

# 8.4 Elastic Collisions in One Dimension

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# Elastic Collisions in One Dimension

An elastic collision is one that conserves internal kinetic energy (Conceptual Question)

Internal kinetic energy is the sum of the kinetic energies of the objects in the system

# Equations

- Momentum= $Mv$
- The primes (') indicate values after the collision
- $P=P'$
- $P_1 + P_2 = P'_1 + P'_2$  ( $F_{\text{net}}=0$ )
- $m_1 v_1 + m_2 v_2 = m_1 v'_1 + m_2 v'_2$  ( $F_{\text{net}}=0$ )
- An elastic collision conserves internal kinetic energy, so the sum of kinetic energies before and after the collision are equal
  - $\frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 = \frac{1}{2} m_1 v'_1{}^2 + \frac{1}{2} m_2 v'_2{}^2$  (Two-object elastic collision)

# Textbook Problem

**28.** Two identical objects (such as billiard balls) have a one-dimensional collision in which one is initially motionless. After the collision, the moving object is stationary and the other moves with the same speed as the other originally had. Show that both momentum and kinetic energy are conserved.

# LAB

[https://phet.colorado.edu/sims/collision-lab/collision-lab\\_en.html](https://phet.colorado.edu/sims/collision-lab/collision-lab_en.html)