Chapter 6

Momentum and Collisions

Momentum and Impulse

6.1

Objectives

- **Compare** the momentum of different moving objects.

- **Compare** the momentum of the same object moving with different velocities.

- **Identify** examples of change in the momentum of an object.

- **Describe** changes in momentum in terms of force and time.

Linear Momentum

- **Momentum** is defined as mass times velocity
- I remember it as Pa-mentum

$$p = mv$$
- Momentum is usually measured in kg*m/s

Question

Is momentum a vector quantity?

Explain

Yes, it needs a direction!

$p = mv$

Questions

What happens to momentum when you double the speed of an object?

What happened to speed of an object when the momentum was halved?

Which has a higher momentum, a moving train or a moving golf ball?

Tricky, depends on the….

Make sure to watch the Momentum Math Help Video

Change in momentum

- How do you think you would change the momentum of an object?
    - Add an external force (push or pull)
- The more momentum an object has, the more force it will take! (bowling ball vs. kick ball)

- Imagine playing kickball with a bowling ball!

Impulse

- A change in momentum requires a force…
    – and an amount of time this force is applied
- This leads us to impulse
- **Impulse** is the product of the applied force over the time the force acts on the object
- The **impulse-momentum theorem** states that when a net force is applied to an object over a certain time interval, the force will cause a change in the object's momentum

Impulse

- Equation(s)

$$\Delta p = Ft$$
OR
$$Ft = mv_f - mv_i$$

- How could a small force give you the same momentum changes as a larger force?
    – (Or can it??)

Increase the time!

"Real" Life

- Stopping distances
    – Ever wonder why they say you should stay 3 car length behind the car in front of you…
    – Its for your impulse!
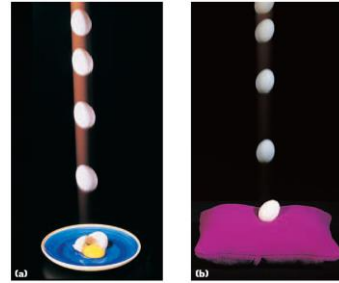
- The faster you go, the longer it takes to stop!

Don't forget to watch the Impulse Math Help Video!

AND the Stopping Distance Math Help Video

Impulse-momentum theorem

Assignment

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- Work Day tomorrow
  - SP – A
  - SP – B
  - SP – C