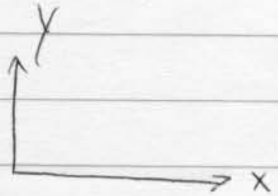
1.



□ → Cadillac, $m_1 = 1800\text{kg}$

↑

□ Toyota, $m_2 = 1300\text{kg}$

Just before collision, Cadillac has velocity $\vec{v}_c = v_1 \vec{e}_x$ and Toyota has velocity $\vec{v}_T = v_2 \vec{e}_y$. According to momentum conservation,

$$\begin{cases} m_1 v_1 = (m_1+m_2) v_1' \\ m_2 v_2 = (m_1+m_2) v_2' \end{cases}$$

here v_1', v_2' are X, Y components of the velocity of the combined wreck.

$$\begin{cases} v_1' = \dfrac{m_1}{m_1+m_2} v_1 \\ v_2' = \dfrac{m_2}{m_1+m_2} v_2 \end{cases} \Rightarrow \vec{v}' = v_1' \vec{e}_x + v_2' \vec{e}_y \Rightarrow v' = \sqrt{v_1'^2 + v_2'^2}$$

$$v' = \frac{1}{m_1+m_2} \sqrt{m_1^2 v_1^2 + m_2^2 v_2^2} \quad ①$$

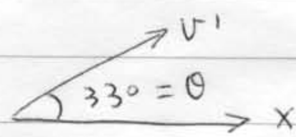
After collision.

$$F = \mu (m_1+m_2) g = (m_1+m_2) a \Rightarrow a = \mu g \quad \mu = 0.38$$

then the skid marks : $l = \frac{1}{2} a t^2 = \frac{1}{2} a \left(\frac{v'}{a}\right)^2 = \frac{v'^2}{2a} \Rightarrow v' = \sqrt{2al}$

$$v' = \sqrt{2\mu g l} \quad ②$$

And we know the skid marks make an angle of 33° from the initial ~~ton~~ direction of the Cadillac



$$\frac{v_1'}{v_2'} = \cot\theta = \frac{\frac{m_1}{m_1+m_2} v_1}{\frac{m_2}{m_1+m_2} v_2} = \frac{m_1 v_1}{m_2 v_2} \quad ③$$

① + ② + ③

$$\begin{cases} v_1 = \dfrac{m_1+m_2}{m_1 \sec\theta} \sqrt{2\mu g l} = \dfrac{m_1+m_2}{m_1} \sqrt{2\mu g l} \cos\theta = 7.27 \text{ m/s} \\ v_2 = \dfrac{m_1+m_2}{m_2 \csc\theta} \sqrt{2\mu g l} = \dfrac{m_1+m_2}{m_2} \sqrt{2\mu g l} \sin\theta = \cancel{4.72 \text{ m/s}} \end{cases}$$

$$= 6.54 \text{ m/s}$$