

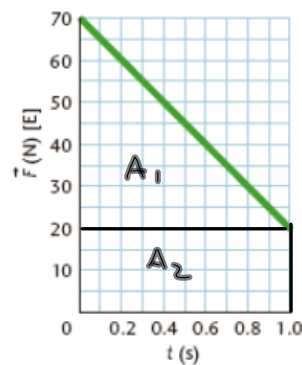
### Section 20: Force-versus-Time Graphs - Calculating the Impulse Applied to an Object from a Graph

In most cases, the force acting on an object during the collision process is a complicated one. It increases as the colliding objects are compressed together and decreases as the objects move away from each other. All this may be on a microscopic level (for hard objects). We will use **average force** when dealing with such interactions. We can still get a value for the impulse if we have a graph of force versus time available to us.

To find **impulse** using  $\vec{F} - t$  graphs, calculate the **area under the graph**.

Example: Calculate the impulse for the time interval shown in each of the following graphs.

A)



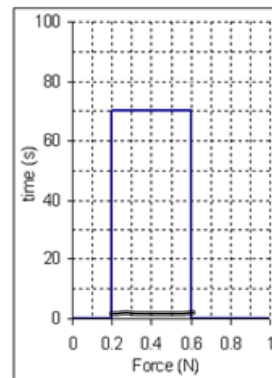
$$A_1 = \frac{1}{2}bh = \frac{1}{2}(1.0s)(50N) = 25Ns$$

$$A_2 = lw = (1.0s)(20N) = 20Ns$$

$$\text{Impulse} = 25Ns + 20Ns$$

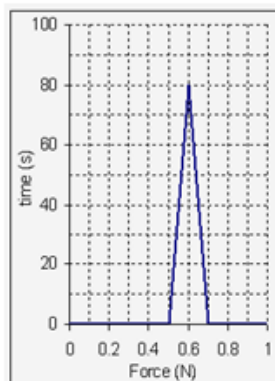
$$\text{Impulse} = 45Ns$$

B)



$$J = A = lw = (0.4N)(70s) = 28Ns$$

C)



$$J = A = \frac{1}{2}bh = \frac{1}{2}(0.2N)(80s) = 8Ns$$