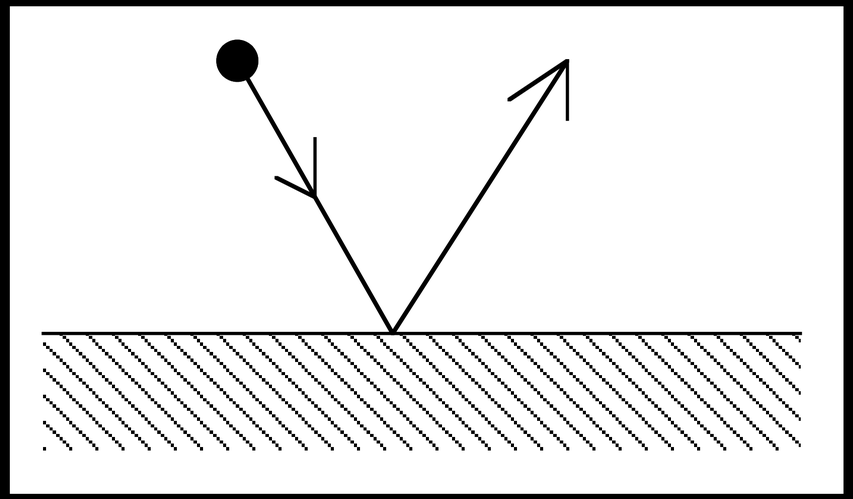
A ball bounces off the floor as shown. The direction of the impulse on the ball (Δp) is:



A) Straight up
B) Straight down
C) to the left
D) to the right
E) None of the above

Consider these situations:
(i) a ball moving at speed v is brought to rest;
(ii) the same ball is projected from rest so that it moves at speed v;
(iii) the same ball moving at speed v is brought to rest and then projected backward to its original speed.

In which case(s) does the ball undergo the largest change in momentum?

A) i
B) ii
C) iii
D) both i and ii
E) All are the same

A car is sitting on the surface of the Earth and both the car and the Earth are at rest. (Pretend the Earth is not rotating or revolving around the Sun.) The car accelerates to a final velocity.

After the car reaches its final velocity, the magnitude of the Earth's momentum is _____ the magnitude of the car's momentum.

A) more than
B) the same as
C) less than
D) Cannot answer the question because the answer depends on the interaction between the Earth and the car.

Suppose rain falls vertically into an open cart rolling along a straight horizontal track with negligible friction. As a result of the accumulating water, the speed of the cart:

A) increases
B) does not change
C) decreases
D) Not enough information

Consider two carts, of masses m and 2m, at rest on an air track. If you push each car for 3s, exerting equal force on each, the momentum of the light cart after the push is . . .

Hint: $F_{net} = ma = \Delta p/\Delta t$

A) 4 times B) 2 times C)equal to

D) 1/2 E) 1/4

. . . the momentum of the heavy cart

In this situation, the kinetic energy of the light cart after the push is . . .

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

. . the kinetic energy of the heavy cart.

Two people on roller skates throw a ball back and forth. After a couple of throws, when the first thrower once again is holding the ball, they are (ignore friction):

A) standing still, where they were initially.
B) standing still, farther away from each other.
C) standing still, closer together than initially.
D) moving away from each other.
E) moving toward each other.

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 vehicles.
D) Can't tell without knowing the initial velocities.

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

(*Hint: Remember that F=ma)*

A: car
B: truck
C: Both experience the same acceleration.
D: Can't tell without knowing the initial velocities.

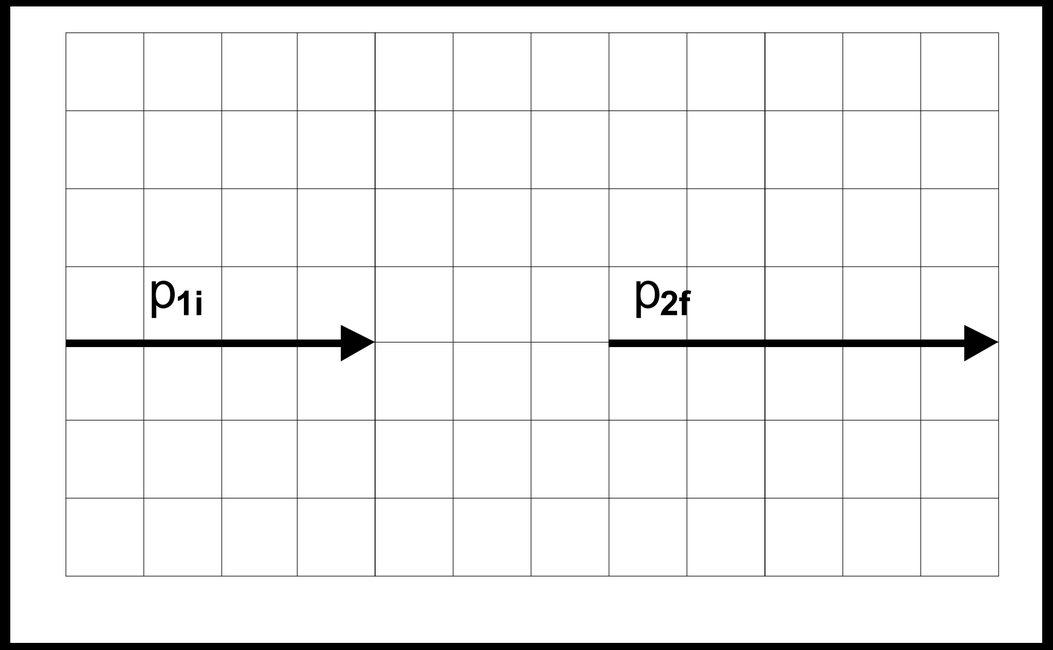
You are in a dodge ball game and get hit by a ball that has a given momentum. Given that the momentum is fixed, would you rather that:

A) the ball is low mass
B) the ball is high mass
C) It doesn't matter

Hint: Energy transfer *hurts*.

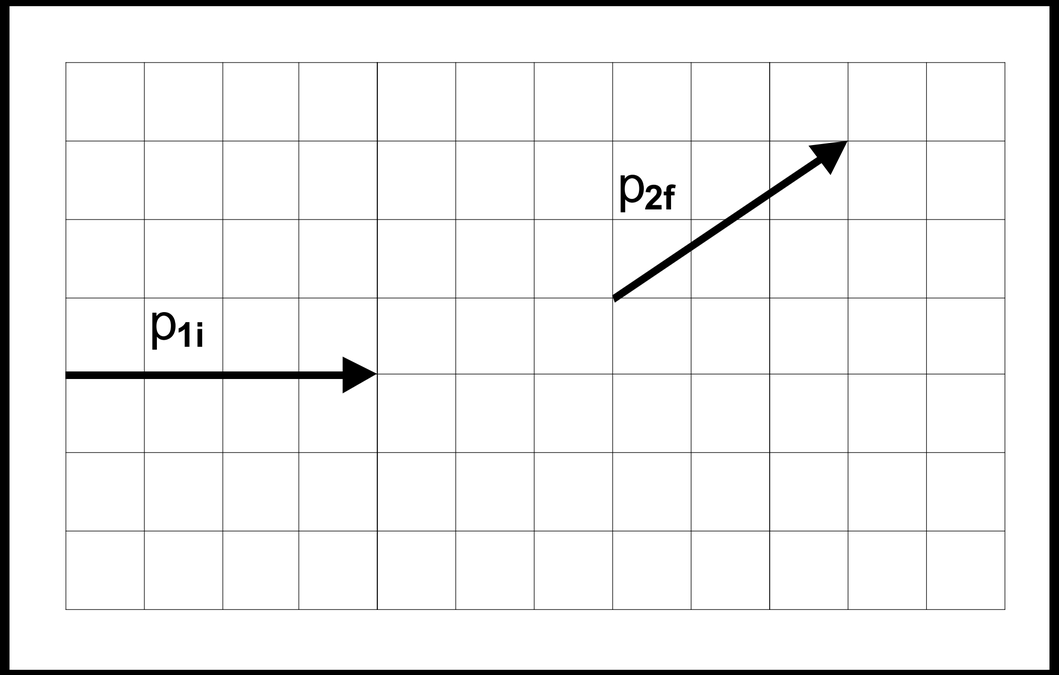
Ball 1 strikes stationary Ball 2 in a 1D elastic collision. The ***initial*** momentum of ball 1, p_{1i}, and the ***final*** momentum of Ball 2, p_{2f} are shown on the graph (4 and 5 units, respectively)

What is the magnitude of the x-component of p_{1f}?



A) 0
B) 1
C) 2
D) 3
E) none of these

Ball 1 strikes Ball 2 in a 2D elastic collision. The ***initial*** momentum of Ball 1, p_{1i}, (4,0) and the ***final*** momentum of Ball 2, p_{2f} (3,2) are shown on the graph.



What is the x-component of p_{1f}?

A) 0
B) 1
C)2
D) 3
E)none of these

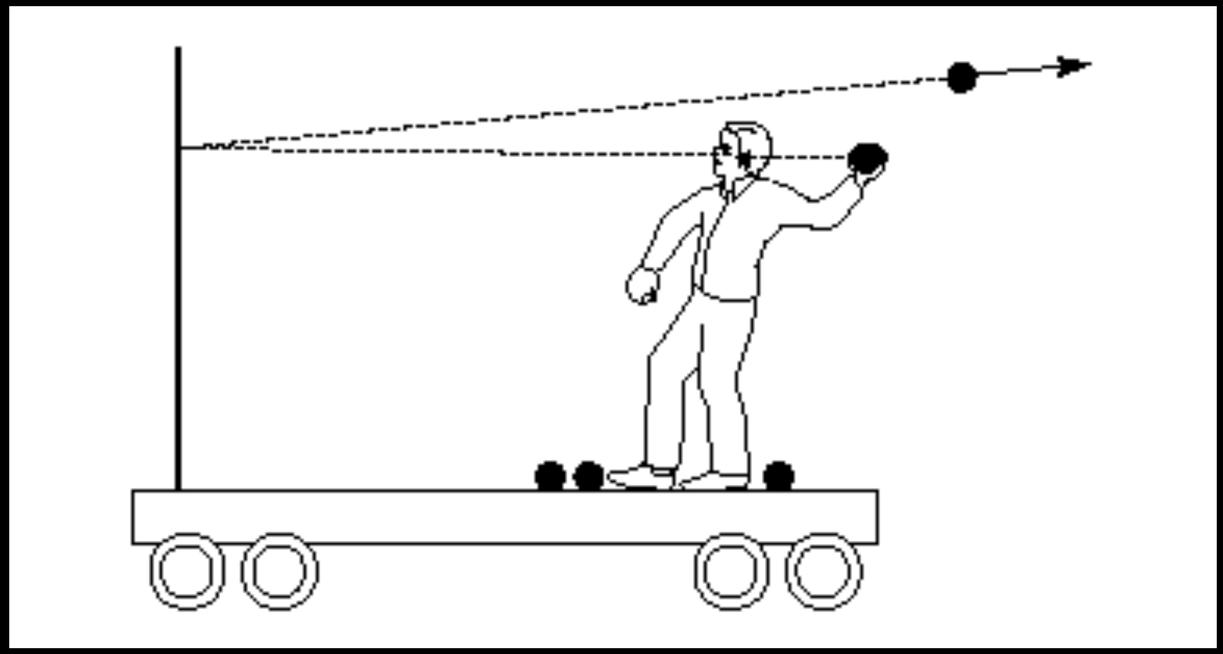
A person attempts to knock down a large wooden bowling pin by throwing a ball at it. The person has two balls of equal size and mass, one made of rubber and the other of putty. The rubber ball bounces back, while the ball of putty sticks to the pin.
Which ball is most likely to topple the bowling pin?

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

Is it possible for a stationary object that is struck by a moving object to have a larger final momentum than the initial momentum of the incoming object?

A) Yes
B) No

Suppose you are on a cart, initially at rest on a track with very little friction. You throw balls at a partition that is rigidly mounted on the cart. If the balls bounce straight back as shown in the figure, 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