$$\cancel{l = vt} = \frac{x m_{yacht} + (x + l) m_{car}}{m_{yacht} + m_{car}} = \cancel{\quad} tv$$

$$x = \frac{t m_{car} v_{car} - l m_{car}}{m_{yacht} + m_{car}}$$

$$x = \frac{\frac{l m_{car} v_{car}}{v_{car} - \frac{1}{2}[v_{car} - v] \times \left(1 + \frac{m_{car}}{m_{yacht}}\right)} - l m_{car}}{m_{yacht} + m_{car}}$$

$$v = \frac{m_{car} v_{car}}{m_{car} + m_{yacht}}$$

$$x \doteq 0.52 m$$

(a) Simutaneously. suppose she will move with velocity v_1 and lighter tool, heavier tool moves with v_2

$m_1 = 80kg \quad m_2 = 0.80kg \quad m_3 = 1.2kg$

$v_{rel} = 8.0 m/s$

$$\begin{cases} v_1 - v_2 = v_{rel} \\ m_1 v_1 + (m_2 + m_3) v_2 = 0 \end{cases}$$

$\Rightarrow v_1 \doteq 0.195122 m/s$

(b) first the lighter tool. she moves with v_1. the lighter tool with v_2,

$$\begin{cases} v_1 - v_2 = v_{rel} \\ (m_1 + m_3) v_1 + m_2 v_2 = 0 \end{cases}$$

then the heavier tool. she moves with v_1'. the heavier tool with v_3

$$\begin{cases} v_1' - v_3 = v_{rel} \\ m_1 v_1' + m_3 v_3 = (m_1 + m_3) v_1 \end{cases}$$

$\Rightarrow v_1' = 0.196275 m/s$

) first the heavier tool. she moves with v_1 the heavier tool with v_2

$$\begin{cases} v_1 - v_2 = v_{rel} \\ (m_1 + m_2) v_1 + m_3 v_2 = 0 \end{cases}$$