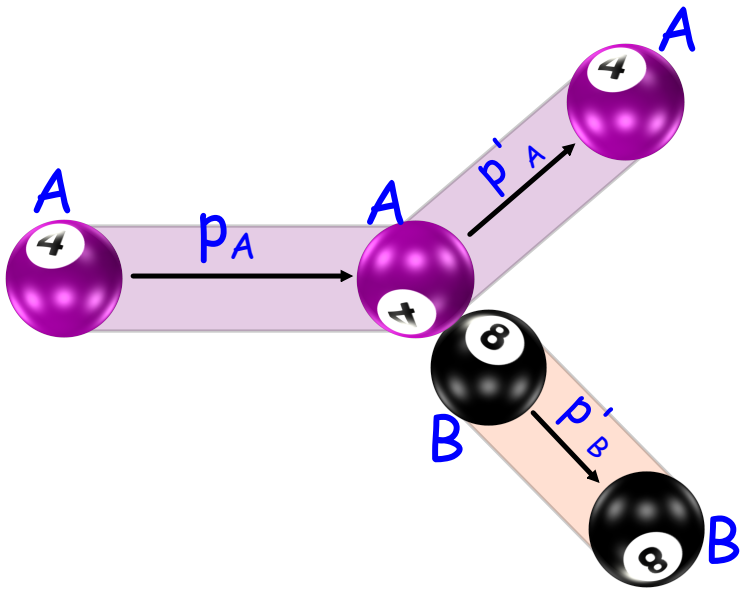
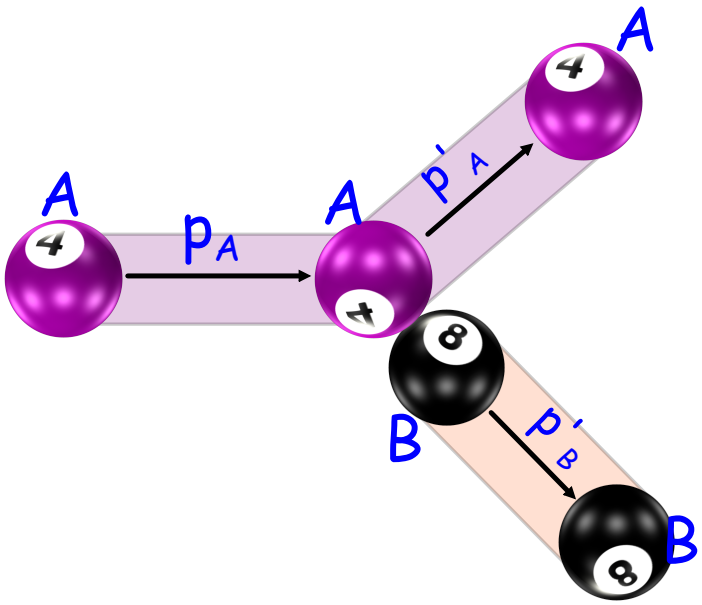
Conservation of Momentum in Two Directions

Conservation of momentum holds true for all isolated, closed systems.



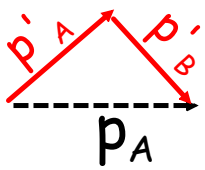
What is the initial momentum of the scenario above?

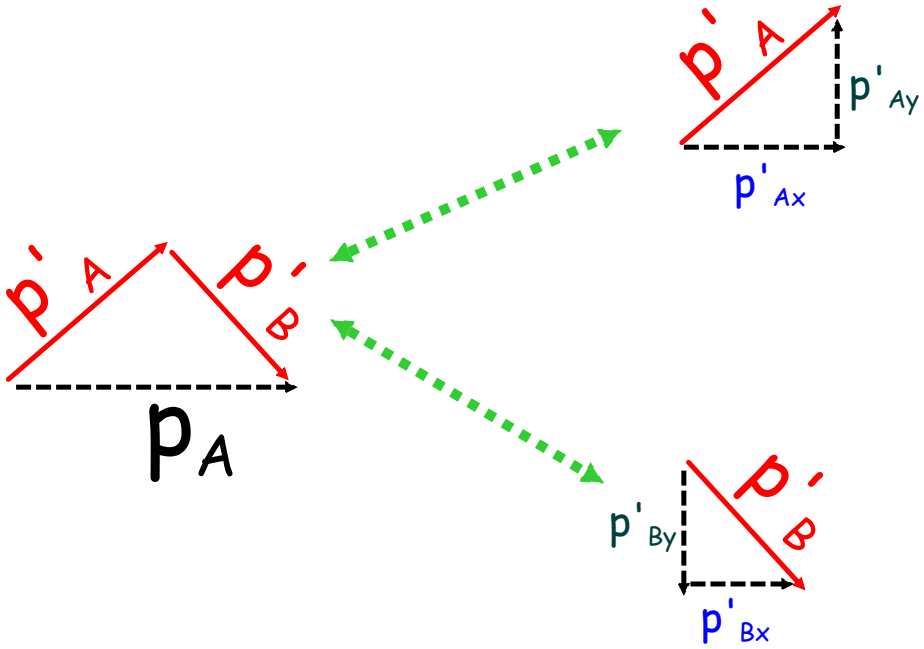


After the collision, the final momentum is represented by p'_A and p'_B

So... $p_A = p'_{Ax} + p'_{Bx}$

If we look at the vector components after the collision....





Because p_A has no vertical component, this means that $p'_{Ay} + p'_{By}$ must equal zero.

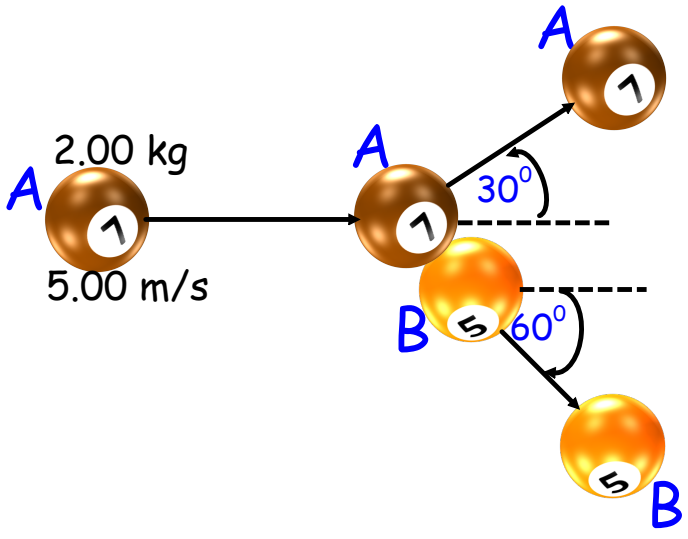
This also implies that the sum of the horizontal components after the collision ($p'_{Ax} + p'_{Bx}$) must equal the entire momentum before the collision (p_A)

Example:

A 2.00 kg ball, A, is moving at a velocity of 5.00 m/s. It collides with a stationary ball, B, also of mass 2.00 kg. After the collision, ball A moves off in a direction 30.0^0 to the left of its original direction. Ball B moves off in a direction 90.0^0 to the right of ball A's final direction.

a) Draw a vector diagram to find the momentum of ball A and ball B after the collision.

b) Find the velocities of the balls after the collision



Try questions 13-15 and 2.1-2.4 on page 191 and page 195 #29 and 30