

Ball Blasters

When balls collide its all about the momentum.

WHAT TO DO

Slide a pencil through the holes at the top of the tube, then place a golf ball on top of the pencil and a ping pong ball on top of the golf ball. Quickly pull out the pencil and watch what happens.

WHAT'S HAPPENING?

Momentum is defined as the mass of an object times its velocity ($m \cdot v$), so a ball that is moving has some momentum, but a stationary ball does not (since its velocity is zero). A ball with higher velocity has more momentum, and for a given velocity a ball with more mass also has more momentum than one with less mass. That's the situation we have in this experiment. The golf ball has a much higher mass than the ping pong ball. When you drop both at the same time gravity will accelerate each of them downwards at the same velocity, but the golf ball will have much more momentum. Since the golf ball is on the bottom it will hit the base of the tube first and bounce upwards and immediately collide with the ping pong ball, which is still moving downward. When they collide the golf ball, which has a lot of momentum, transfers some to the ping pong ball, but because the mass of the ping pong ball is so much smaller this gives it a very high velocity- much higher than the velocity of the golf ball even though the golf ball still has much more momentum.