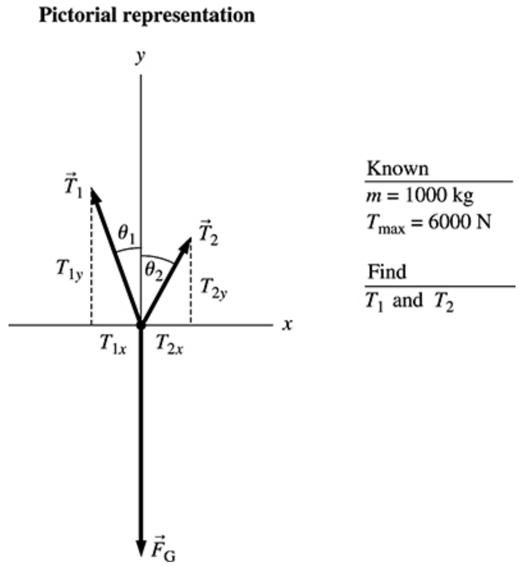
6.29. Model: You can model the beam as a particle in static equilibrium.

Visualize:



Solve: Using Newton's first law, the equilibrium equations in vector and component form are:

$$\vec{F}_{net} = \vec{T}_1 + \vec{T}_2 + \vec{F}_G = \vec{0}\ \text{N}$$
$$(F_{net})_x = T_{1x} + T_{2x} + F_{Gx} = 0\ \text{N}$$
$$(F_{net})_y = T_{1y} + T_{2y} + F_{Gy} = 0\ \text{N}$$

Using the free-body diagram yields:

$$-T_1 \sin\theta_1 + T_2 \sin\theta_2 = 0\ \text{N} \qquad T_1 \cos\theta_1 + T_2 \cos\theta_2 - F_G = 0\ \text{N}$$

The mathematical model is reduced to a simple algebraic system of two equations with two unknowns, T_1 and T_2. Substituting $\theta_1 = 20°$, $\theta_2 = 30°$, and $F_G = mg = 9800$ N, the simultaneous equations become

$$-T_1 \sin 20° + T_2 \sin 30° = 0\ \text{N} \qquad T_1 \cos 20° + T_2 \cos 30° = 9800\ \text{N}$$

You can solve this system of equations by simple substitution. The result is $T_1 = 6397$ N and $T_2 = 4376$ N.

Assess: The above approach and result seem reasonable. Intuition indicates there is more tension in the left rope than in the right rope.