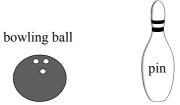
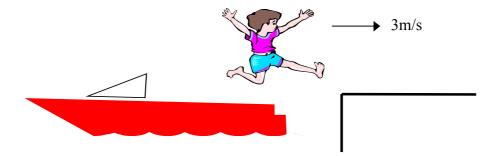
Collisions and explosions.

What is the formula for Momentum?	
What is the formula for KE?	
Are they similar?	

1. During a bowling competition, a player throws a 5kg bowling ball along the lane with a velocity of 5m/s. The ball hits a 0.5kg stationary pin. After impact, the ball continues to move with a velocity of 4m/s.



- a) What is the momentum of the ball before the collision?
- b) What is the momentum of the pin before the collision?
- c) Find the total momentum before the collision.
- d) Calculate the velocity of the pin after the collision.
- 2. A dart of mass 75g (0.075kg) is tossed with a velocity of 20m/s and sticks to a stationary suspended dartboard of mass 7.5kg.
- a) Find the total momentum before the collision.
- b) What is the total momentum after the collision.
- c) Calculate the combined velocity of the dart and dartboard just after the collision.
- 3. A 50kg boy is sitting quietly in a boat. He suddenly jumps out of the rowing boat of mass 300kg onto the bank with a horizontal velocity of 3m/s. With what velocity does the boat begin to move backwards?



4. A cart of mass 1 kg moving at a speed of 0.5 m/s collides elastically with a cart of mass 0.5 kg at rest. The speed of the second mass after the collision is 0.667 m/s. What is the speed of the 1 kg mass after the collision? Compare the total momentum and total kinetic energy before and after the collision.

5. A 10 gram bullet is shot from a 500 gram gun at a speed of 230 m/s. Find the speed and kinetic energy of the bullet and the gun. Assume that the momentum and energy of the escaping gasses are negligible.

6. Two carts with masses of 4 kg and 3 kg move toward each other on a frictionless track with speeds of 5.0 m/s and 4.0 m/s respectively. The carts stick together after the colliding head on. Find the final speed of the carts.

7. An average player hitting a forehand shot on a ball approaching at 30 m/s can deliver an impulse of 5.13 kg m/s on a tennis ball of mass 57 grams. With what speed would the ball leave the racket in this situation?