

Momentum Notes

Momentum - measure of how hard an object is to stop.

- depends on velocity and mass
- vector - symbol = $\vec{p}$ - units = $\text{kg} \cdot \text{m/s}$
petere $\text{or } \text{N} \cdot \text{s}$

$$\vec{p} = m \cdot \vec{v}$$

A 0.02kg pencil is moving at +25m/s, what is its momentum?

$$m = 0.02 \text{ kg} \quad \vec{p} = m\vec{v} = 0.02(25) \\ \vec{v} = +25 \text{ m/s} \quad = +0.5 \text{ kg m/s}$$

The pencil would have the same momentum as a 0.14 kg baseball travelling at ...

$$\vec{v} = \frac{\vec{p}}{m_{\text{BB}}} = \frac{+0.5}{0.14} = +3.57 \text{ m/s}$$

Impulse - the change in an object's momentum.

- depends on force and time
- vector - symbol = $\vec{J}$ - units $\text{kg} \cdot \text{m/s}$ or $\text{N} \cdot \text{s}$

$$\vec{J} = \vec{F} \cdot \Delta t = \Delta \vec{p}$$

The momentum an object has
= the force needed to stop it in one second.

Examples of Impulse:

By increasing $\Delta t \Rightarrow$ decrease $\vec{F}$ for a given $\vec{J}$.

1. Bending your knees when you land a jump.
2. "Riding a punch" when you pull your head back as you get punched.
3. Airbags exert a force for a longer amount of time.
4. Bungee cords slow you down gradually, because they stretch.

If the time the force acts increases,
the momentum also increases.

1. When you hit a sports ball with
a sport stick, you follow through
to increase the impulse.

2. Bend your knees before you
jump.

3.