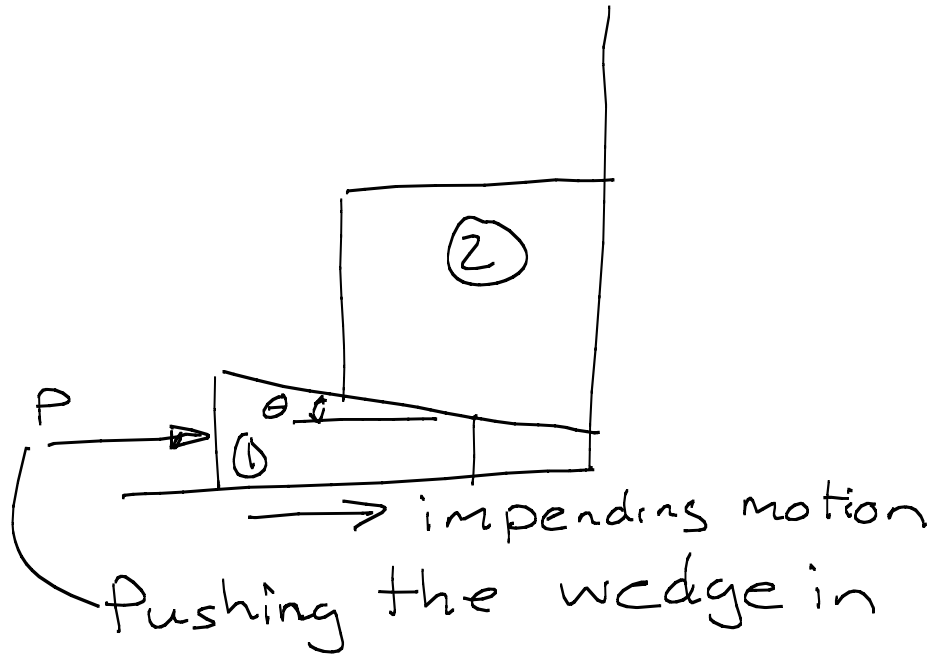
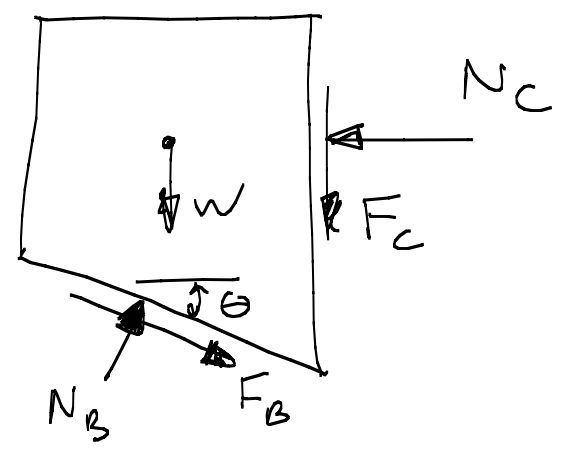
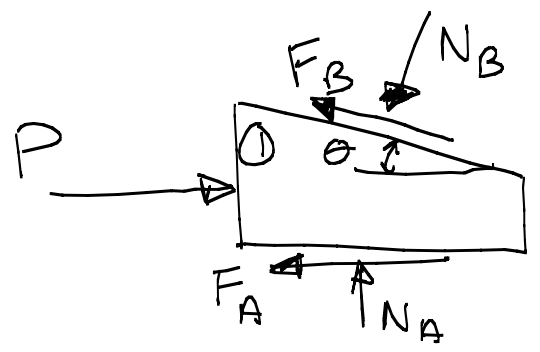


Wedges

Determine P for impending motion



- Assume:
- Neglect the weight of the wedge
 - No tipping occurs
 - W, θ are known



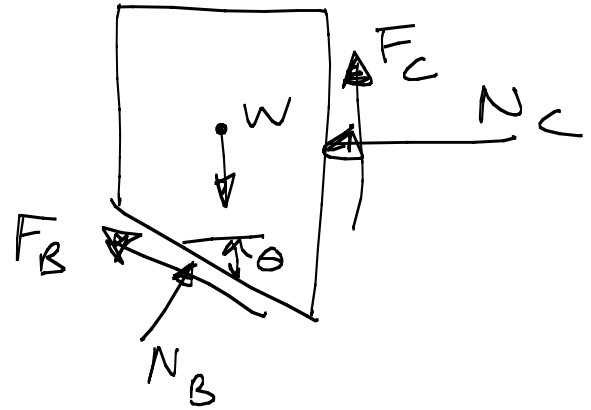
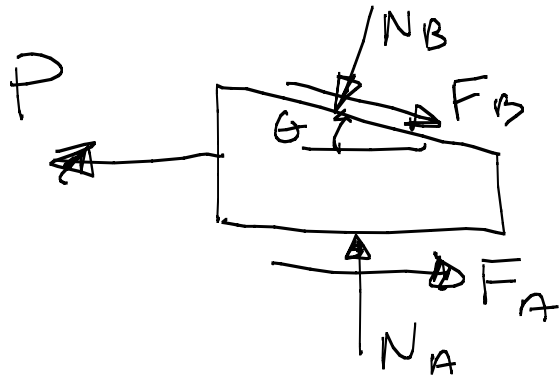
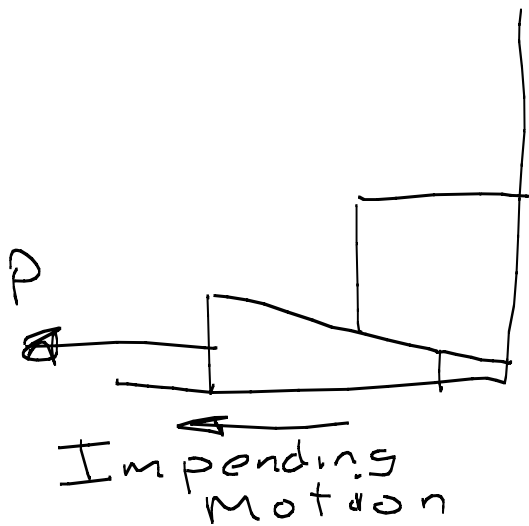
Unknowns: $F_A, N_A, F_B, N_B, N_C, F_C, P$ (7)

Equilibrium: $(\sum F_x = 0, \sum F_y = 0) \times 2$ (4)

Friction $(F_A = \mu_A N_A, F_B = \mu_B N_B, F_C = \mu_C N_C)$ (3)

(7)

Pulling the Wedge



Example

Determine:

P for impending motion

Unknowns

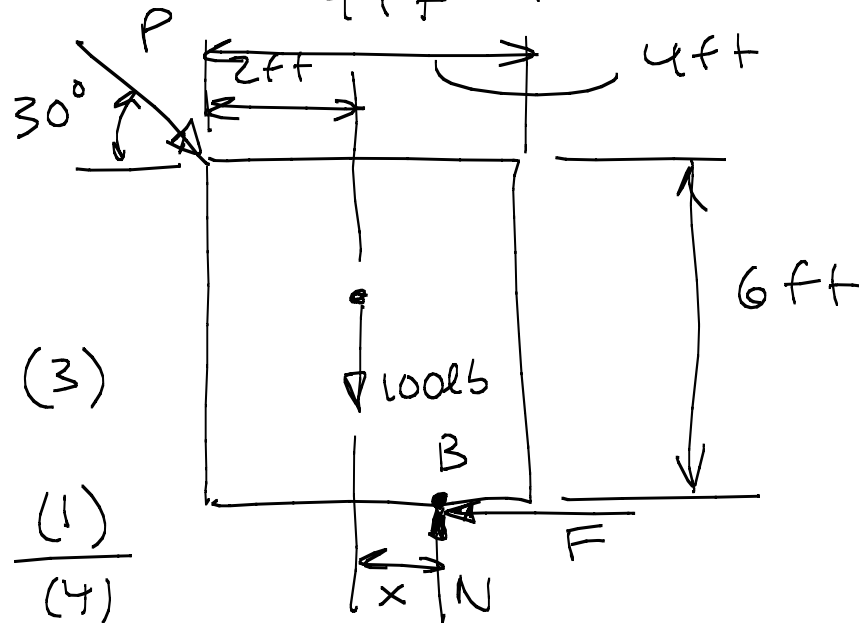
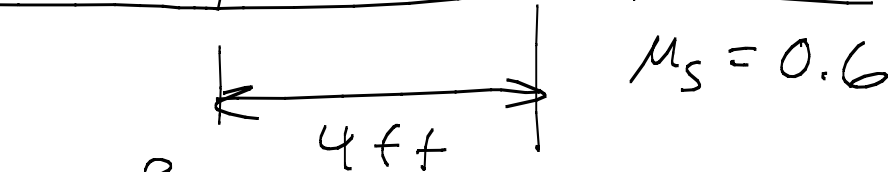
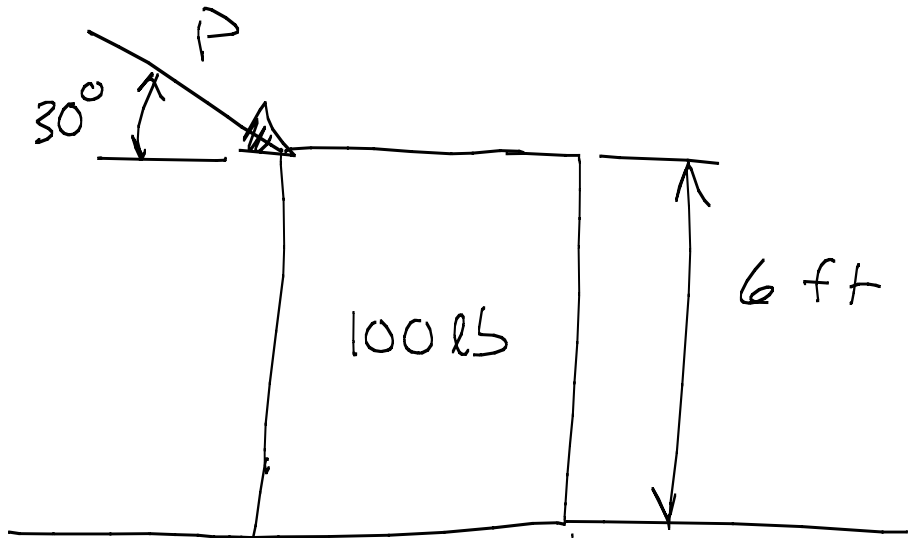
P, N, x, F (4)

Equil

$\sum F_x = 0, \sum F_y = 0, \sum M = 0$ (3)

Friction $F_s = \mu_s N$ (1)

$F = F_s$ (4)



$$\rightarrow \sum F_x = 0 \Rightarrow P \cos 30^\circ - F = 0$$

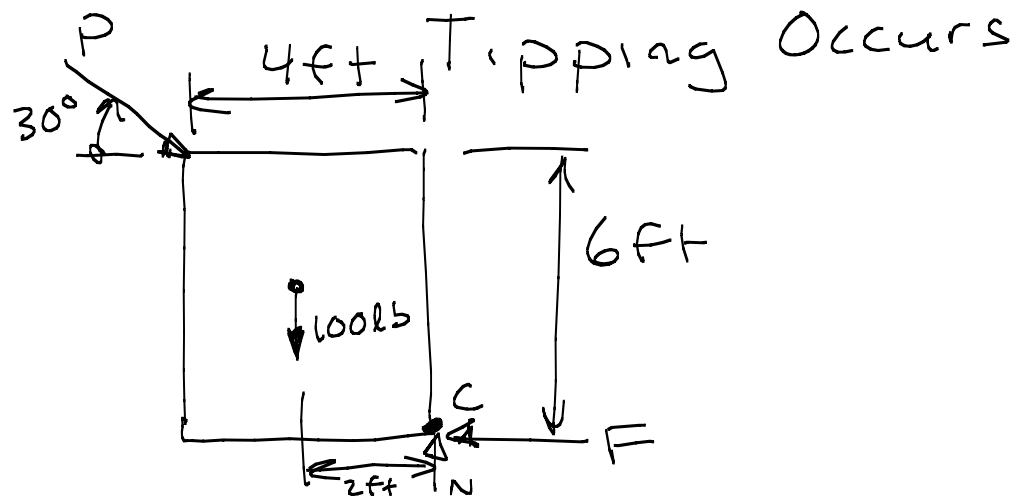
$$\uparrow \sum F_y = 0 \Rightarrow -P \sin 30^\circ - 100 \text{ lb} + N = 0$$

Friction $F = 0.6N$

$$P = 106 \text{ lb}, N = 153 \text{ lb}, F = 91.8 \text{ lb}$$

$$\uparrow \sum M_B = 0 \Rightarrow (100 \text{ lb})(x) - (106 \text{ lb})(\cos 30^\circ)(6 \text{ ft}) + (106 \text{ lb})(\sin 30^\circ)(2 + x) = 0$$

$$\underline{x = 2.9 \text{ ft} > 2} \quad \underline{\text{Not OK}}$$



$$\sum F_x = 0 \Rightarrow P \cos 30^\circ - F = 0$$

$$\sum F_y = 0 \Rightarrow -P \sin 30^\circ - 100 \text{ lb} + N = 0$$

$$\sum M_c = 0 \Rightarrow (100 \text{ lb})(2 \text{ ft}) - (P \cos 30^\circ)(6 \text{ ft}) + (P \sin 30^\circ)(4 \text{ ft}) = 0$$

$$P = 62.6 \text{ lb}, F = 54 \text{ lb}, N = 131.25 \text{ lb}$$

Check $F \stackrel{?}{\leq} \mu_s N$

$$54 \text{ lb} \stackrel{?}{\leq} (0.6)(131.25 \text{ lb})$$

$$54 \text{ lb} < 78.75 \text{ lb} \quad \checkmark$$

$$\boxed{P = 62.6 \text{ lb}}$$