

Problem 1: You are running late so you put your coffee in your car's cup holder and start the car. You speed up and suddenly, a cat crosses your way. You hit the brakes and you notice that your coffee spills. Why is that?

Solution: This is a conceptual example of the first law of motion. The coffee wants to resist changes in its motion. The coffee tries to keep going forward at the same pace as you hit the brakes, but when it does so, it goes over the rim of the cup and spills over.

For numbers 2 and 3: You push a heavy box that sits on a smooth floor and it accelerates.

Problem 2: If you apply thrice the net force, what will happen to the acceleration?

Solution: In the second law of motion, it is stated that the net force is directly proportional to the acceleration, hence, when the net force is thrice, the acceleration will also be thrice.

Problem 3: What will happen if you apply the same force on the same box, but it slides on a very rough floor?

Solution: When you slide a box on a rough floor, there will be more friction. Hence, the box will slide slowly.

For numbers 4 and 5: A high-speeding car and a bug have a head-on collision.

Problem 4: Which imparts a greater force upon the other?

Solution: The third law of motion states that for every action, there is an equal and opposite reaction, hence, the bug and the car exerted an equal and opposite force upon the other.

Problem 5: Which experiences a greater acceleration?

Solution: We must apply the concept of the second law of motion to determine which one experiences a greater force. Since acceleration is directly proportional to the force and inversely proportional to the mass, the bug experienced greater acceleration compared to the car since it is less massive.