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AP Physics 1 Collisions Practice

1. A 3.00 kg mud ball has a perfectly inelastic collision with a second mud ball that is initially at rest. The composite system moves with a speed equal to one-third the original speed of the 3.00 kg mud ball. What is the mass of the second mud ball? ***6.00 kg***
2. A 15.0 g toy car moving to the right at 20.0 cm/s has an elastic head-on collision with a 20.0 g toy car moving in the opposite direction at 30.0 cm/s. After colliding, the 15.0 g car moves with a velocity of 37.1 cm/s to the left. Find the velocity of the 20.0 g car after the collision. ***12.8 cm/s to the right***
3. An 82-kg male and a 48-kg female pair figure skating team are gliding across the ice at 7.4 m/s, preparing for a throw jump maneuver. The male skater tosses the female skater forward with a speed of 8.6 m/s. Determine the speed of the male skater immediately after the throw. ***6.7 m/s***
4. A 70.9-kg boy and a 43.2-kg girl, both wearing skates face each other at rest on a skating rink. The boy pushes the girl, sending her eastward with a speed of 4.64 m/s. Neglecting friction, determine the subsequent velocity of the boy. ***2.83 m/s west***
5. A 1550 kg car moving south at 10.0 m/s collides with a 2250 kg car moving north. The cars stick together and move as a unit after the collision at a velocity of 5.22 m/s to the north. Find the velocity of the 2250 kg car before the collision. ***15.7 m/s north***
6. Anna Litical and Noah Formula are doing a cart and brick lab. They drop a brick on a 2.6 kg cart moving at 28.2 cm/s. After the collision, the dropped brick and cart are moving together with a velocity of 15.7 cm/s. Determine the mass of the dropped brick. ***2.1 kg***
7. A 75 kg student stands in the middle of a frozen pond having a radius of 5.0 m. He is unable to get to the other side because of a lack of friction between his shoes and the ice. To overcome this difficulty, he throws his 2.6 kg physics book horizontally toward the north shore at a speed of 5.0 m/s. How long does it take him to reach the south shore? ***29 s***
8. 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. ***0.61 m/s***
9. A 200 g arrow moving horizontally collides inelastically with a 500 g apple, initially at rest on top of a 1.2 m tall post. If the arrow and apple move together a horizontal distance of 2.6 m from the base of the post as it falls, what is the initial velocity of the arrow before it strikes the apple? ***18.4 m/s***
10. A 125 g arrow moving horizontally at a speed of 12 m/s collides inelastically with a 375 g pendulum bob initially at rest. What will be the peak height of the arrow and pendulum after the collision? ***0.46 m***