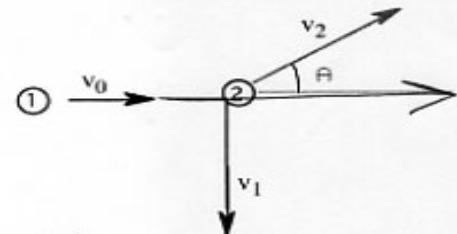


3. Sphere 1 of mass  $m_1 = 0.0500 \text{ kg}$  is traveling at  $v_0$  to the right. It collides with sphere 2 of mass  $m_2 = 0.0250 \text{ kg}$  which is initially at rest. After the collision, sphere 1 has a speed of  $0.400 \frac{\text{m}}{\text{s}}$  along the negative y-axis and sphere 2 has a speed of  $v_2$  at an angle of  $37.0^\circ$  above the x-axis. Find the initial speed  $v_0$  of the first mass and the final speed  $v_2$  of the second mass.



x-dir

$$m_1 v_0 = m_2 v_2 \cos \theta$$

$$v_0 = \frac{m_2 v_2 \cos \theta}{m_1} = \frac{0.025 (1.33) \cos 37^\circ}{0.05}$$

$$= 0.531 \frac{\text{m}}{\text{s}}$$

y-dir

$$0 = m_2 v_2 \sin \theta - m_1 v_1$$

$$v_2 = \frac{m_1 v_1}{m_2 \sin \theta}$$

$$= \frac{0.05 \times 0.4 \left( \frac{4}{5} \right)}{0.025 \sin 37^\circ}$$

$$= 1.33 \frac{\text{m}}{\text{s}}$$

(b) Describe/sketch the motion of the center of mass of this system of two objects before and after the collision.

com continues in straight line  
@ const speed.

(c) Is the collision elastic or inelastic? Explain and/or show calculation(s).

$$K_i = \frac{1}{2} m_1 v_0^2 = \frac{1}{2} (0.05 \text{ kg}) (0.531 \frac{\text{m}}{\text{s}})^2 = 7.04 \text{ mJ}$$

$$K_f = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 = \frac{1}{2} (0.05 \text{ kg}) (0.4)^2 + \frac{1}{2} (0.025) (1.33)^2$$

$$= 26 \text{ mJ}$$

super-elastic!  
KE not conserved, but increased!