

Topic 3C: Conservation of Momentum

Skill 27: Conservation of momentum

Momentum (p) is product of an object's mass and velocity $p = mv$

When objects interact in a collision or explosion the combined momentum of the objects before the event must be equal to the combined momentum after

$$p_{\text{before}} = p_{\text{after}} \rightarrow \text{Known as Conservation of momentum}$$

To solve conservation of momentum problems

- Identify the "system" and summarize momentum for each object before & after

	Before		After	
	1	2	1	2
m				
v				
p				
total	=			

This chart can help for any object $p = mv$

3 types of events occur (direction of p or v is given by + or - sign)

- Elastic = Objects remain separate before and after

$$p_{1\text{before}} + p_{2\text{before}} = p_{1\text{after}} + p_{2\text{after}}$$

$$m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2'$$

(you can cross off any object at rest $p=0$)
 v_1' means prime indicates after

- Inelastic = Objects stick together after collision

$$p_{1\text{before}} + p_{2\text{before}} = (p_1 + p_2)_{\text{after}}$$

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v'$$

(cross off any object at rest $p=0$)

- Explosion or Separation = Objects separate after event (often but not always from rest)

$$(m_1 + m_2) v = m_1 v_1' + m_2 v_2'$$

$$\text{If at rest } 0 = m_1 v_1' + m_2 v_2'$$

* Concept typically limited to 2 objects on a single axis in Regents Physics
 - momentum is a vector so vector rules apply to adding in more complex situations