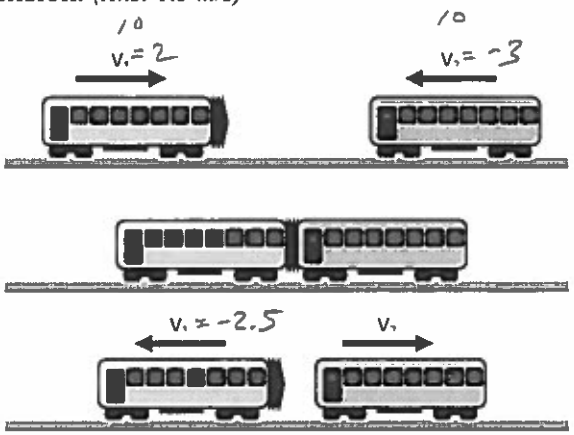
I, Key, love elastic collisions

AP Physics 1: 6.2 Inelastic & Elastic Collisions

1. Two train cars of identical mass (m = 10.0 kg) collide and move off as shown. The left car was initially traveling at 2.0 m/s right and the right car was initially traveling at a velocity of 3.0 m/s left. After the collision, the left car is traveling at a velocity of 2.5 m/s to the left.
   a) Calculate the velocity of the cart on the right after the collision. *(Ans: 1.5 m/s)*

$10(2)+10(-3)=10(-2.5)+10v_f$

$v_f = 1.5\ m/s$



   b) Calculate the total kinetic energy before the collision. *(Ans: 65 J)*

$\frac{10(2)^2}{2} + \frac{10(3)^2}{2} = 65J$

   c) Calculate the total kinetic energy after the collision. *(Ans: 42.5 J)*

$\frac{10(2.5)^2}{2} + \frac{10(1.5)^2}{2} = 42.5J$

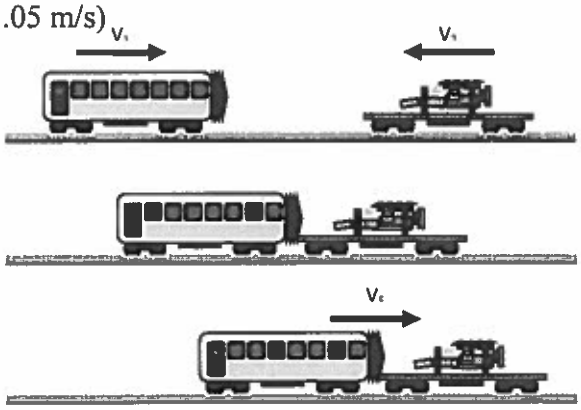
   d) Is the collision elastic or inelastic? Justify.

inelastic before KE was not conserved.

2. A Passenger car (m = 10.0 kg) and a flat car (m = 7.5 kg) collide and move off as shown. The left car was initially traveling at 3.5 m/s right and the right car was initially traveling at a velocity of 2.2 m/s left.
   a) Calculate the velocity of the carts after the collision. (1.05 m/s)

$10(3.5)+7.5(-2.2)=(10+7.5)v_f$

$v_f = 1.05\ m/s$



   b) Is the collisions elastic or inelastic? Justify.

$KE_{before} = \frac{10(3.5)^2}{2} + \frac{7.5(2.2)^2}{2} = 79.4\ J$

$KE_{After} = \frac{17.5(1.05)^2}{2} = 9.65\ J$ inelastic because KE is not conserved.

3. Based off of questions 2 & 3, what type of collision seems to conserve more energy, when objects bounce off each each other or when objects stick together?

when they bounce.

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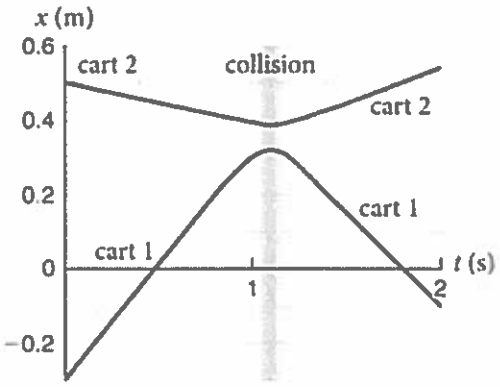
4. Write most likely elastic or inelastic next to the pictures of each collision.
   a. Two cars collide into each other and stick together as they glide to a stop.

inelastic

   b. Two billiard balls collide while playing pool.

elastic

5. To the right is a graph of two carts that collide in a wreck.



   a. Did the two carts collide and stick together or bounce off each other in this example? Justify.

bounce since one cart has a positive velocity (slope) and the other is negative.

   b. Calculate the velocity of cart 2 before & after the collision. *(Ans: Before: - 0.1 m/s After: .166 m/s)*

slope $\frac{\text{rise}}{\text{run}}$

Before $\frac{-.1}{1} = -.1\ m/s$

After $\frac{.1}{.6} = .166\ m/s$

   c. Calculate the velocity of cart 1 before & after the collision. *(Ans: Before: .6 m/s After: -0.5 m/s)*

slope

Before $\frac{.6}{1} = .6\ m/s$

After $\frac{-.4}{.8} = -.5\ m/s$

   d. If Car 1 has a mass of 50 kg, what is the mass of Car B? *(Ans: 206.7 kg)*

$$50(.6) + m(-.1) = 50(-.5) + m(.166)$$
$$30 - .1m = -25 + .166m$$
$$55 = .266m$$
$$m = 206.7\ kg$$

   e. Was the collision elastic or inelastic? Justify.

Before

$$\frac{50(.6)^2}{2} + \frac{206.7(-.1)^2}{2} = 10.03\ J$$

After

$$\frac{50(-.5)^2}{2} + \frac{206.7(.166)^2}{2} = 9.09\ J$$

No because KE is not conserved.