

### Answer on Question #44172 – Physics – Mechanics, Kinematics, Dynamics

the physical quantity which is equal to the rate of momentum is impulse (spot the error)

#### Solution:

These concepts are merely an outgrowth of Newton's second law. Newton's second law ( $F_{\text{net}} = m \cdot a$ ) stated that the acceleration of an object is directly proportional to the net force acting upon the object and inversely proportional to the mass of the object. When combined with the definition of acceleration ( $a = \text{change in velocity} / \text{time}$ ), the following equalities result.

$$F = m \cdot a$$
$$F = m \cdot \frac{dv}{dt}$$

If both sides of the above equation are multiplied by the quantity  $dt$ , a new equation results.

$$F \cdot dt = m \cdot dv$$

This equation represents one of two primary principles to be used in the analysis of collisions during this unit. To truly understand the equation, it is important to understand its meaning in words. In words, it could be said that the force times the time equals the mass times the change in velocity. In physics, the quantity Force  $\cdot$  time is known as impulse. And since the quantity  $m \cdot v$  is the momentum, the quantity  $m \cdot dv$  must be the change in momentum. The equation really says that the

$$\mathbf{Impulse = Change in momentum}$$