

Newton's Third Law

According to Newton's Third Law, forces always act in equal but opposite pairs. For every action force, there is an equal but opposite reaction force. When you push on a wall, the wall pushes back on you. The action force and the reaction force are on two different objects. As a result, action and reaction forces don't cancel each other. Consider what happens when you do a pushup. You press down on the floor. The floor presses up on you. The forces are equal and opposite, but they don't cancel each other because they are on different objects. The evidence that these are *unbalanced* forces is the fact that you move up as a result of pushing down.

Action-reaction forces are a bit confusing when it comes to gravity. Gravity pulls down on you, but gravity is a mutual force of attraction. You are also pulling up on the earth. These forces make up one unbalanced action-reaction force pair. When you stand on a surface, your weight presses down, and the surface presses up. This makes up another unbalanced action-reaction force pair. Out of these four forces, there are some balanced forces. Gravity and the surface you are standing on are both exerting forces that are acting on *you*. These forces *are* balanced. As a result, you are not moving. But if you press down with a force greater than your weight, the reaction force is enough to overcome gravity. This is what happens when you jump.

Answer the questions below based on the reading above and on your understanding of Newton's Third Law.

- For each force described below, describe the reaction force:
 - You kick a football forward with a force of 10 N. _____

 - Using a hammer, you bang a nail into a wall with a force of 15 N. _____

 - You push a box east with a force of 23 N. _____

- A 600 N man contracts his leg muscles and presses down on the ground with a force of 700 N. What happens as a result?

- In what direction does a runner need to exert a force in order to sprint forward? Explain. _____

