

Thomas-Palmer Physics In-Class Lecture Notes:

A Slightly More Complicated Friction and Newton's 2nd Law Problem
 Thank You, Amanda Ciccarelli, for these notes.



force of friction is independent of F_a .

$$M = 4.00 \text{ kg}$$

$$a_x = 6.00 \text{ m/s}^2$$

$$F_a = 85.0 \text{ N}$$

$$\theta = 55.0^\circ$$

$$\mu_k = ?$$



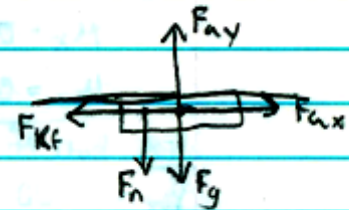
$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{F_{ay}}{F_a} \Rightarrow F_{ay} = F_a \sin \theta$$

$$F_{ay} = 85 \sin 55^\circ \quad F_{ay} = 69.6279 \text{ N}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{F_{ax}}{F_a} \Rightarrow F_{ax} = F_a \cos \theta$$

$$F_{ax} = 85 \cos 55^\circ$$

$$F_{ax} = 48.75391 \text{ N}$$



$$\Sigma F_x = F_{ax} - F_{kf} = ma_x$$

$$F_{ax} - \mu_k F_n = ma_x$$

$$48.75391 - \mu_k (30.4279) = (4)(6)$$

$$- \mu_k (30.4279) = (4)(6) - 48.75391$$

$$\mu_k = \frac{4(6) - 48.75391}{-30.4279}$$

$$\mu_k = 0.813529$$

$$\approx 0.814$$

$$\Sigma F_y = F_{ay} - F_g - F_n = ma_y$$

$$= m(0)$$

$$F_{ay} - F_n - F_g = 0$$

$$F_{ay} - F_n - mg = 0$$

$$F_n = F_{ay} - mg =$$

$$69.6279 - 4(1.8)$$

$$F_n = 30.4279 \text{ N}$$