

# Collision Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/collision-simulator/>

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Learning objectives

- Apply conservation of momentum to collisions.
- Distinguish elastic from inelastic collisions by kinetic energy.
- Predict outcomes for equal and unequal masses.

## Variables to change

- Mass of each object
- Initial velocities
- Elasticity (elastic/inelastic)

## Procedure

1. Set two equal masses moving toward each other at equal speeds in an elastic collision.
2. Make one object much heavier and repeat.
3. Switch to a perfectly inelastic collision (objects stick) and compare.

## Observations

Record velocities before and after, and note total momentum and total kinetic energy each time.

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## Questions

1. Is momentum conserved in every collision here?
2. Is kinetic energy conserved in an inelastic collision?

3. Two equal masses collide elastically head-on at equal speeds. What happens?
4. In a perfectly inelastic collision, what is true of the objects afterward?
5. Write the conservation-of-momentum equation for a two-body collision.

### Answer key (instructors)

- **1.** Yes — total momentum is conserved in all collisions when no external force acts, elastic or inelastic.
- **2.** No. Kinetic energy is conserved only in elastic collisions; inelastic collisions convert some to heat/deformation.
- **3.** They exchange velocities and rebound with equal and opposite speeds.
- **4.** They move together with a common velocity found from total momentum ÷ total mass.
- **5.**  $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$ .

*Momentum is conserved in every isolated collision. Elastic collisions also conserve kinetic energy (objects bounce), while inelastic ones lose kinetic energy to heat and deformation — perfectly inelastic objects stick and move together.*