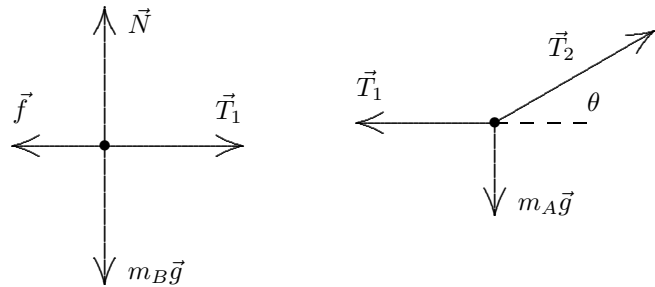


19. The free-body diagrams for block  $B$  and for the knot just above block  $A$  are shown below.  $\vec{T}_1$  is the tension force of the rope pulling on block  $B$  or pulling on the knot (as the case may be),

$\vec{T}_2$  is the tension force exerted by the second rope (at angle  $\theta = 30^\circ$ ) on the knot,  $\vec{f}$  is the force of static friction exerted by the horizontal surface on block  $B$ ,  $\vec{N}$  is normal force exerted by the surface on block  $B$ ,  $W_A$  is the weight of block  $A$  ( $W_A$  is the magnitude of  $m_A\vec{g}$ ), and  $W_B$  is the weight of block  $B$  ( $W_B = 711$  N is the magnitude of  $m_B\vec{g}$ ).



For each object we take  $+x$  horizontally rightward and  $+y$  upward. Applying Newton's second law in the  $x$  and  $y$  directions for block  $B$  and then doing the same for the knot results in four equations:

$$\begin{aligned} T_1 - f_{s,\max} &= 0 \\ N - W_B &= 0 \\ T_2 \cos \theta - T_1 &= 0 \\ T_2 \sin \theta - W_A &= 0 \end{aligned}$$

where we assume the static friction to be at its maximum value (permitting us to use Eq. 6-1). Solving these equations with  $\mu_s = 0.25$ , we obtain  $W_A = 103 \approx 100$  N.