

**We use momentum to give an indication of the impulse something can exert**

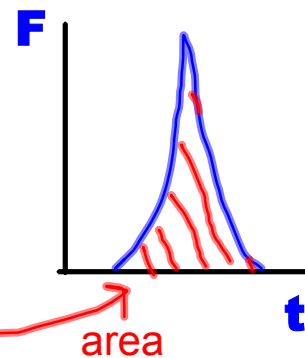
$$\mathbf{p = mv}$$

momentum = mass x velocity



$$p_{\text{van}} = (2000 \text{ kg})(10 \text{ m/s})$$
$$= 20,000 \text{ kgm/s}$$

In a collision...  
it would take -20,000 kgm/s to stop the van.



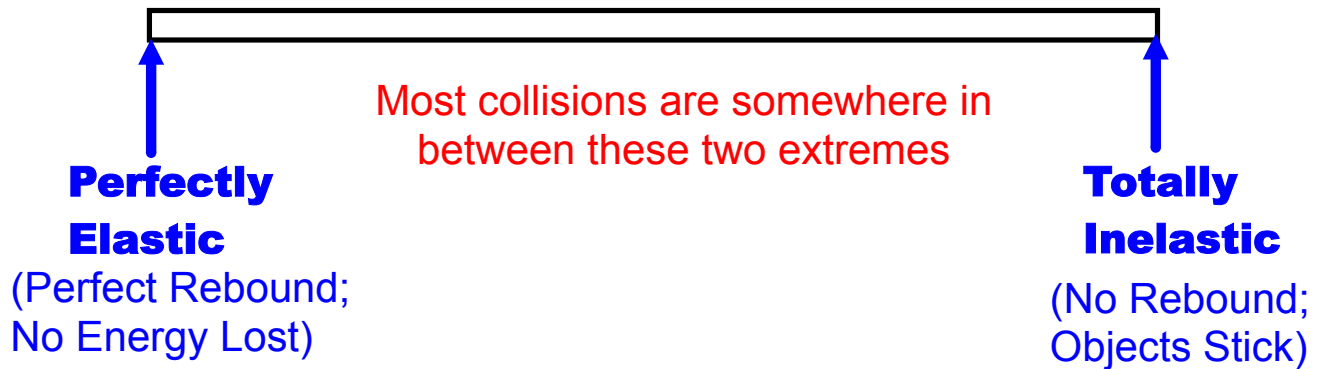
**So instead of worrying about Impulse (force & time), we calculate Momentum - they measure the same thing.**

$$\mathbf{p = mv}$$

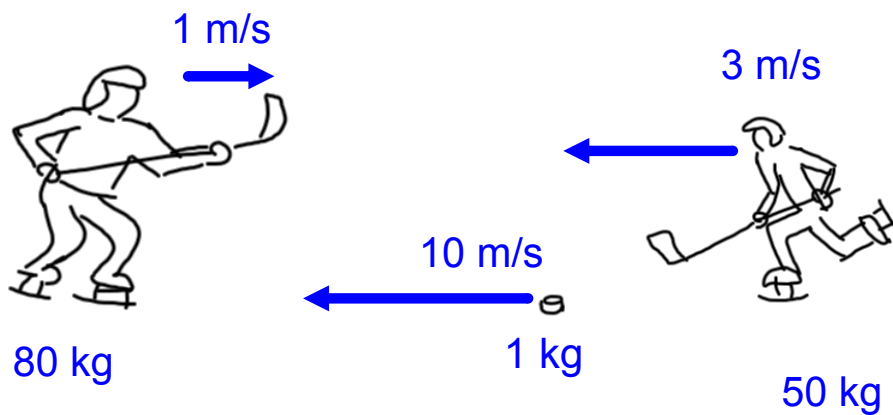
momentum = mass x velocity

$$(\text{kgm/s}) = (\text{kg}) \times (\text{m/s})$$

# Range of Possible Collisions



## Calculating Total Momentum of a System



Find the momentum of each thing,  
then add them up.  
(velocities to the left are negative!)

$$(80 \text{ kg})(1 \text{ m/s}) + (1 \text{ kg})(-10 \text{ m/s}) + (50 \text{ kg})(-3 \text{ m/s})$$

$$(80 \text{ kgm/s}) + (-10 \text{ kgm/s}) + (-150 \text{ kgm/s})$$

$$p_{\text{total}} = -80 \text{ kgm/s}$$