

EGR 180 6/2

Statistics of Particles

Concurrent Forces

$$\sum \vec{F} = 0$$

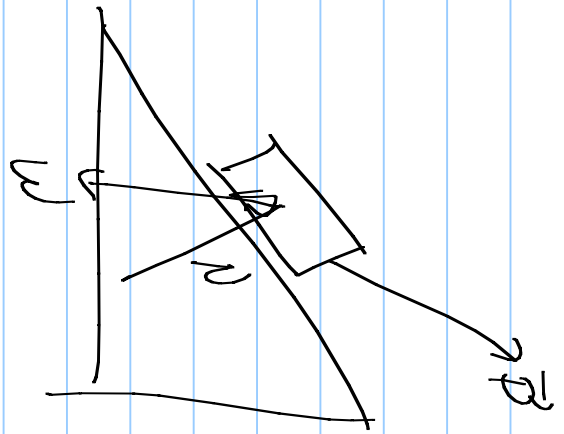
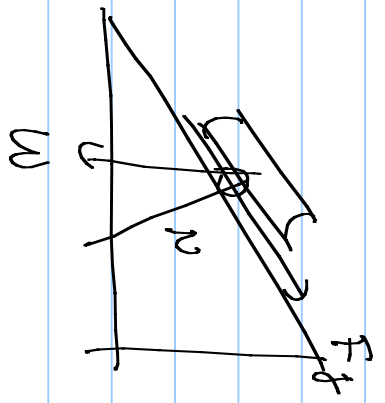
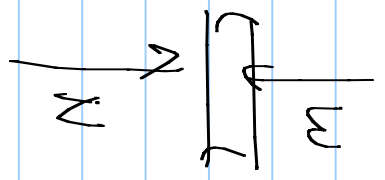
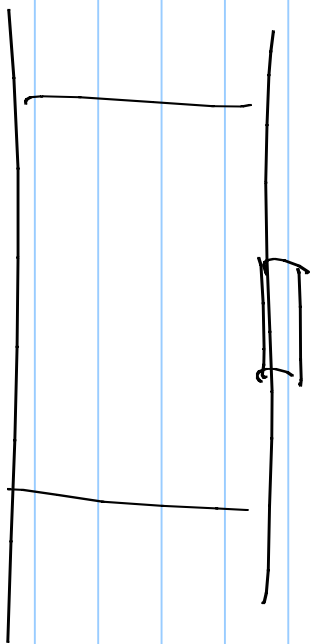
In 2D

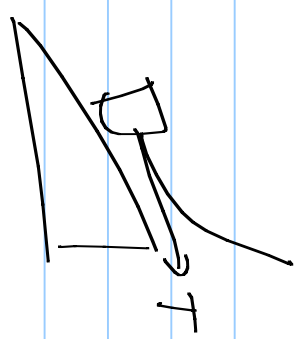
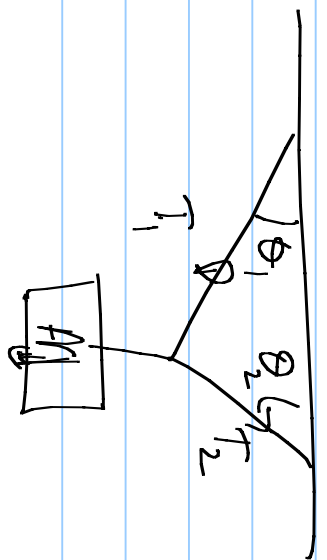
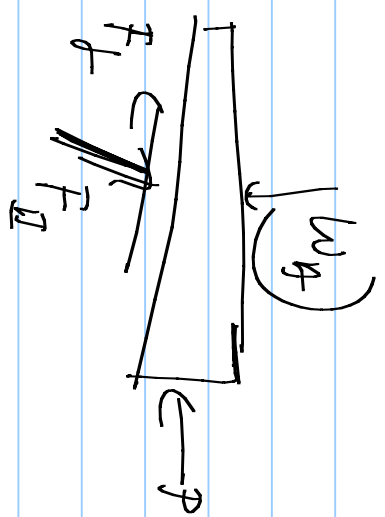
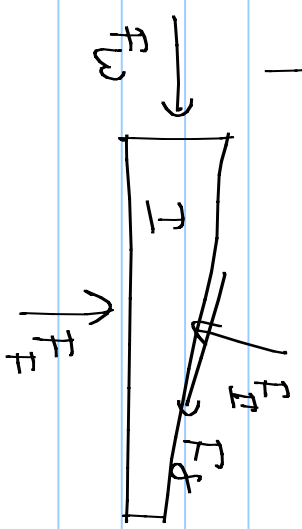
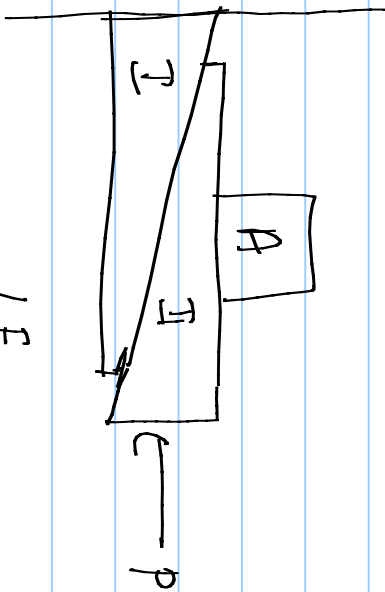
2 unknowns

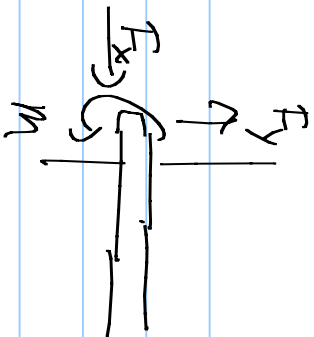
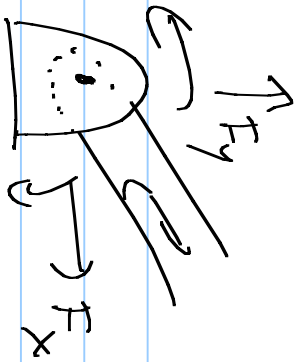
3D

3 unknowns

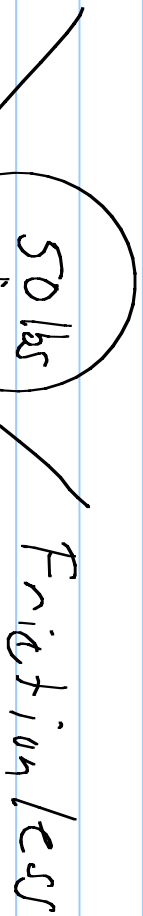
Free Body Diagram





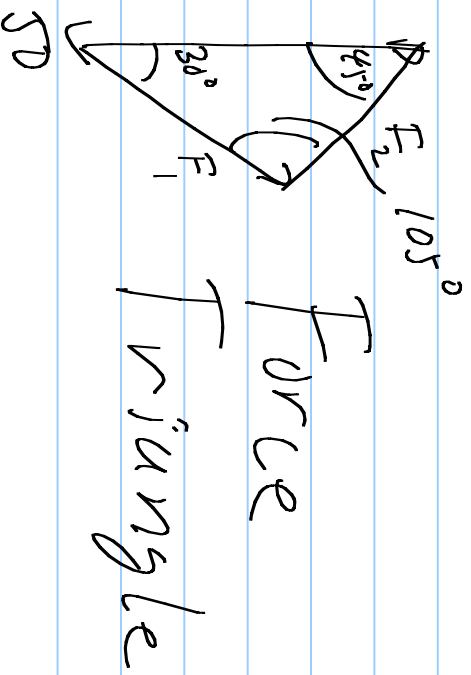


$$F_2 = 50 \frac{\sin(30)}{\sin(105)} = 25.9 \text{ lbs}$$



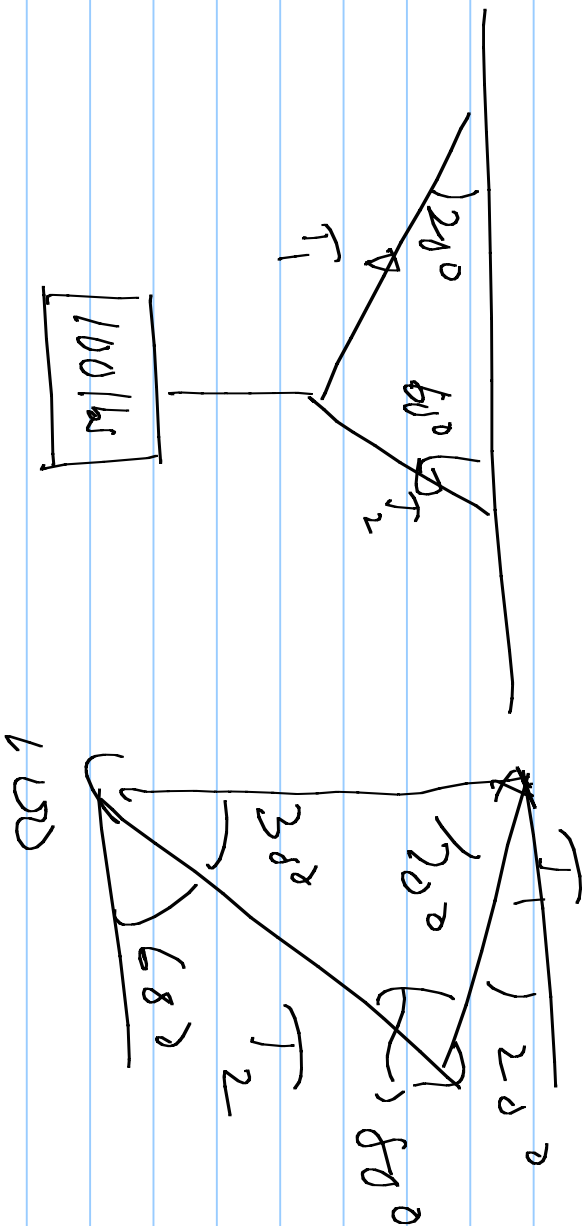
Frictionless

$$F_1 = 50 \frac{\sin(45)}{\sin(105)} = 36.6 \text{ lbs}$$



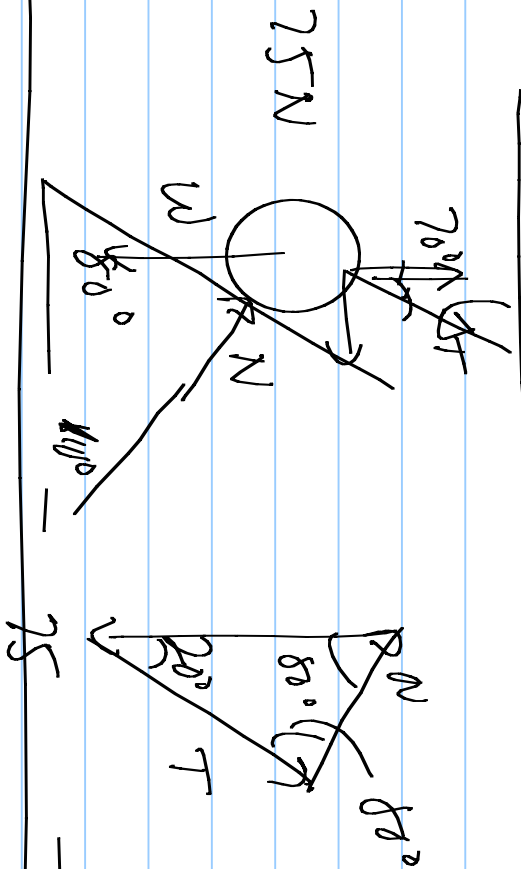
Force

Triangle



$$T_1 = 100 \cdot \frac{\sin(30)}{\sin(80)} = 50.8 \text{ lbs}$$

$$T_2 = 100 \cdot \frac{\sin(20)}{\sin(80)} = 95.4 \text{ lbs}$$



$$T = 75 \cdot \frac{\sin(80^\circ)}{\sin(80^\circ)} = 75 \text{ N}$$

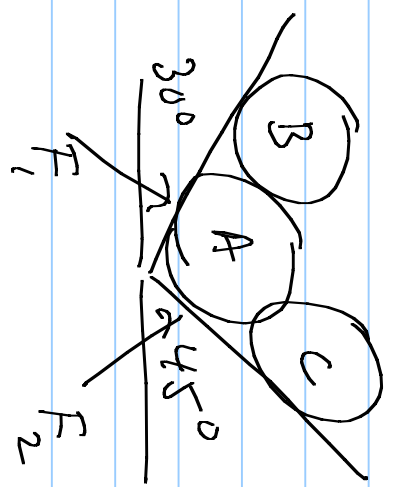
$$N = 75 \cdot \frac{\sin(20^\circ)}{\sin(80^\circ)} \approx 26.0 \text{ N}$$

$$\sum F_x = 0 = T \cos(20^\circ) - N \cos(10^\circ) \Rightarrow N = T \frac{\cos(20^\circ)}{\cos(10^\circ)}$$

$$\sum F_y = 0 = -75 + T \sin(20^\circ) + N \sin(10^\circ) \quad | \quad 75 = T \sin(20^\circ) + T \frac{\cos(20^\circ)}{\cos(10^\circ)} \sin(10^\circ)$$

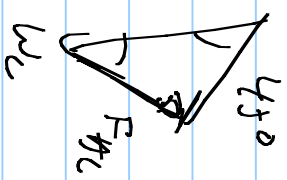
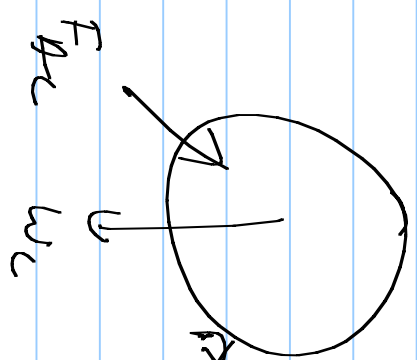
$$= T \frac{\sin(80^\circ)}{\cos(10^\circ)} \rightarrow T = 75 \text{ N}$$

3-14



Dia 500 mm  
 Mass 100 kg

Smooth



$$F_{AB} = \frac{1}{2} W_B = 50g$$

$$F_{AC} = W_C \sin(45) = 50\sqrt{2}g$$

