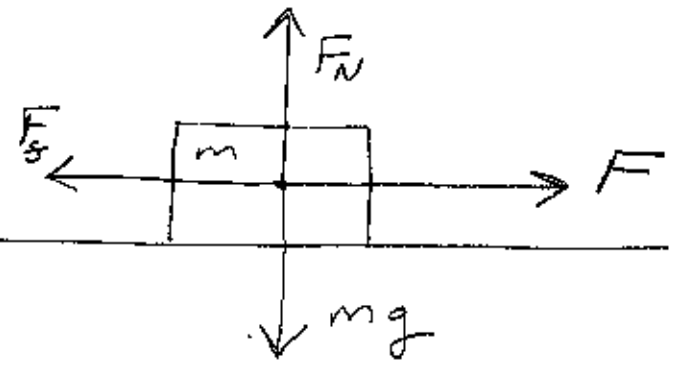
20080314-0904 Friction Forces

$g = 9.80\ m/s^2$

$\mu_s = 0.300$

$\mu_k = 0.200$

$m = 100.0\ kg$



1ST Determine the normal force.

$$F_N = F_W = mg = (100.0\ kg)(9.80\ m/s^2) = 980.\ N$$

2ND Determine force of static friction

$$F_{ss} = \mu_s F_N = (0.300)(980.\ N) = 294\ N$$

3RD Determine F to overcome static friction
It must be $>= F_{ss}$ so $F >= 294\ N$

4TH Determine force of kinetic friction

$$F_{sk} = \mu_k F_N = (0.200)(980.\ N) = 196\ N$$

5TH Determine F to keep object in motion at a constant velocity (i.e. $a = 0$)
This force must be 196 N

6TH Find the accelerating force is the applied force is the same as that to overcome the static Friction.

$$F_{TOTAL} = F_{FK} + F_{acc} \quad \text{so} \quad F_{acc} = F_{TOTAL} - F_{FK}$$

$$F_{acc} = 294 - 196 = 98\ N \quad \text{(Note 2SF)}$$

Then use $F = ma$ to get a

$$a = \frac{F_{acc}}{m} = \frac{98\ N}{100.\ kg} = 0.98\ m/s^2$$