

Extra Review Inclined Plane example ( $\mu = 0.4$ )  
 A 50 kg object is placed on a ramp that is 2.0 m high and 5.0 m long.

a) What is the force required to push it up at a constant speed  $a = 0$ ?

b) " " to accel it up at 1.50 m/s<sup>2</sup>?

c) " " to accel it down at 2.0 m/s<sup>2</sup>?

$\sin \theta = \frac{2}{5}$   
 $\theta = \sin^{-1} \frac{2}{5}$   
 $\theta = 23.6^\circ$

$F_g = (50)(9.81) = 490.5 \text{ N}$   
 $F_g = 490.5 \sin 23.6^\circ = 196.4$   
 $F_g = 490.5 \cos 23.6^\circ = 447.5$

a)  $a = 0$   
 $F_n = F - F_{gx} - f$   
 $F = F_{gx} + f = 196.4 + 177.8$   
 $F = 374.2 \text{ N}$

b)  $a$  up at  $1.50 \text{ m/s}^2$   
 $F_n = F - F_{gx} - f$   
 $F = F_n + F_{gx} + f$   
 $= (50)(1.5) + 196.4 + 177.8$   
 $= 75 + 374.2$   
 $= 449.2 \text{ N}$

c) accel it down at  $2.0 \text{ m/s}^2$   
 $F_n = F + F_{gx} - f$   
 $F = F_n - F_{gx} + f$   
 $= (50)(2.0) - (196.4) + (177.8) = 83.4 \text{ N}$

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