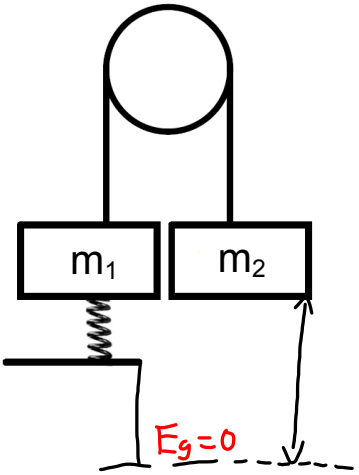
Calculate the maximum distance the masses will move. The masses start from rest.

m_1 = 1.5 kg k = 120 N/m

m_2 = 3.5 kg



$v_f = 0$ m/s $v_0 = 0$ m/s

$x_f = 0$

$x_0 = ?$

$$\Delta E_T = 0$$

$$\Delta E_{g1} + \Delta E_{g2} + \Delta E_e = 0$$

$$(m_1 g h_{1f} - m_1 g h_{10}) + (m_2 g h_{2f} - m_2 g h_{20}) + \tfrac{1}{2}kx_f^2 - \tfrac{1}{2}kx_0^2 = 0$$

($m_2 g h_{2f}$ → 0; $\tfrac{1}{2}kx_f^2$ → 0)

$h_{20} = x_f$

$h_{1f} = 2x_f$

$h_{10} = x_f$

$$(1.5)(9.81)(2x_f) - (1.5)(9.81)(x_f) - (3.5)(9.81)(x_f) + \tfrac{1}{2}(120)x_f^2 = 0$$

$$14.7x_f - 34.3x_f + 60x_f^2 = 0$$

$$-19.6x_f + 60x_f^2 = 0$$

$$60x_f^2 - 19.6x_f = 0$$

$$x_f(60x_f - 19.6) = 0$$

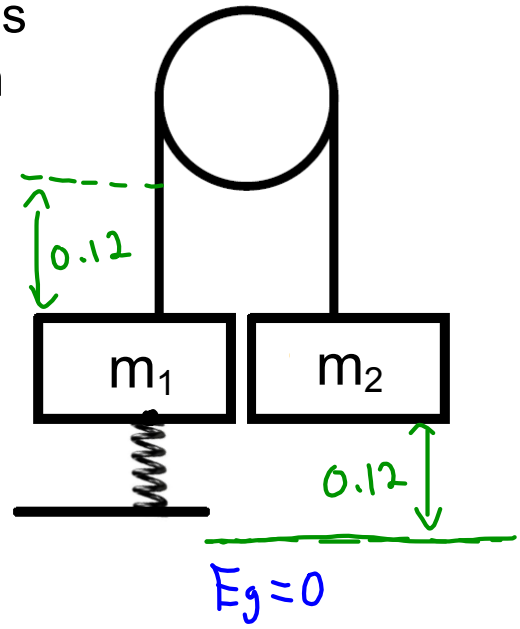
$60x_f - 19.6 = 0$

$60x_f = 19.6$

$x_f = \frac{19.6}{60}$

$x_f = 0.33$ m

Calculate the instantaneous speed of the masses when they have moved 0.12 m.



$m_1 = 1.5$ kg $k = 120$ N/m

$m_2 = 3.5$ kg $v_f = ?$

$v_0 = 0$

$h_{10} = 0.12$ $h_{2f} = 0$

$h_{1f} = 0.24$ $x_f = 0.12$

$h_{20} = 0.12$

$$\Delta E_{K1} + \Delta E_{K2} + \Delta E_{g1} + \Delta E_{g2} + \Delta E_e = 0$$

$$\frac{1}{2}m_1 v_f^2 + \frac{1}{2}m_2 v_f^2 + (m_1 g h_{1f} - m_1 g h_{10}) + (m_2 g h_{2f} - m_2 g h_{20}) + \frac{1}{2}kx_f^2 = 0$$

($h_{2f} \to 0$)

$$\frac{1}{2}(1.5)v_f^2 + \frac{1}{2}(3.5)v_f^2 + (1.5)(9.81)(0.24) - (1.5)(9.81)(0.12) - (3.5)(9.81)(0.12) + \frac{1}{2}(120)(0.12)^2 = 0$$

$$2.5v_f^2 + 3.53 - 1.77 - 4.12 + 0.864 = 0$$

$$2.5v_f^2 - 1.496 = 0$$

$$v_f = \sqrt{\frac{1.496}{2.5}}$$

$$\boxed{v_f = 0.77 \text{ m/s}}$$