



A worker carries a load with weight  $W$  lbs and centre of gravity  $G$ . If the worker stands on a smooth floor, find the smallest angle  $\theta$  that will allow the worker to lift the load in the position shown above.

$$\Sigma M_B = 0 \rightarrow (d_3 - d_1 \cos(\theta)) \cdot W - (d_2 + d_3) \cdot N_A = 0 \rightarrow \theta = \arccos \left( \frac{d_3 - \frac{(d_2 + d_3) \cdot N_A}{W}}{d_1} \right)$$

As  $\theta$  decreases,  $N_A$  also decreases. Since  $N_A \geq 0$ , let  $N_A = 0$

$$\rightarrow \theta_{min} = \arccos \left( \frac{d_3}{d_1} \right)$$