HOLT PHYSICS
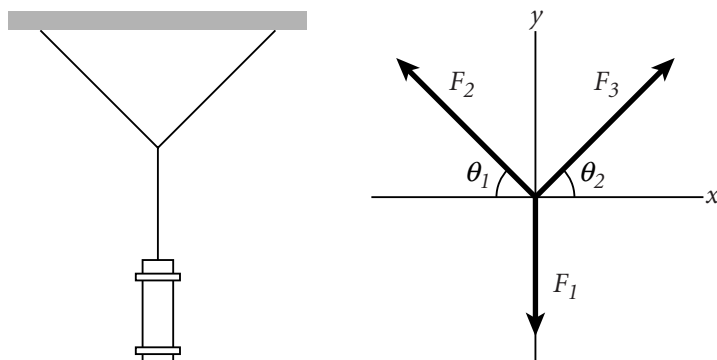
Forces and the Laws of Motion

Diagram Skills

Newton's First Law

A lantern of mass m is suspended by a string that is tied to two other strings, as shown in the figure below. The free-body diagram shows the forces exerted by the three strings on the knot.

1. In terms of $\mathbf{F_1}$, $\mathbf{F_2}$, and $\mathbf{F_3}$, what is the net force acting on the knot? (Hint: The lantern is in equilibrium.)

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2. Find the magnitudes of the x and y components for each force acting on the knot. (Assume the positive directions are to the right and up.)

   String 1 (F_1) x component _____ y component _____

   String 2 (F_2) x component _____ y component _____

   String 3 (F_3) x component _____ y component _____

3. In terms of F_1, F_2, and F_3, what is the magnitudes of the net force acting on the knot in the x direction? in the y direction?

   $F_{x\ net}$ = _____

   $F_{y\ net}$ = _____

4. Assume that $\theta_1 = 30°$, $\theta_2 = 60°$, and the mass of the lantern is 2.1 kg. Find F_1, F_2, and F_3.

   F_1 = _____

   F_2 = _____

   F_3 = _____