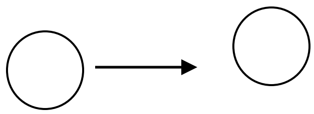
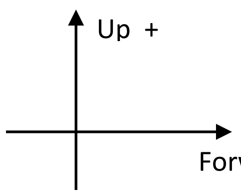
<u>Conservation of Momentum in 2D – text 4.5</u>

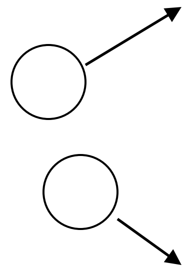
If a curling rock hits another stationary rock head-on, usually the first rock stops and transfers all it's forward momentum to the 2nd rock. But sometimes the thrown rock glances off the stationary rock such that both rocks keep moving, however, neither one in a straight path. They veer off.

before collision.





After collision



However, the original momentum is still conserved. In order to analyze such a situation (in 2 dimensions), one must analyze the components of momentum – the 'x' momentum and the 'y' momentum. In the diagram above, the 'x' momentum would be the forward momentum and the 'y' momentum would be the up/down momentum.

Typically you will be given information about <u>both</u> objects **BEFORE** the collision and information about <u>only one</u> of them **AFTER** the collision. Your task will be to determine the information about the unkown object.

Steps:

1. Always draw a 'before collision' diagram and an 'after collision' diagram.
2. Set your 'x' and 'y' planes and the +ve directions.
3. Pto = Ptf as always, but you will analyze in 'x' plane first. Then you will analyze in 'y' plane.

   Break Humpty Dumpty Apart
4. Break the momentums into components – you will know the angles and you will use trig for this.
5. Solve for the unknown 'x' momentum - usually it's the 'after collision' one. Normally you will be given the mass of the object and it's original velocity. (hence, it's original momentum).
6. Solve for the unknown 'y' momentum - usually it's the 'after collision' one. Normally you will be given the mass of the object and it's original velocity. (hence, it's original momentum).

   Put Humpty Dumpty Together Again
7. Add you 'x' and 'y' momentum vectors together. Use Pythagorean and trig. to determine the momentum and the direction. You know how to do this – it's vector components again!

Organization is the key to success here! It is a tedious process but it works!