Impulse and Momentum

Lesson #1

A review of Grade 11 Impulse and Momentum

- In Dynamics and Kinematics we only looked at the motion of a single object, what happens when we consider two objects?
- In Linear Momentum we will consider a system of two or more objects
- Linear Momentum (p) is defined as the product of an objects mass and its velocity.

  $p = m.v$ since v is a vector, p is thus also a vector.
- The direction of momentum is thus also the direction of the velocity.

What is momentum and Where does it come from?

Newtons First Law says…

Where no net force acts Velocity remains Constant.

Thus a net force is required to change the momentum of an object

Consider two objects, one heavy and one light, both have the same velocity.

Which one will require more stopping force?

$F = ma$

where $a = \frac{\Delta v}{\Delta t}$

so $F = \frac{mv}{\Delta t}$

and $Ft = mv$

Momentum (P) $= m.v$

Impulse $= F.t$

Impulse

An equivalent quantity to Momentum

Impulse = F x t [N.s]

Question:

How are air bags making good use of the concept of Impulse?

We can use the impulse equation to find momentum and vice versa

Momentum is always conserved

$F_1 = -F_2$ (Newton's 3rd law)

Therefore $F_1 t = -F_2 t$

but $Ft = P$

Thus $P1 = -P2$

or **$P1 + P2 = 0$**

In an isolated system… ie where there are no net forces acting.

$P = m \times v$ [Kg.m/s]

Because P is conserved:

***p* before = *p* after**

U try

- Turn To Giancoli page 187
- Do Q # 1,3,5,6,and 7

Answers:

1) 0.242 kg m/s

3) 0.675 m/s

5) 12 m/s

6) 4.82 m/s

7) 5.1×10^2 m/s