

Momentum and Impulse Practice Problems

1. A deer with a mass of 146 kg is running head-on toward you with a speed of 17 m/s. You are going north. Find the momentum of the deer.
 2. A 21 kg child on a 5.9 kg bike is riding with a velocity of 4.5 m/s to the northwest.
 - a. What is the total momentum of the child and the bike together?
 - b. What is the momentum of the child?
 - c. What is the momentum of the bike?
 3. What velocity must a 1210 kg car have in order to have a momentum of 5.6×10^4 kg m/s?
 4. A 0.5 kg football is thrown with a velocity of 15 m/s to the right. A stationary receiver catches the ball and brings it to rest in 0.020 seconds. What is the force exerted on the ball by the receiver? (-375 N)
 5. A 0.40 kg soccer ball approaches a player horizontally with a velocity of 18 m/s to the north. The player strikes the ball and causes it to move in the opposite direction with a velocity of 22 m/s. What impulse was delivered to the ball by the player? (16 N s)
 6. A 63.0 kg astronaut is on a spacewalk when the tether line to the shuttle breaks. The astronaut is able to throw a spare 10.0 kg oxygen tank in a direction away from the shuttle with a speed of 12.0 m/s, propelling the astronaut back to the shuttle. Assuming that the astronaut starts from rest with respect to the shuttle, find the astronaut's final speed with respect to the shuttle after the tank is thrown. (1.90 m/s)
 7. An 85.0 kg fisherman jumps from a dock onto a 135.0 kg rowboat at rest of the west side of the dock. If the velocity of the fisherman is 4.30 m/s to the west as he leaves the dock, what is the final velocity of the fisherman and the boat? (1.66 m/s)
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1. A 100 kg cart, initially at rest, rolls down a 37° incline. At the bottom of the hill, the cart stops after plowing 3 m into a hay stack. If the average force of the hay stack on the cart is 16,000 n, how far up the frictionless hill did the cart start? (81 meters)
 2. A 60 kg person falls 9.8 m from a storage building and lands stiff legged in some mud. The average force of the mud while stopping the person is 15,000 n. Determine the distance that the person sinks into the mud. Ignore air resistance. (0.38 meters)
 3. A 1000-kg out of control car initially moving at 20 m/s enters a horizontal escape surface made of loose gravel. The force of friction is 250-N. Determine the distance that the car travels before coming to a stop. (800 m)
 4. A 1.5 kg ball is dropped from a height of 10 meters above the ground. It falls and is caught by a spring (spring constant of 435 N/m). How far does the spring compress? (0.83 m)

