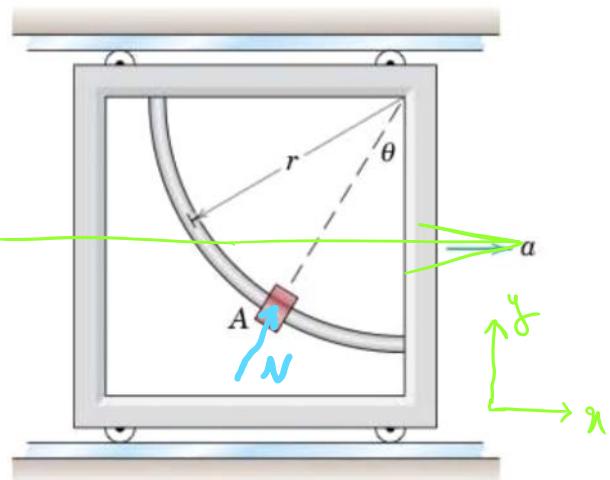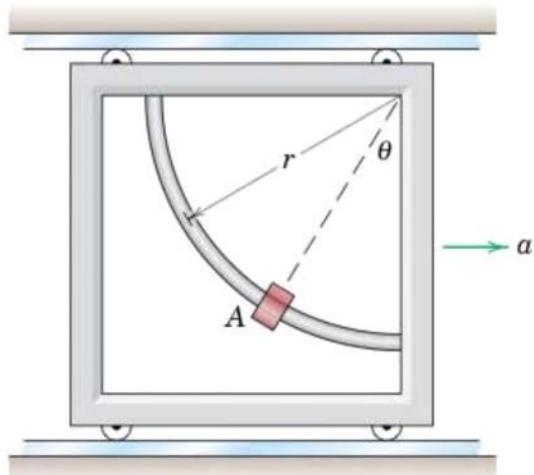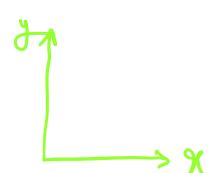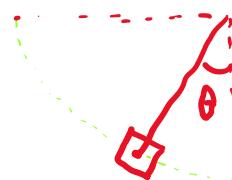
$$\begin{cases} \sum F_x = ma_x \quad , \quad a_x = a = \text{constant} \\ \sum F_y = ma_y \quad , \quad a_y = 0 \end{cases} \Longrightarrow$$

$$\begin{cases} \sum F_x = ma \Longrightarrow N\sin\theta = ma \Longrightarrow N\sin\theta = ma \\ \sum F_y = 0 \Longrightarrow N\cos\theta - mg = 0 \Longrightarrow N\cos\theta = mg \end{cases} \Longrightarrow \frac{N\sin\theta}{N\cos\theta} = \frac{ma}{mg} \Longrightarrow$$

$$\left[\sum F_y = 0 \Rightarrow N\cos\theta - mg = 0 \Rightarrow N\cos\theta = mg \right] \quad N\cos\theta \quad mg$$

$$\frac{\sin\theta}{\cos\theta} = \frac{a}{g} \Rightarrow \tan\theta = \frac{a}{g} \Rightarrow \boxed{\theta = \tan^{-1}\left(\frac{a}{g}\right)}$$