Physics 12 Section 7.1
Momentum and Force

1. From Physics 11, linear momentum is defined as the product of mass and velocity.

$$p = mv$$

2. Momentum is a vector quantity (direction is important).

3. Newton's second law (F=ma) was originally stated as: "The rate of change in momentum of a body is equal to the net force applied to it."

$$\Sigma F = \frac{\Delta p}{\Delta t}$$

$$\Sigma F = \frac{mv_2 - mv_1}{\Delta t}$$

$$\Sigma F = \frac{m(v_2 - v_1)}{\Delta t}$$

$$\Sigma F = \frac{m\Delta v}{\Delta t}$$

$$\Sigma F = ma$$

Physics 12 Section 7-2
Conservation of Momentum

1. The total momentum of an isolated system of bodies remains constant. If the system consists of two bodies then:

$$\Delta P_1 + \Delta P_2 = 0$$

$$m_1v_1' - m_1v_1 + m_2v_2' - m_2v_2 = 0$$

$$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$$

The total momentum before an interaction is equal to the total momentum after the interaction.

2. If there were more than two objects then you would have an additional term m_3v_3 and m_3v_3'.

Physics 12 Section 7-3
Impulse

1. If an object receives an impulse (force applied for a certain amount of time) then the object's momentum changes.

$$\Delta p = F \times \Delta t$$

2. The change in momentum of the object is equal to the impulse the object receives.

$$\text{Impulse} = \Delta p = F \times \Delta t$$

3. If the force is not constant then the impulse is the area under a force versus time graph.