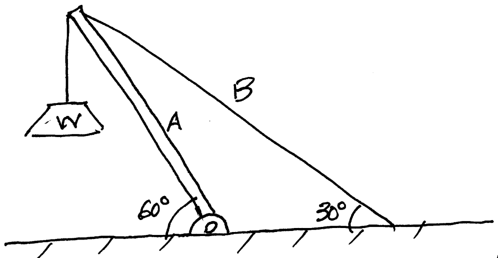
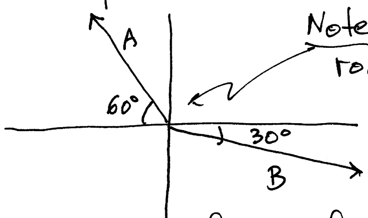
4.2



Assume that $W = 100\,N$. Also, we know that a strut that is frictionlessly pivoted at one end can only exert a force along its length — were there a component of force perpendicular to its length, the strut would rotate. A string can only pull along its length.

Free-Body Diagram

Replace each object by the force it exerts:



Note: place the end of the rod at the origin.

The sum of the forces on the end of the rod $= 0$.

$\Sigma F_x = 0 \Rightarrow -A\cos 60° + B\cos 30° + 0 = 0$

sum of the x-comps.

$A\cos 60° = B\cos 30°$

$A = B\dfrac{\cos 30°}{\cos 60°}$

$\boxed{A = 1.732B} \leftarrow$ eq. 1

$\Sigma F_y = 0 \Rightarrow A\sin 60° - B\sin 30° - 100 = 0$

$\boxed{A(0.866) - B(0.5) = 100}$ eq. 2

Substituting eq. 1 into eq. 2:

$(1.732B)\,0.866 - 0.5B = 100$

$1.5B - 0.5B = 100$

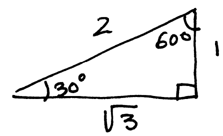
$\boxed{B = 100N}$ eq. 3

Substituting eq. 3 into eq. 1:

$A = 1.732B = 1.732(100)$

$\boxed{A = 173.2\,N}$

Is it a coincidence that $B = 100N$? Is that exact? Let's use exact values:



$\cos 30° = \dfrac{\sqrt{3}}{2} = \sin 60°$

$\sin 30° = 1/2 = \cos 60°$

Eq. 1 would become:

$A = B\dfrac{\cos 30°}{\cos 60°} = B\dfrac{\sqrt{3}/2}{1/2} = \sqrt{3}B$

Eq. 2 would become:

$A\left(\frac{\sqrt{3}}{2}\right) - B\left(\frac{1}{2}\right) = 100$

Substituting eq. 1 into eq. 2:

$(\sqrt{3}B)\left(\frac{\sqrt{3}}{2}\right) - \frac{1}{2}B = 100$

$\frac{3}{2}B - \frac{1}{2}B = 100$

$\boxed{B = 100N}$ ✓