

Conservation of Momentum – 17

Ramped Questions

When objects collide or move apart, the total momentum before the event is equal to the total momentum after the event, provided no external forces act. These questions gradually increase in difficulty and include a range of real-life situations.

1. A 2 kg trolley moving at 3 m/s collides with a stationary 1 kg trolley. After the collision they stick together. Calculate their final velocity.
2. A 0.5 kg football rolling at 8 m/s strikes a stationary football of the same mass. The first ball stops. Calculate the velocity of the second ball.
3. A 60 kg skateboarder travelling at 4 m/s jumps onto a stationary 20 kg skateboard. Calculate their combined velocity.
4. A 1000 kg car travelling at 10 m/s collides with a stationary 500 kg trailer and they lock together. Calculate their final velocity.
5. A 70 kg ice skater moving at 5 m/s catches a stationary 50 kg ice skater. Calculate their velocity after they move off together.
6. A 0.15 kg cricket ball travelling at 30 m/s is caught by a stationary wicketkeeper of mass 75 kg. Calculate the wicketkeeper's velocity immediately after the catch.
7. A 1200 kg car travelling at 15 m/s collides with a stationary car of mass 800 kg. They stick together. Calculate their final velocity.
8. A 2000 kg van travelling at 12 m/s crashes into a stationary 1000 kg car. They remain joined after the collision. Calculate their final velocity.
9. A 75 kg canoeist at rest throws a 5 kg bag backwards at 8 m/s. Calculate the canoeist's velocity immediately after the throw.
10. A 50 kg astronaut floating in space throws a 2 kg tool forwards at 15 m/s. Calculate the astronaut's recoil velocity.
11. A 1500 kg car travelling at 20 m/s collides with a 1000 kg car travelling in the same direction at 5 m/s. They stick together. Calculate their final velocity.

12. A 1200 kg car travelling east at 18 m/s collides head-on with an 800 kg car travelling west at 10 m/s. They stick together. Calculate their final velocity and direction.
13. A 0.2 kg tennis ball travelling at 25 m/s rebounds straight back at 15 m/s after hitting a wall. Calculate the change in momentum of the ball.
14. A 1500 kg car travelling east at 12 m/s collides with a 1000 kg car travelling west at 8 m/s. After the collision they move together. Calculate their final velocity.
15. Two dodgems at a fairground collide and stick together. One has a mass of 250 kg and is travelling at 4 m/s. The other has a mass of 200 kg and is travelling at 2 m/s in the opposite direction. Calculate their final velocity.
16. A 3000 kg railway wagon travelling at 6 m/s couples with a stationary 2000 kg wagon. Calculate the speed of the wagons after they join together.
17. A 1200 kg electric car travelling at 20 m/s collides with a 1500 kg SUV travelling at 10 m/s in the opposite direction. The vehicles lock together. Calculate their final velocity and state the direction of travel after the collision.