Momentum Practice Problems

This assignment is on your honor. Do the problems, check your answers and give yourself a score at the top of this page. Each problem is worth 1 point. The assignment is out of 16 total points.

Name: _____

1> Calculate the momentum of a 1200kg car with a velocity of 25m/s.

2. What is the momentum of a child and wagon if the total mass of the child and wagon is 22kg and the velocity is 1.5m/s?

3. The parking brake on a 1200kg automobile has broken, and the vehicle has reached a momentum of 7800kg.m/s. What is the velocity of the vehicle?

4. A toy dart gun generates a dart with .140kg.m/s momentum and a velocity of 4m/s. What is the mass of the dart in grams? (hint: figure kg, then convert answer to grams)

5. A bowling ball of 35.2kg, generates 218 kg.m/s units of momentum. What is the velocity of the bowling ball?

6. A school bus traveling at 40 km/hr. (11.1m/s) has a momentum of 152625 kg.m/s. What is the mass of the bus?

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Answers:

1) p = mv = 1200 X 25 = 30,000kg.m/s
2) p = mv = 22 X 1.5 = 33kg.m/s
3) V = p/m = 7800/1200 = 6.5m/s
4) M = p/v = .140/4 = .035kg conversion: .035 X 1000 = 35grams
5) V = p/m = 218/35.2 = 6.2m/s
6) M = p/v = 152625/11.1 = 13,750kg

Conservation of Momentum Practice Problems

1. Two grocery carts collide, a full one with a mass of 35 kg moving East at 2 m/s and an empty one with a mass of 10 kg moving West at 3 m/s. After the collision the full cart is moving East at 0.75 m/s. What is the velocity of the empty cart?

2. Two cans of **SPAM** with identical masses collide. Before the collision, the hickory-smoke flavor is moving to the left at 4 m/s, while the hot-and-spicy flavor is moving to the right at 2 m/s. After the collision, the hickory-smoke is moving to the left at 1.2 m/s. What is the velocity of the hot-and-spicy? Is this collision elastic?

3. A North-going Zak has a mass of 50 kg and is traveling at 4 m/s. A South-going Zak has a mass of 40 kg and is traveling at 5 m/s. If they have a perfectly inelastic collision, what is their final velocity? What are the initial and final total kinetic energies?

4. Two cars have a 'rear end' collision. A 1200 kg Honda moving at 20 m/s strikes a 1000 kg Ford moving at 15 m/s. Their bumpers become locked and they continue to move as one mass. What is their final velocity?

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5. Two football players have a head-on collision and grab onto each other's uniforms. The 80 kg Pennridge Ram was moving at 3 m/s, while the 70 kg Souderton player was moving in the opposite direction at 2.5 m/s. What is their final velocity after impact?

6. Two barges full of salted toad guts have a collision. The red barge has a mass of 150 000 kg and is traveling Northwest at 0.25 m/s. The blue barge has a mass of 100 000 kg and is traveling Southeast at 0.1 m/s. After the collision the blue barge has a velocity of 0.32 m/s to the Northwest. What is the final velocity of the red barge? Is this collision elastic?

7. A 15 kg dog jumps out of a 40 kg canoe. If the dog's velocity is 1.2 m/s, what is the velocity of the canoe?

8. An 800 kg cannon mounted on wheels fires a 10 kg cannonball at 80 m/s. At what velocity does the cannon recoil? What are the final kinetic energies of each?

9. Tarzan has a mass of 80 kg and is about to be attacked by a gang of Amazon warriors. Jane has a mass of 60 kg and swings on a vine to come to his rescue, starting at 2 m/s and 5 m above the ground. What is her velocity when she reaches Tarzan a ground level? What is their velocity after Jane grabs Tarzan? (Hint: This would be a perfectly inelastic collision.) Will they be able to swing to safety on a tree branch that is 1.7 m above the ground?

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10. What if the above scenario was repeated but with Tarzan saving Jane from a gang of paparazzi?

Answers:

1) 1.375 m/s
2) -0.8 m/s; no, KE_i = 10 J/kg, KE_f = 1.04 J/kg
3) 0 m/s; 900 J, 0 J
4) 17.73 m/s
5) 0.433 m/s
6) -0.030 m/s; yes, KE_f = KE_i = 5188 J
7) 0.45 m/s
8) 1 m/s; 400 J, 32 000 J
9) 10.10 m/s; 4.329 m/s; no, y = 0.9561 m
10) 10.10 m/s; 5.771 m/s; almost! y = 1.699 m