8. ***REASONING*** Each of the two forces produces a torque about the axis of rotation, one clockwise and the other counterclockwise. By setting the sum of the torques equal to zero $(\Sigma\tau = 0)$, we will be able to determine the distance x in the drawing

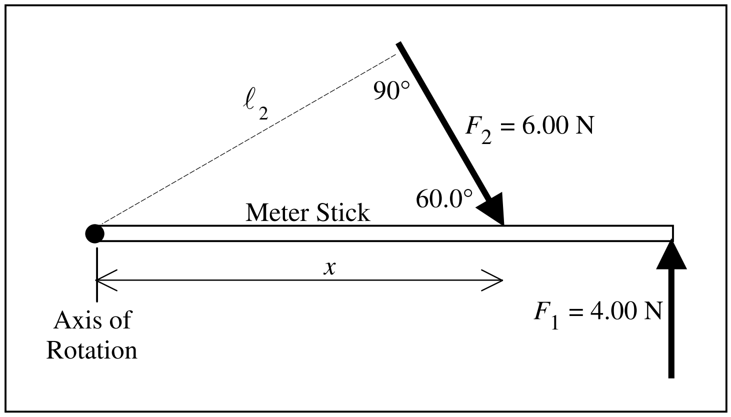

Table (Top view)

SOLUTION The torque τ_1 produced by the force F_1 is given by Equation 9.1 as $\tau_1 = +F_1\ell_1$, where the lever arm is $\ell_1 = 1.00$ m. It is a positive torque, since it tends to produce a counterclockwise rotation. The torque τ_2 produced by F_2 is $\tau_2 = -F_2\ell_2$, where $\ell_2 = x\sin 60.0°$. It is a negative torque, since it tends to produce a clockwise rotation. Setting the net torque equal to zero, we have

$$\underbrace{+F_1\ell_1 + \left(-F_2\ell_2\right)}_{\Sigma\tau} = 0 \qquad \text{or} \qquad +F_1\underbrace{\left(1.00\text{ m}\right)}_{\ell_1} - F_2\underbrace{\left(x\sin 60.0°\right)}_{\ell_2} = 0$$

Solving for x gives

$$x = \frac{F_1\left(1.00\text{ m}\right)}{F_2\sin 60.0°} = \frac{\left(4.00\text{ N}\right)\left(1.00\text{ m}\right)}{\left(6.00\text{ N}\right)\sin 60.0°} = \boxed{0.770\text{ m}}$$