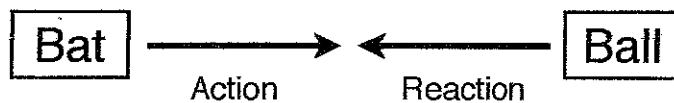


Newton's 3rd Law

- Newton stated 3 laws of motion
 - Newton's 1st Law-Objects tend to resist change in their motion (Inertia)
 - Newton's 2nd Law-The Force of an object is equal to its Mass times its Acceleration ($F=MA$)
 - Newton's 3rd Law-for every force in a certain direction, there is an equal, but opposite force in the opposite direction
- The forces are called action and reaction pairs
 - Examples:
 - When a player hits a baseball, the bat exerts a force on the ball (Action) and the ball exerts a force on the bat in the opposite direction (Reaction)



- If these forces are equal and opposite, why does the ball move?
- Objects will move in action reaction pairs because of **momentum**
 - Momentum describes the size of the motion
 - Momentum (P) can be calculated by multiplying the mass (M) and the velocity (V)
 - Can be written as this formula: $P=MV$
 - The unit for momentum is: $\text{Kg} \times \text{m/s}$
- So how does momentum affect motion?
 - More mass means more momentum; less mass means less momentum
 - Higher velocity means more momentum; lower velocity means less momentum
 - When two objects collide, they transfer their momentum to each other
 - Lets go back to the baseball pitch:
 - Momentum of ball (P) = Mass (0.145Kg) x Velocity (40m/s) $P= 5.8\text{Kg m/s}$
 - Momentum of player (P)= Mass (84kg) x Velocity (21m/s) $P=1,764\text{Kg m/s}$
 - The player's momentum is much higher than the ball's
 - When the bat hits the ball, the momentum is transferred and the ball changes directions
- While the forces of the objects are equal and opposite, the object with the most momentum will stay in place, while the object with less momentum will tend to move