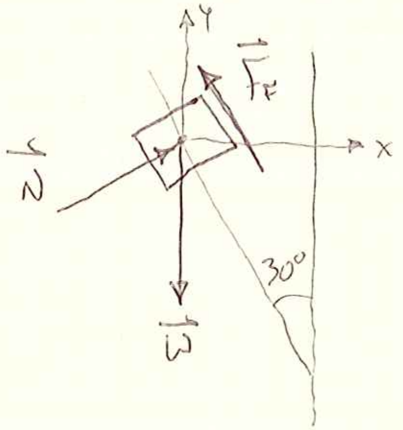
PROB. 12-56 $m = 200^{g}$, $\omega = $ CONSTANT, $\alpha = 30°$, $r = 600^{mm}$, $\mu_s = 0.30$. FIND v FOR MASS NOT TO SLIDE.

CASE 1: BLOCK TENDS TO SLIDE DOWN.



$$\vec{N} = N[(\cos 30°)\hat{i} + (\sin 30°)\hat{j}]$$

$$\vec{W} = (-mg)\hat{j}$$

$$\vec{F}_F = \mu_s N[(-\sin 30°)\hat{i} + (\cos 30°)\hat{j}]$$

$$\Sigma F_y = m a_y: \; N \sin 30° + \mu_s N \cos 30° - mg = 0$$

$$N = \frac{mg}{(\sin 30° + \mu_s \cos 30°)}$$

$$\Sigma F_n = \frac{mv^2}{\rho}: \; N \cos 30° - \mu_s N \sin 30° = \frac{mv^2}{r}$$

$$v = \sqrt{\frac{Nr(\cos 30° - \mu_s \sin 30°)}{m}}$$

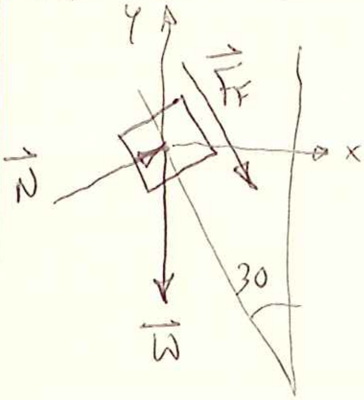
$$v = \sqrt{\frac{mg}{(\sin 30° + \mu_s \cos 30°)} \cdot \frac{r(\cos 30° - \mu_s \sin 30°)}{m}}$$

$$v = \sqrt{\frac{gr(\cos 30° - \mu_s \sin 30°)}{(\sin 30° + \mu_s \cos 30°)}}$$

PROB. 12-56 CONT.

$$v = \sqrt{\frac{(9.81\,\frac{m}{s^2})(0.6\,m)[\cos 30° - (0.3)\sin 30°]}{[\sin 30° + (0.3)\cos 30°]}} \boxed{= 2.355\,\frac{m}{s}}$$

CASE 2: BLOCK TENDS TO SLIDE UP:



$$\vec{N} = N[(\cos 30°)\hat{i} + (\sin 30°)\hat{j}]$$

$$\vec{W} = (-mg)\hat{j}$$

$$\vec{F}_F = \mu_s N[(\sin 30°)\hat{i} + (-\cos 30°)\hat{j}]$$

$$\Sigma F_y = ma_y: \; N\sin 30° - mg - \mu_s N\cos 30° = 0$$

$$N = \frac{mg}{(\sin 30° - \mu_s \cos 30°)}$$

$$\Sigma F_n = \frac{mv^2}{r}: \; N\cos 30° + \mu_s N \sin 30° = \frac{mv^2}{r}$$

$$v = \sqrt{\frac{gr(\cos 30° + \mu_s \sin 30°)}{(\sin 30° - \mu_s \cos 30°)}}$$

$$v = \sqrt{\frac{(9.81\,\frac{m}{s^2})(0.6\,m)[\cos 30° + (0.3)\sin 30°]}{[\sin 30° - (0.3)\cos 30°]}} \boxed{= 4.989\,\frac{m}{s}}$$

TOPS 35500