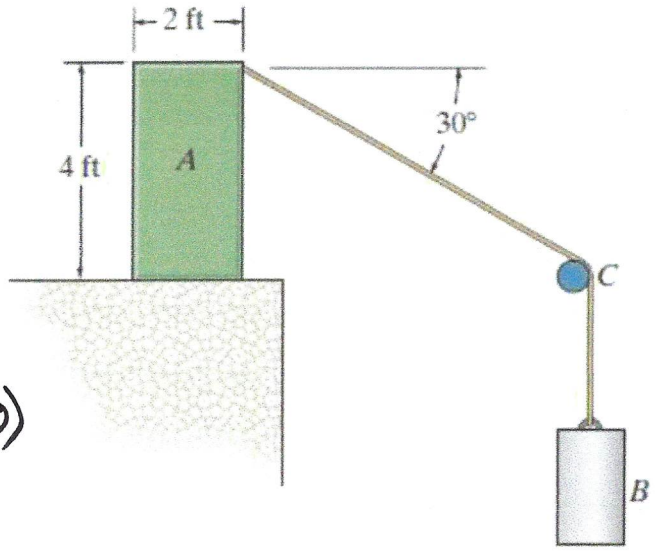
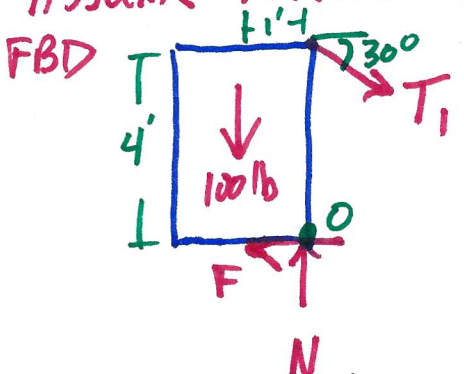
Problem 1 – Friction IV

Block *A* has a weight of 100 lb and rests on a surface for which $\mu_s = 0.25$. If the coefficient of static friction between the cord and the fixed peg at *C* is $\mu_s = 0.3$, determine the greatest weight of the suspended cylinder *B* without causing motion.



ASSUME TIPPING

FBD

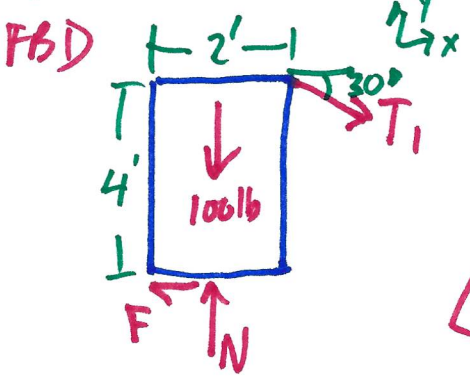


$\circlearrowleft \Sigma M_O = 0 = 4(T_1 \cos 30°) - (1)(100)$

$T_1 = 28.9$ lbs TO TIP

ASSUME SLIDING

FBD



$\rightarrow \Sigma F_x = 0 = T_1 \cos 30 - F$ but $F = F_{max} = \mu_s N$

$T_1 \cos 30 - 0.25N = 0$

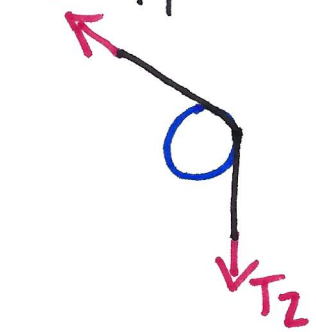
$\uparrow \Sigma F_y = 0 = N - 100 - T_1 \sin 30$

$-T_1 \sin 30 + N = 100$

SOLVE

$$\begin{bmatrix} \cos 30 & -.25 \\ -\sin 30 & 1 \end{bmatrix} \begin{Bmatrix} T_1 \\ N \end{Bmatrix} = \begin{Bmatrix} 0 \\ 100 \end{Bmatrix} \quad \begin{Bmatrix} T_1 \\ N \end{Bmatrix} = \begin{Bmatrix} 33.7 \text{ lb} \\ 117 \text{ lb} \end{Bmatrix}$$

T_1 $T_1 = 33.7$ TO SLIDE $\therefore$ TIPS FIRST



$T_2 = T_1 e^{\mu_s \beta} = 28.9 e^{(0.3)(\pi/3)} = 39.5$ lbs

GREATEST WEIGHT FOR IMPENDING MOTION (TIPPING) = 39.5 lbs