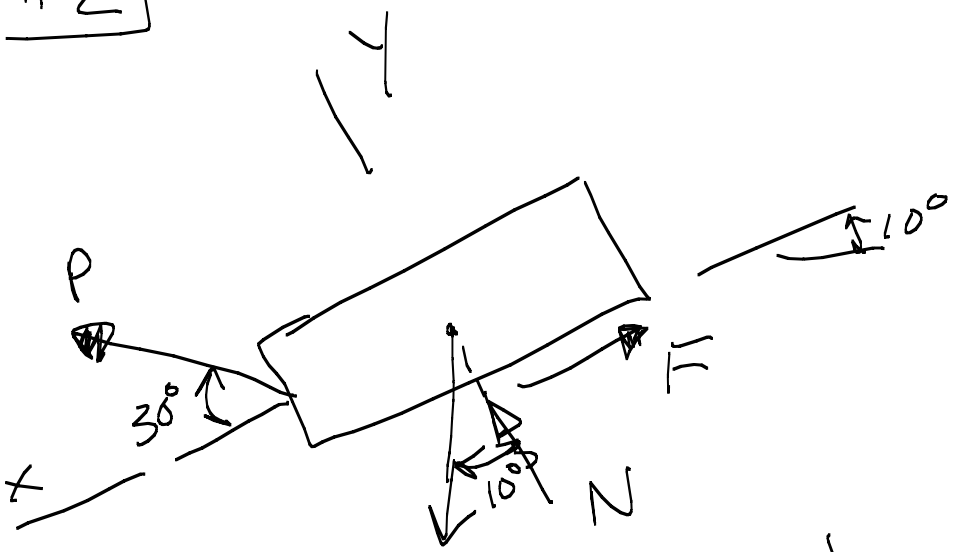
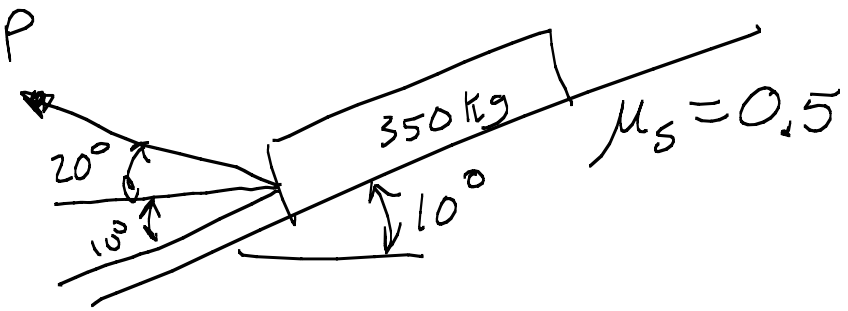
#2





$(350\text{kg})(9.81\,m/s^2) = 3433.5$ **Newtons**

Unknowns: P, N, F (3)

Equilibrium: $\Sigma F_x = 0$, $\Sigma F_y = 0$ (2)

Friction: $F = \mu_s N$ (1)

3

Impending motion at all points

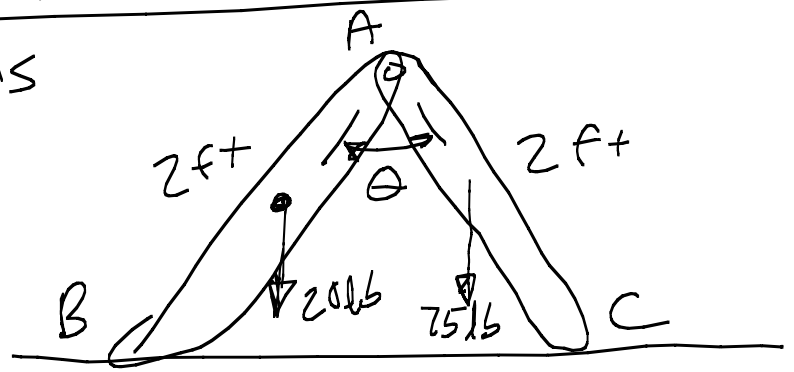
$\swarrow^{+} \Sigma F_x = 0 = P\cos 30^\circ + (3433.5)(\sin 10^\circ) - F = 0$

$+\uparrow \Sigma F_y = 0 \Rightarrow P\sin 30^\circ - (3433.5)(\cos 10^\circ) + N = 0$

$\underline{F = 0.5\ N}$

$P = 981$ Newtons, $N = 2891$ Newtons

4] 2 Friction Equations
6 Equil Equations



Unknowns

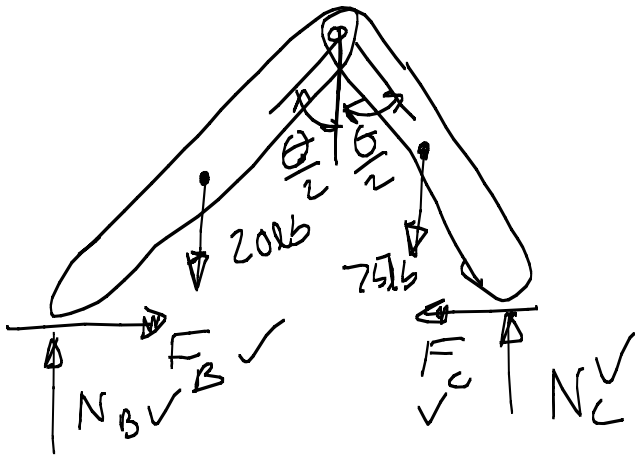
$N_B, F_B, N_C, F_C, A_x, A_y, \theta$ (7)

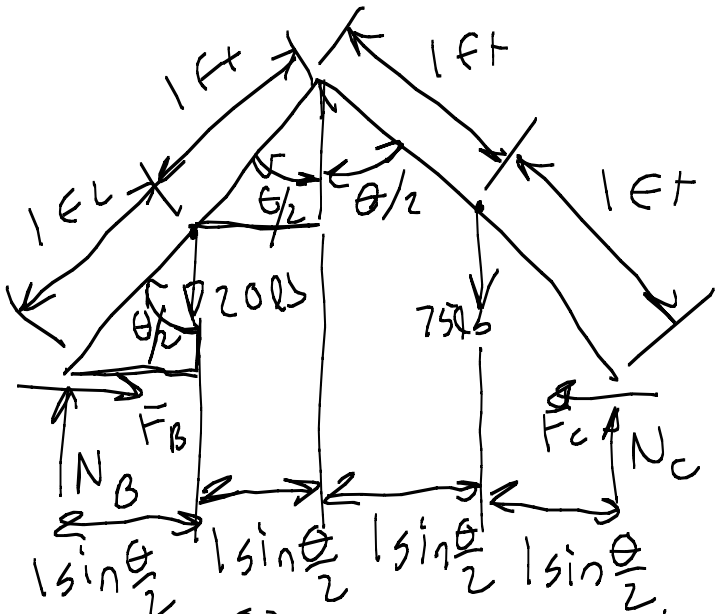
Impending Motion at some points

Assume Slipping at B

Entire Frame

$F_B = \mu_B N_B$





$+\circlearrowright \Sigma M_C = 0 \Rightarrow (75\text{lb})\left(1\sin\frac{\theta}{2}\right) + (20\text{lb})\left(3\sin\frac{\theta}{2}\right) - N_B\left(4\sin\frac{\theta}{2}\right) = 0$

$\sin\frac{\theta}{2}\left(75 + (20)(3) - 4N_B\right) = 0$

$75 + (20)(3) - 4N_B = 0$

$\boxed{N_B = 33.75\text{lb}}$

$F_B = (0.6)(33.75) = \boxed{20.25\text{lb}}$

$\pm\rightarrow \Sigma F_x = 0 \qquad F_B - F_C = 0$

$\boxed{F_C = F_B = 20.25\text{lb}}$

$+\circlearrowleft \Sigma F_y = 0 \quad N_B - 20\,lb - 75\,lb + N_C = 0$

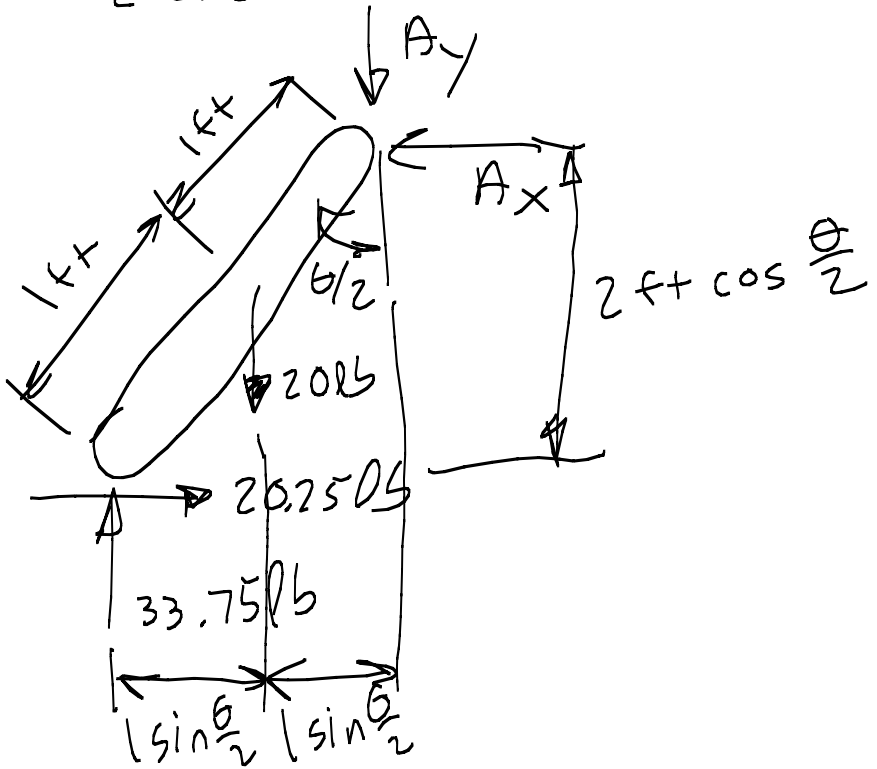
$$\boxed{N_C = 61.25\,lb}$$

Check $F_C < \mu_C N_C$

$20.25\,lb \overset{?}{<} (0.6)(61.25\,lb)$

$20.25\,lb < 36.75\,lb$ ✓ Slipping at B

AB



$$+\circlearrowleft \sum M_A = 0 \Rightarrow (20\,\text{lb})\left(1\sin\frac{\theta}{2}\right) - (33.75\,\text{lb})\left(2\sin\frac{\theta}{2}\right)$$
$$+(20.25\,\text{lb})\left(2\,\text{ft}\cos\frac{\theta}{2}\right) = 0$$

$$20\,\text{lb}\,\frac{\sin\frac{\theta}{2}}{\cos\theta/2} - (33.75)(2)\frac{\sin\frac{\theta}{2}}{\cos\frac{\theta}{2}} + (20.25)(2) = 0$$

$$(20\,\text{lb})\tan\frac{\theta}{2} - (33.75)(2)\tan\frac{\theta}{2} + (20.25)(2) = 0$$

$$\frac{\theta}{2} = 40.45^\circ \qquad \boxed{\theta = 80.9^\circ}$$