PRACTICE PROBLEMS

5. A friend pushes a 600 g (6.00×10^2 g) textbook along a lab bench at constant velocity with 3.50 N of force.
   (a) Determine the normal force supporting the textbook.
   (b) Calculate the force of friction and coefficient of friction between the book and the bench.
   (c) Which coefficient of friction have you found, μ_s or μ_k?

6. A 125 kg crate full of produce is to be slid across a barn floor.
   (a) Calculate the normal force supporting the crate.
   (b) Calculate the minimum force required to start the crate moving if the coefficient of static friction between the crate and the floor is 0.430.
   (c) Calculate the minimum force required to start the crate moving if half of the mass is removed from the crate before attempting to slide it.

7. Avalanches often result when the top layer of a snow pack behaves like a piece of glass, and begins sliding over the underneath layer. Calculate the force of static friction between two layers of horizontal ice on the top of Mount Everest, if the top layer has a mass of 2.00×10^2 kg. (Refer to Table 4.5 for the coefficient of friction.)

Friction Practice Problems

5) a) $F_N = ?$

$F_{net\,y} = ?$

$F_{net\,y} = 0$ (no motion up or down)

$F_{net\,y} = F_g + F_N$ (sum of all y-dir forces)

$0 = -(0.6\,kg)(9.81) + F_N$

↑ gravity acts down

$0 = -5.89\,N + F_N$

$\boxed{5.89\,N = F_N}$

b) $F_f = ?$ $\quad \mu = ?$ $\quad F_{net\,x}$ = Sum of all x-direction forces

$F_{net\,x} = F_f + F_a$

$F_{net\,x} = 0\,N$ (constant velocity)

$F_{app} = 3.50\,N$

$0 = F_f + 3.50$

$\boxed{-3.50\,N = F_f}$

$\mu = ?$ $\quad F_f = \mu F_N$ (use all positive numbers ← use magnitudes)

$3.50 = \mu(5.89)$

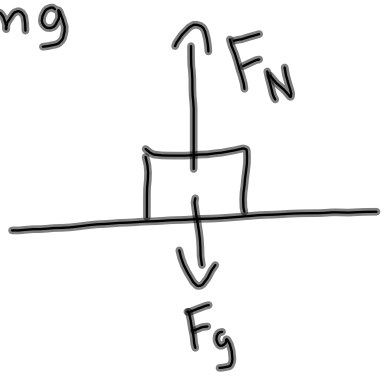
$\frac{3.50\,N}{5.89\,N} = \mu$

$\boxed{0.594 = \mu}$

c) $\mu_{Kinetic}$ friction - book is moving

6. $m = 125\ kg$ $\quad F_g = mg$

$g = 9.81\ m/s^2$



$F_N = ?$

$F_{net_y} = F_g + F_N$

$0N = -(125)(9.81) + F_N$

$\boxed{1226\ N = F_N}$

b) $\mu_s = 0.43$

$F_{f_{static}} = ?$

$F_f = \mu F_N$

$F_f = 0.43(1226)$

$\boxed{F_f = 527\ N}$ ← static

c) $F_f = 263\ N$

7) $F_f = ?$ $\quad F_f = \mu F_N$

$m = 200\,kg$ $\quad F_{net_y} = F_g + F_N$

$\mu_s = 0.94$ $\quad 0 = -(200)(9.81) + F_N$

$g = 9.81\,m/s^2$ $\quad 1962\,N = F_N$

$F_{f_{static}} = 0.94(1962) = \boxed{1844\,N}$

31) $F_a = 385\ N$

$F_{net_x} = 0\ N$

$F_{net_y} = 0\ N$

$g = 9.81\ m/s^2$

$\mu = 0.20$

$m = ?$

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① $F_g = mg$ (?)

② $F_{net_y} = F_g + F_N$ (?)

③ $F_f = \mu F_N$ (?)

④ $F_{net_x} = F_f + F_a$

④ $0 = F_f + 385$

$-385\ N = F_f$

③ $385 = 0.2\, F_N$

$1925\ N = F_N$

② $0 = F_g + 1925$

$-1925\ N = F_g$

① $-1925 = (m)(-9.81)$

$\frac{-1925\ N}{-9.81\ m/s^2} = m$

$196\ Kg = m$