Momentum & 1D conservation

Small Group Warm up:

A frictionless disc of mass 500 g is moving in a straight line across an air table at a speed of 2.4 m/s when it bumps into an elastic band stretched between 2 fixed posts. If the elastic band exerts an average opposing force of 1.4 N on the disc for 1.5 s, what will the final velocity be?

New Idea:
It turns out that not only is energy conserved, but also momentum! Check out Richard Gariott on the Internal Space Station as he demonstrates this law in microgravity. (2009)

https://www.youtube.com/watch?v=4IYDb6K5UF8

This means that the total momentum before a collision equals the total momentum after the collision.

Mathematically: $p_{To} = p_{Tf}$ where: $p_{To} \rightarrow$ stands for total momentum **before**

$p_{Tf} \rightarrow$ stands for total momentum **after**

Remember: momentum is a vector. So solve problems, you will need to set the +/- direction.

Whiteboard practice:

#1. Rex (m=86 kg) and Tex (92 kg) board the bumper cars at the local carnival. Rex is moving at a full speed of 2.05 m/s when he rear-ends Tex who is at rest in his path. Tex and his 125-kg car lunge forward at 1.40 m/s. Determine the post-collision speed of Rex and his 125-kg car.
Start with a labelled sketch and use GRASP. **Answer: 0.61 m/s [fwd]**

Note: This question is from www.physicsclassroom.com Click here for more momentum questions.

#2. A loaded railway car of mass 6000 kg is rolling to the right at 2.0 m/s when it collides and couples with an empty freight car of mass 3000 kg, rolling to the left on the same track at 3.0 m/s. What is the speed and direction (velocity!) of the pair after the collision?

Answer:

Need extra help?
Hewitt Drew-It video - Conservation of Momentum
https://www.youtube.com/watch?v=1-s8NZ8xKW0