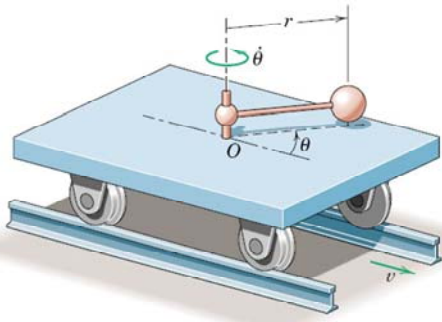


Impulse-Momentum: Yet Another Exercise



A small **car** with mass of **20 kg** rolls freely and carries a **5-kg sphere** mounted on a light rotating **rod** with $r = 0.4 \text{ m}$ and **angular velocity** of **4 rad/s**. The car has a **velocity** $v = 0.6 \text{ m/s}$ when $\theta = 0^\circ$.

Determine v when $\theta = 60^\circ$.

ME 231: Dynamics

4/26

$\dot{r}\dot{\theta}$

$\Sigma F_x = 0$ for system so $\Delta G_x = 0$

$(G_x)_{\theta=0} = (20 + 5)(0.6) = 15.0 \text{ N}\cdot\text{s}$

$(G_x)_{\theta=60^\circ} = (20 + 5)v - 5(1.6)\sin 60^\circ$

$= 25v - 6.93 \text{ N}\cdot\text{s}$

$r\dot{\theta} = 0.4(4) = 1.6 \text{ m/s}$

Thus $15.0 = 25v - 6.93$, $v = 21.9/25 = \underline{0.877 \text{ m/s}}$