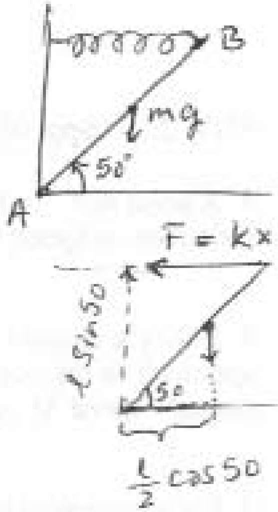
$\frac{\#9}{Ch. 10}$ $m = 10.1\ kg$
$k = 176\ N/m$



Taking torque about the corner (point A)

$$(kx)\, l \sin 50^0 - mg\left(\frac{l}{2}\cos 50\right) = 0$$

$$x = \frac{\frac{1}{2}mg}{k}\frac{\cos 50}{\sin 50}$$

$$= \frac{(0.5)(10.1\ kg)(9.81)}{176\ N/m}\frac{\cos 50}{\sin 50} = 0.236\ m$$

$\frac{34}{Ch. 10}$ $m_1 = 14.6\ kg$, $m_2 = 29.2\ kg = 2m_1$, $k = 1170\ N/m$

$x = 0.152\ m$

Initial momentum = 0
Initial Energy = $\frac{1}{2}kx^2$

Conservation of momentum ⇒ $m_1V_1 + m_2V_2 = 0$ (1)
Where V_1 and V_2 are final velocities after the spring is released. Also conservation of energy implies

$$\frac{1}{2}kx^2 = \frac{1}{2}m_1V_1^2 + \frac{1}{2}m_2V_2^2$$

$$= \frac{1}{2}m_1V_1^2 + \frac{1}{2}m_2\left(-\frac{m_1}{m_2}V_1\right)^2$$

$$= \frac{1}{2}m_1V_1^2 + \frac{1}{2}\frac{m_1^2}{m_2}V_1^2$$

$$\frac{1}{2}kx^2 = \frac{1}{2}m_1V_1^2\left(1 + \frac{m_1}{m_2}\right)$$

$$kx^2 = \frac{m_1}{m_2}(m_1+m_2)V_1^2$$

$$V_1^2 = \frac{m_2k}{m_1(m_1+m_2)}x^2 = \frac{2m_1k}{m_1(3m_1)}x^2$$

$$= \frac{2}{3}\frac{k}{m_1}x^2 = \frac{2}{3}\frac{1170\ N/m}{14.6\ kg}(0.152\ m)^2$$

$$V_1 = 1.11\ m/s, \quad V_2 = -\frac{m_1}{m_2}V_1 = -\frac{1}{2}V_1 = -0.56\ m/s$$

→ Note that if $m_1 \ll m_2$ then $\frac{1}{2}m_1V_1^2 \simeq \frac{1}{2}kx^2$, i.e., all the P.E. in the spring becomes KE of m_1. Then it becomes a spring loaded gun.