

Impulse Momentum Problems

1. A 1000 kg car accidentally drops from a crane and crashes at 30 m/s to the ground below and comes to an abrupt halt. What impulse acts on the car when it crashes?
2. If a force of 300N is exerted upon a 60 kg mass for 4 seconds, how much impulse does the mass experience?
3. A billiard ball approaches a cushioned edge of a billiard table with momentum, p . After the collision with the cushion, it bounces straight back with the same amount of momentum in the opposite direction. What is the impulse on the ball?
4. A projectile, of mass 20 g, traveling at 350 m/s, strikes a steel plate at an angle of 30-degrees with a plane of the plate. It ricochets off at the same angle, at a speed of 320 m/s. What is the magnitude of the impulse that the steel plate gives to the projectile?
5. A daredevil ($m = 77.00$ kg) tied to a 32.00 m bungee cord, leaps off a 62.00 m tall platform. He falls to 9.00 m above the ground before the bungee cord pulls him back up. What size impulse is exerted on the daredevil while the cord stretches.
6. An 80-kg man and his car are suddenly accelerated from rest to a speed of 5 m/s as a result of a rear-end collision. Assuming the time taken to be 0.3s, find the
 - a) impulse on the man and
 - b) the average force exerted on him by the back seat of his car
7. The momentum of a 30.0-g sparrow with a speed of 12 m/s is 0.36 kg*m/s. What will be its momentum 12s later if a constant .02 N force due to air resistance acts on it?
8. Two rickshaws, one twice the mass of the other, experience the same force for the same time. What is their difference in momentum? What is their difference in kinetic energy?
9. A racket exerted an average force of 152.0 N on a ball initially at rest. If the ball has a mass of 0.070 kg and was in contact with the racket for 0.030 s, what was the kinetic energy of the ball as it left the racket?
10. A 0.15-kg rubber ball's velocity just before impact with a floor is 6.5 m/s down, and just after is 3.5 m/s straight up. If the ball is in contact with the floor for 0.025 s, what is the magnitude of the average force applied by the floor on the ball?
11. A 23.5 N force acts on a body for duration of 12.0 s. Compute the impulse that the body receives. How long does a force of 14.0 N need to act in order to impress the same impulse on the body?
12. A 2.5 kg body has a velocity of 5.8 m/s. How long will it require to stop if a breaking force of 2.3 N acts on it?

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13. A motorcycle has a mass of 325 kg and has an initial velocity of 5.6 m/s. A force of 62 N acts on the machine and causes its velocity to increase to 28 m/s. How long does the force act on the machine?
14. A small car has a mass of 853 kg and a speed of 120 km/h. Compute the momentum of the car.
15. A 0.25 kg ball approaches a player at +6.2 m/s. The player kicks the ball and gives it a velocity of -12 m/s. If the player's foot is in contact with the ball for 0.021 s, compute the average force exerted on the ball.
16. A force of 1500 N is required to stop a car moving at an initial speed of 26 m/s in 21 s. Compute the mass of the car.
17. A 15,000 kg train car is rolling at a speed of 3.2 m/s. Compute the time required for a force of 1200 N to stop the car.
18. A car moving at 11 m/s crashes into an obstacle and stops in 0.26 s. Compute the force that a seatbelt exerts on a 21 kg child to bring him/her to a stop.