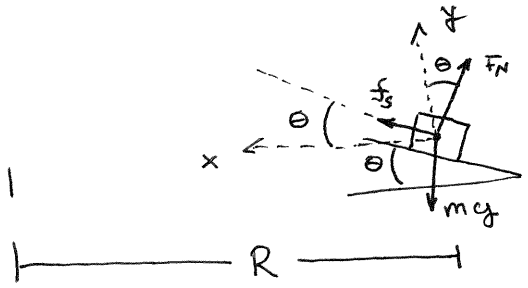
CH5 #26



FIND $T = \frac{2\pi R}{v}$

$\Rightarrow$ find v

$$\sum F_x = m a_c = \frac{m v^2}{R}$$

I $$f_s \cos\theta - F_N \sin\theta = \frac{m v^2}{R}$$

SUITCASE SLID TO A STOP $\Rightarrow$ $f_s = f_{s_{MAX}} = \mu_s F_N \Rightarrow$ I

II. $$\underbrace{\mu_s F_N}_{f_{s\,MAX}} \cos\theta - F_N \sin\theta = \frac{m v^2}{R}$$

$$\sum F_y = 0 \qquad F_N \cos\theta + f_s \sin\theta - mg = 0$$

($f_s \rightarrow \mu_s F_N$)

III $$F_N \cos\theta + \mu_s F_N \sin\theta - mg = 0$$

SOLVE III FOR $F_N \Rightarrow$ II

$$F_N \left[\cos\theta + \mu_s \sin\theta \right] = mg$$

$$F_N = \frac{mg}{\left[\cos\theta + \mu_s \sin\theta \right]} \Longrightarrow \text{II}$$

$$F_N \left[\mu_s \cos\theta - \sin\theta \right] = \frac{m v^2}{R}$$

$$mg \, \frac{\left[\mu_s \cos\theta - \sin\theta \right]}{\left[\cos\theta + \mu_s \sin\theta \right]} = \frac{m v^2}{R}$$

$$v = \left[Rg \, \frac{\left[\mu_s \cos\theta - \sin\theta \right]}{\left[\cos\theta + \mu_s \sin\theta \right]} \right]^{1/2}$$

$$T = \frac{2\pi R}{v}$$