

Homework Solutions
9/13/2007

Problem

60.

$$F_{\text{parallel}} = 85.0N \cos 55^\circ = 48.75N$$

$$F_{\text{perpendicular}} = 85.0N \sin 55^\circ = 69.63N = \text{Normal Force}$$

$$a = \frac{\Sigma F}{m}$$

$$6.00 \frac{m}{s^2} = \frac{48.75 - 69.63N \cdot \mu_k}{4.00kg}$$

$$\mu_k = 0.355$$

69.

$$10.0kg \left(9.80 \frac{m}{s^2} \right) - T_1 = 10.0kg \left(2.00 \frac{m}{s^2} \right)$$

$$T_1 = 78.0N$$

For the 5.00kg block:

$$T_1 - T_2 - \mu_k \left[5.00kg \left(9.80 \frac{m}{s^2} \right) \right]$$

$$78.0N - T_2 - \mu_k \left[5.00kg \left(9.80 \frac{m}{s^2} \right) \right]$$

$$T_2 = 68.0N - (49.0N)\mu_k$$

For the 3.00kg block:

$$T_2 - \mu_k (mg \cos 25.0) - mg \sin 25$$

$$T_2 - (26.6N)\mu_k = 18.4N$$

Substituting from above:

$$68.0N - (49.0N)\mu_k - (26.6N)\mu_k = 18.4N$$

$$\mu_k = .656$$

$$T_1 = 78.0N$$

$$T_2 = 35.9N$$

76.

$$\Sigma F_{sled} = F - 130N\mu_k$$

$$\Sigma F_{penguin} = F_{s,max} = 70.0N \bullet 0.7 = 49N$$

$$a_{penguin,max} = \frac{49N}{7.136kg} = 6.867 \frac{m}{s^2}$$

$$a_{sled,max} = \frac{F - 130N \bullet 0.1}{13.25kg}$$

$$6.867 \frac{m}{s^2} = \frac{F - 13N}{13.25kg}$$

$$F = 103N$$