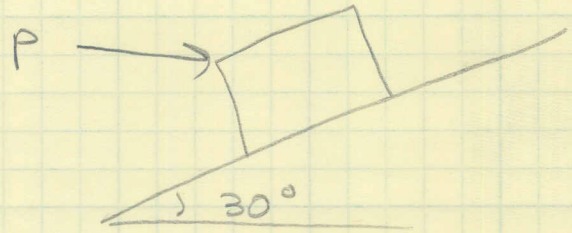
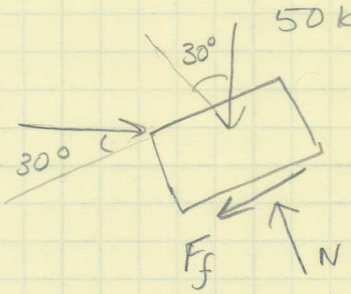
8-2



Sliding up the plane



$\Sigma F_x = 0 \quad P\cos 30° - 0.25N - 50(9.81)\sin 30° = 0$

$\Sigma F_y = 0 = -P\sin 30° - 50(9.81)\cos 30° + N = 0$

$N = P\sin 30° + 50(9.81)\cos 30°$

Substitute back into ΣF_x:

$$P\cos 30° - 0.25\left[P\sin 30° + 50(9.81)\cos 30°\right] - 50(9.81)\sin 30° = 0$$

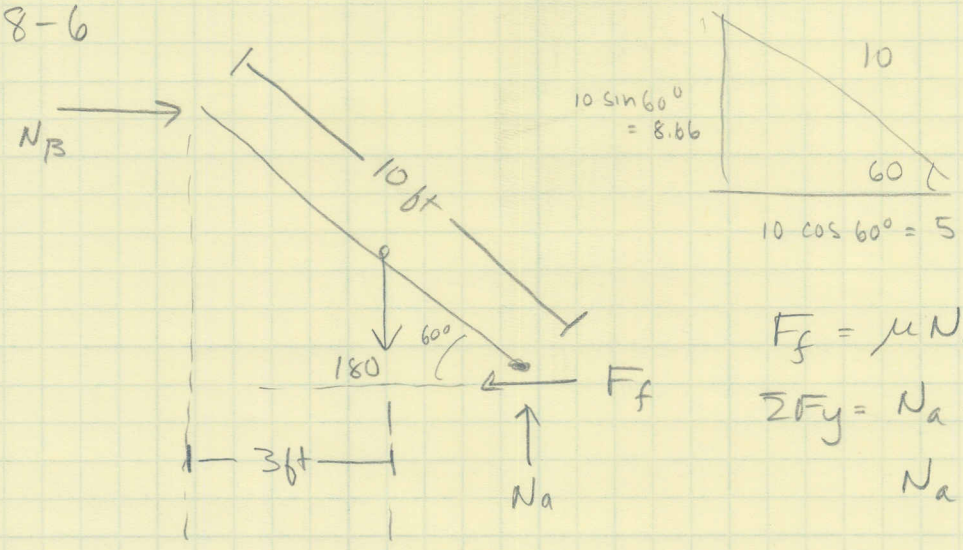
$$0.866P - 0.125P - 106.196 - 245.25 = 0$$

$$0.741P = 351.446$$

$$\boxed{P = 474.29\ N}$$

$$N = 474.29\sin 30° + 50(9.81)\cos 30° = \boxed{661.93\ N}$$

8-6



$F_f = \mu N_a$

$\Sigma F_y = N_a - 180 = 0$

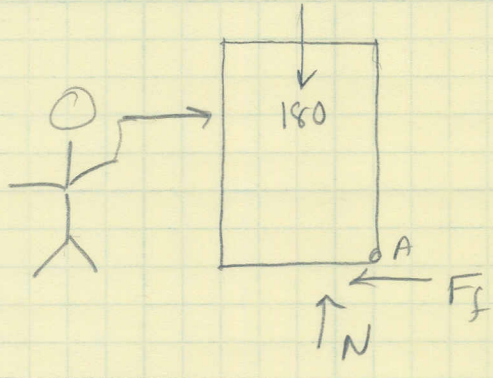
$N_a = 180$

$\Sigma M_B = -180(3) + N_a(5) - \mu_s(180)(8.66)$

$\mu_s(180)(8.66) = 180(5) - 540$

$\mu_s = \frac{360}{(180)(8.66)} = \boxed{0.231}$

8-27



$\Sigma F_y = 0 = N - 180$; $N = 180$

$\Sigma F_x = 0 = P - F_f = 0$

Assume slipping: $F_f = \mu_s N$

$P = \mu_s N = 0.25(180) = \boxed{45 \text{ lb}}$

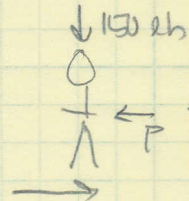
Assume tipping:

$\Sigma M_a = 180(1.5) - P(4) = 0$

$P = \frac{270}{4} = \boxed{67.5 \text{ lb}}$

Fridge will slide befor it tips

Can 150 lb man move the refridgerator?



$\Sigma F_y = 0 = 150 - N$

$N = 150$

$\Sigma F_x = 0 = F_f - P = 0$

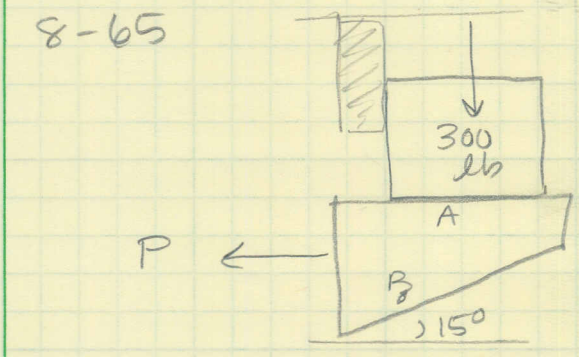
$\mu N - P = 0$

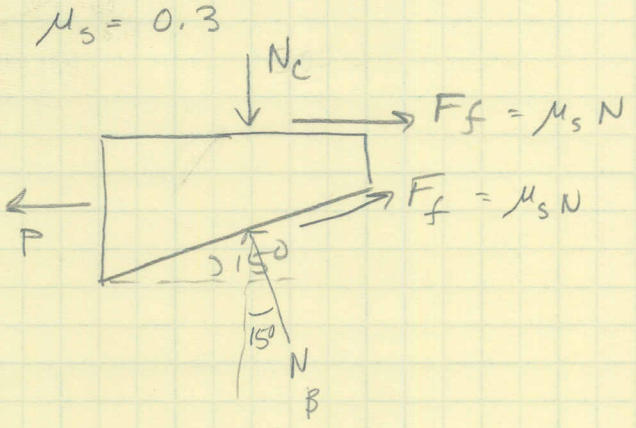
$0.6(150) = P$

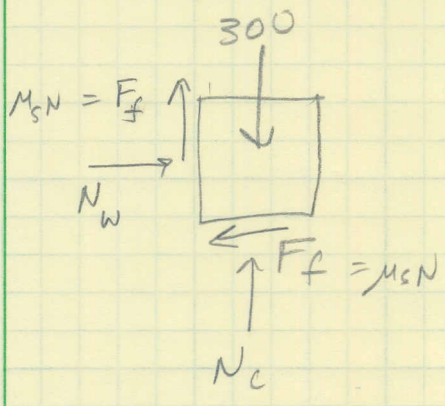
$\boxed{P = 90 \text{ lb}}$

yes, he can move the refridge because $90 > 45$

8-65







$\sum F_x = 0 = N_W - 0.3 N_C = 0$

$\sum F_y = 0 \quad N_C + 0.3 N_W - 300 = 0$

$N_W = 0.3 N_C \Rightarrow$ substitute:

$N_C + 0.3[0.3 N_C] - 300 = 0$

$1.09 N_C = 300$

$N_C = 275.2$ lb

$N_W = 0.3(275.2) = 82.57$ lb

For the wedge

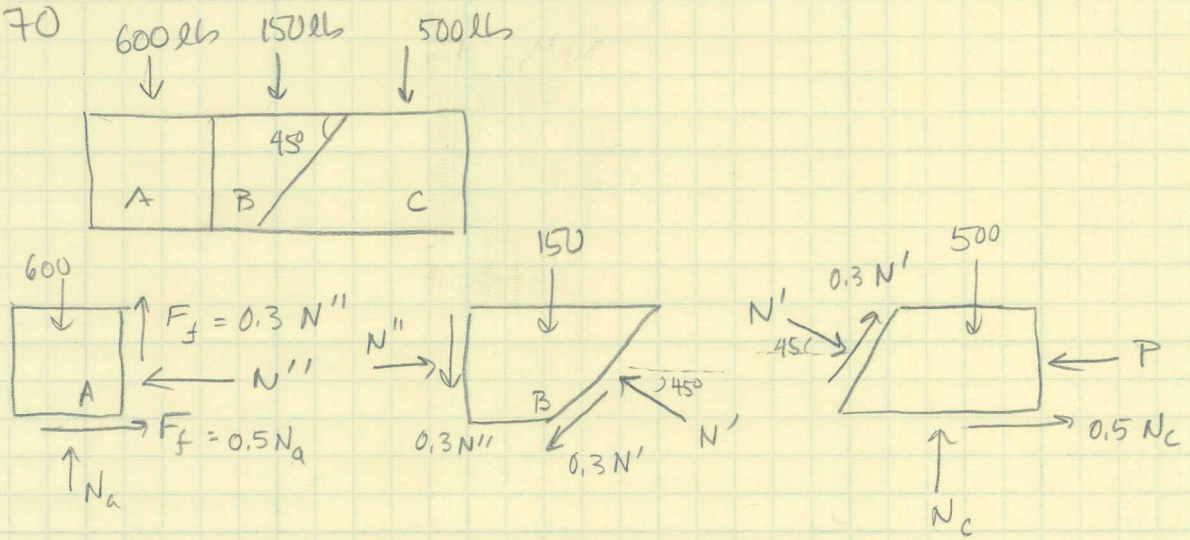
$\sum F_y = N_B \cos 15° + 0.3 N_B \sin 15° - 275.2 = 0$

$N_B = 263.74$ lb

$\sum F_x = 0 = 0.3(275.2) + 0.3(263.74)\cos 15° - 263.74 \sin 15° - P = 0$

$P = 82.56 + 76.43 - 68.26 = \boxed{90.73 \text{ lb}}$

8-70



Assume the whole thing moves

$$\Sigma F_x = F_f - P = 0$$

$$\mu N = P = 0.5(600 + 150 + 500) = 625 \text{ lb}$$

assume Block B slips up, block A does not move

Block A:

$\Sigma F_x = 0 \quad F_A - N'' = 0$

$\Sigma F_y = 0 \quad N_a - 600 + 0.3N'' = 0$

Block B:

$\Sigma F_x = 0 \quad N'' - N'\cos 45° - 0.3N'\sin 45° = 0$

$\Sigma F_y = 0 \quad N'\sin 45° - 0.3N'\cos 45° - 150 - 0.3N'' = 0$

Block C

$\Sigma F_x = 0 \quad 0.3N'\cos 45° + N'\cos 45° + 0.5N_c - P = 0$

$\Sigma F_y = 0 \quad N_c - N'\sin 45° + 0.3N'\sin 45° - 500 = 0$

substitute & solve: $N'' = 629 \text{ lb}$ $N' = 684.3 \text{ lb}$

$N_a = 411.3 \text{ lb}$ $N_c = 838.7 \text{ lb}$ $P = 1048 \text{ lb}$

$P = 1048$ for sliding block B $P = 625$ everything slips

so all blocks slip at same time $\Rightarrow P = 625$ lb

First