Key words

force
momentum

Newton's third law

- Newton's third law of motion states that when two objects, A and B, interact, the *force* exerted by A on B is equal in magnitude to the force exerted by B on A, but the forces act in opposite directions.

1 Example 1

- When a person steps forward from rest their foot pushes backwards on Earth and Earth exerts an equal and opposite force forward on the person. Two bodies and two forces are involved.
- The small force that a person exerts on Earth gives no noticeable acceleration to Earth because of its large mass. The equal force exerted on the person, who has a much smaller mass, causes them to accelerate.

2 Example 2

- When a person steps out of a rowing boat they push backwards on the boat, and the boat pushes them forwards with an equal but opposite force.
- The friction between the boat and the water is slight and, as the person pushes on the boat, it starts to move backwards reducing the forward motion of the person, who will tend to fall in the water between boat and land.

3 Example 3

- When a bullet is fired from a gun, equal and opposite forces are exerted on the bullet and the gun as the bullet passes down the barrel. Bullet and gun acquire equal *momentum* but in opposite directions.
  mass of bullet x bullet velocity = mass of gun x gun velocity
- Since the mass of the bullet is much less than that of the gun, the bullet will move forward at a much higher velocity than the gun will move backwards.

Newton's third law of motion