A rubber ball and a lump of putty have equal mass. They are thrown with equal speed against a wall. The ball bounces back with nearly the same speed with which it hit. The putty sticks to the wall. Which object experiences the greater momentum change?

A) The ball
B) The putty
C) Both experience the same momentum change
D) Cannot be determined from the information given

A person attempts to knock down a large wooden bowling pin by throwing a ball at it. The person has two balls of equal size and mass, one made of rubber and the other of putty. The rubber ball bounces back, while the ball of putty sticks to the pin. Which ball is most likely to topple the bowling pin?

A) the rubber ball
B) the ball of putty
C) makes no difference
D) need more information

Suppose a ping-pong ball and a bowling ball are rolling toward you. Both have the same momentum, and you exert the same force to stop each. How do the time intervals to stop them compare?

A) It takes less time to stop the ping-pong ball.

B) Both take the same time.

C) It takes more time to stop the ping-pong ball.

Consider two carts, of masses m and $2m$, at rest on an air track. If you push first one cart for 3 s and then the other for the same length of time, exerting equal force on each, the momentum of the light cart is

A) four times

B) twice

C) equal to

D) one-half

E) one-quarter

the momentum of the heavy cart.

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Consider two carts, of masses m and $2m$, at rest on an air track. If you push first one cart for 3 s and then the other for the same length of time, exerting equal force on each, the kinetic energy of the light cart is

A) larger than
B) equal to
C) smaller than

the kinetic energy of the heavy cart.

A 65 g tennis ball moving to the right with a speed of 15 m/s is struck by a tennis racket, causing it to move to the left with a speed of 15 m/s. If the ball remains in contact with the racquet for 0.02 s, what is the magnitude of the force experienced by the ball?

A) zero
B) 97.5 N
C) 163 N
D) 1.63×10^5 N
E) 9.8×10^4 N

A small car meshes with a large truck in a head-on collision. Which of the following statements concerning the magnitude of the collision force is correct?

A) The truck experiences the greater average force.
B) The small car experiences the greater average force.
C) The small car and the truck experience the same average force.
D) It is impossible to tell since the masses and velocities are not given.

A compact car and a large truck collide head on and stick together. Which undergoes the larger momentum change?

A) car
B) truck
C) the momentum change is the same for both
D) you can't tell without knowing the final velocity and combined mass.

A compact car and a large truck collide head on and stick together. Which undergoes the larger acceleration during the collision?

A) car

B) truck

C)both experience the same acceleration

D) you can't tell without knowing the final velocity and combined mass.

Suppose the entire population of the world gathered together at one spot and everyone jumps up at the same time. While all the people are in the air, does the earth gain momentum in the opposite direction?

A) No; the inertial mass of the earth is so large that the planet's change in motion is imperceptible.

B) Yes; because of its much larger inertial mass, however, the change in momentum of the earth is much less than that of all the jumping people.

C) Yes; the earth recoils, like a rifle firing a bullet, with a change in momentum equal and opposite to that of the people

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Suppose the entire population of the world gathered together at one spot and everyone jumps up at the same time. When the 5 billion people land back on the ground, the earth's momentum is

A) the same as what is was before the people jumped.

B) different from what is was before the people jumped.

A 3.0 kg cart, moving to the right with a speed of 1.0 m/s, has a head on collision with a 5.0 kg cart that is initially moving to the left with a speed of 2 m/s. After the collision, the 3.0 kg cart is moving to the left with a speed of 1 m/s. What is the final velocity of the 5.0 kg cart?

A) zero
B) 0.8 m/s to the right
C) 0.8 m/s to the left
D) 2.0 m/s to the right
E) 2.0 m/s to the left

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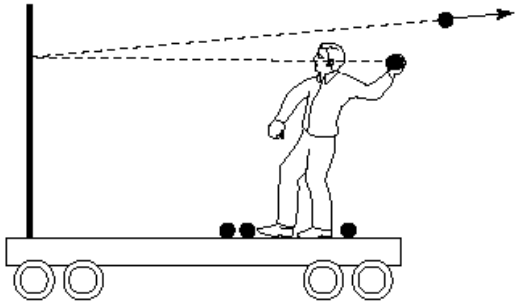
Suppose you are on a cart initially at rest on a track with no friction. You throw balls at a partition that is rigidly mounted on the cart. If the balls bounce straight back as shown, is the cart put in motion?



A) Yes, it moves to the right.
B) Yes, it moves to the left.
C) No, it remains in place.

A 50 g lump of clay moving horizontally at 12 m/s strikes *and sticks to* a stationary 100 g cart which can move on a frictionless air track. Determine the speed of the cart and the clay after the collision.

A) 2 m/s
B) 4 m/s
C) 6 m/s
D) 8 m/s
E) 12 m/s

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A 1000 kg car traveling east at 20 m/s collides with a 1500 kg car traveling west at 10 m/s. The cars stick together after the collision. What is their common velocity after the collision.

A) 1 m/s, west
B) 2 m/s, east
C) 4 m/s, east
D) 6 m/s, west
E) 16 m/s, east

While driving on a one way street you notice an identical car coming at you at the same speed as you are going. You can either hit the car head on or swerve and hit a massive concrete wall, also head on. In the split second before impact you decide to

A) hit the other car.
B) hit the wall.
C) hit either one, it makes no difference.
D) consult your lecture notes.

Tightrope walkers walk with a long flexible rod in order to

A) increase their total weight.
B) allow both hands to hold onto something.
C) lower their center of mass.
D) move faster along the rope.
E) lower their potential energy.

A plane, flying horizontally, releases a bomb, which explodes before hitting the ground. Neglecting air resistance, the center of mass of the bomb fragments, just after the explosion

A) is zero
B) moves horizontally
C) moves vertically
D) moves along a parabolic path
E) not enough information to determine the path