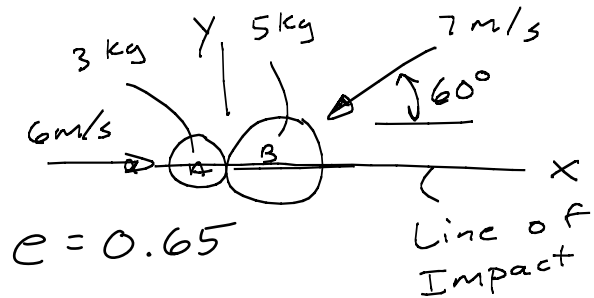


Impact

Problem Statement: Determine the magnitude of the velocities just after impact.



1.) Decide which type of impact is occurring.

Oblique Impact

2.) Apply the conservation of momentum for the system of particles along the line of impact.

$$\begin{aligned} \rightarrow (3 \text{ kg})(6 \text{ m/s}) - (5 \text{ kg})(7 \text{ m/s})(\cos 60^\circ) \\ = (3 \text{ kg})(v_A)_{2x} + (5 \text{ kg})(v_B)_{2x} \end{aligned}$$

3.) Apply the coefficient of restitution equation along the line of impact.

$$\rightarrow 0.65 = \frac{(v_B)_{2x} - (v_A)_{2x}}{(6 \text{ m/s}) - (-7 \text{ m/s})\cos 60^\circ}$$

4.) Solve for the velocity components along the line of impact.

$$\begin{aligned} (v_A)_{2x} &= -3.80 \text{ m/s} \\ (v_B)_{2x} &= 2.378 \text{ m/s} \end{aligned}$$

5.) If an oblique impact, solve for the velocity components along the plane of contact, and then the total velocity.

$$(v_A)_{2y} = (v_A)_{1y} = 0$$

$$\begin{aligned} (v_B)_{2y} &= (v_B)_{1y} = -(7 \text{ m/s})\sin 60^\circ \\ &= -6.062 \text{ m/s} \end{aligned}$$

$$\begin{aligned} \boxed{(v_A)_2 = -3.80 \text{ m/s}} \\ (v_B)_2 = \sqrt{(2.378)^2 + (6.062)^2} = \boxed{6.51 \text{ m/s}} \end{aligned}$$