2. $m_1 = 75\,kg$ $h = 2.5\,m$ $h' = 0.53\,m$

$m_2 = 48\,kg$ $m = 14\,kg$ $\ell = 3.3\,m$


(a) Just ~~before~~ he hits the plank

$$v = \sqrt{2g(h-h')} \doteq 5.31\,m/s$$

After he hits the plank, use angular momentum conservation.

$$m_1 v \times \frac{\ell}{2} = I\omega$$

$$I = \frac{m}{12}\ell^2 + (m_1+m_2)\times\left(\frac{\ell}{2}\right)^2 \doteq 411.1\ kg\cdot m^2$$

$$v' = \omega \times \frac{\ell}{2} = \frac{m_1 v}{\frac{m}{3} + (m_1+m_2)} \doteq 3.12\ m/s$$

(b) when it's horizontal.

energy conservation:

$$m_1 g h'' + \frac{1}{2}\omega^2 = m_1 g h' + m_2 g h' + \frac{I}{2}\omega'^2$$

$$\omega' = \sqrt{\frac{2(m_1-m_2)g h'}{I} + \omega^2}$$

$$= 2.06\ s^{-1}$$

$$v'' = \omega' \times \frac{\ell}{2} \doteq 3.40\ m/s$$

(c) Energy conservation

$$\frac{m_2}{2} v''^2 + m_2 g h' = m_2 g h'''$$

$$h''' \doteq 1.12\ m$$

He will reach a height of 1.12 m

(d) The mechanical energy ~~doesn't conserved~~ doesn't conserve in this proces. When Great Garbanzo hits the plank, ~~so~~ some of the mechanical energy changes to heat.

$$\Delta E = \frac{m_1}{2} v^2 - \frac{I}{2}\omega^2 \doteq 318.42\ J$$