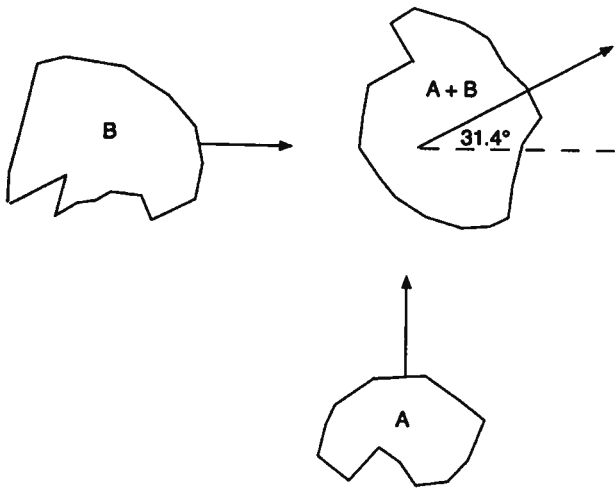


### Physics 10154 - Quiz 7A

Two alien spacecraft collide accidentally during a disastrous first-contact mission. They call in Earth investigators to reconstruct the collision and helpfully provide mks units for everything. The Ataran ship was moving at a rate of 31.0 m/s in the +y direction. The Burfian ship was moving at an unknown speed in the +x direction and is 2.00 times more massive than the Ataran ship.

After the collision, the two ships stuck together and moved off at an angle of 31.4° above the +x direction. What was the initial speed of the Burfian ship?



$$x: m_A v_{A,x} + m_B v_{B,x} = (m_A + m_B) v_f \cos 31.4^\circ$$

$$m(0) + 2m v_B = 3m v_f \cos 31.4$$

$$\Rightarrow v_B = 1.5 v_f \cos 31.4^\circ$$

$$y: m_A v_{A,y} + m_B v_{B,y} = (m_A + m_B) v_f \sin 31.4$$

$$m(31) + 2m(0) = 3m v_f \sin 31.4^\circ$$

$$31 = 3 v_f \sin 31.4^\circ$$

$$\Rightarrow v_f = 19.83$$

$$\Rightarrow v_B = 25.4 \text{ m/s}$$