Question 1: The Basics of Motion

You push a shopping cart down a grocery aisle, and you pull a heavy backpack off the floor.

In science, what single word describes any push or pull that can change how an object moves?



A force!

A force is simply a push or a pull acting on an object.

Forces give things energy to start moving, speed up, slow down, stop, or change direction. Whenever you kick a ball, pull a zipper, or slam a door, you are applying a force.



Question 2: Opposing Strengths

Two friends stand on opposite sides of a large wooden toy box.

Both push inward toward the center at the exact same time, using the exact same amount of strength.

What happens to the toy box, and what do scientists call these opposing forces?



Answer 2: Balanced Forces

The box does not move at all! These are balanced forces.

When two forces acting on an object are equal in size and push or pull in **opposite** directions, they cancel each other out. The net force is zero, so the object's motion does not change.

If one friend pushed harder, the forces would be unbalanced, causing the box to slide.



Question 3: Objects in Motion and at Rest

A soccer ball sits perfectly still on the field. It will not move until someone kicks it.

Once kicked into space where there is no air or friction, it would keep coasting forever in a straight line.

What scientific property makes objects resist any change to their motion?



Answer 3: Newton's First Law (Inertia)

Inertia!

Inertia is an object's natural tendency to resist any change in its state of motion.

Isaac Newton's First Law of Motion states that an object at rest stays at rest, and an object moving at a steady speed keeps moving in a straight line, unless an outside, unbalanced force (like a kick, friction, or gravity) acts on it.



Question 4: Mass and Acceleration

Imagine you push an empty plastic shopping cart with all your might. Next, you push a cart stacked high with heavy bowling balls using that same exact push.

Which cart speeds up faster, and how does an object's mass affect how easily it accelerates?



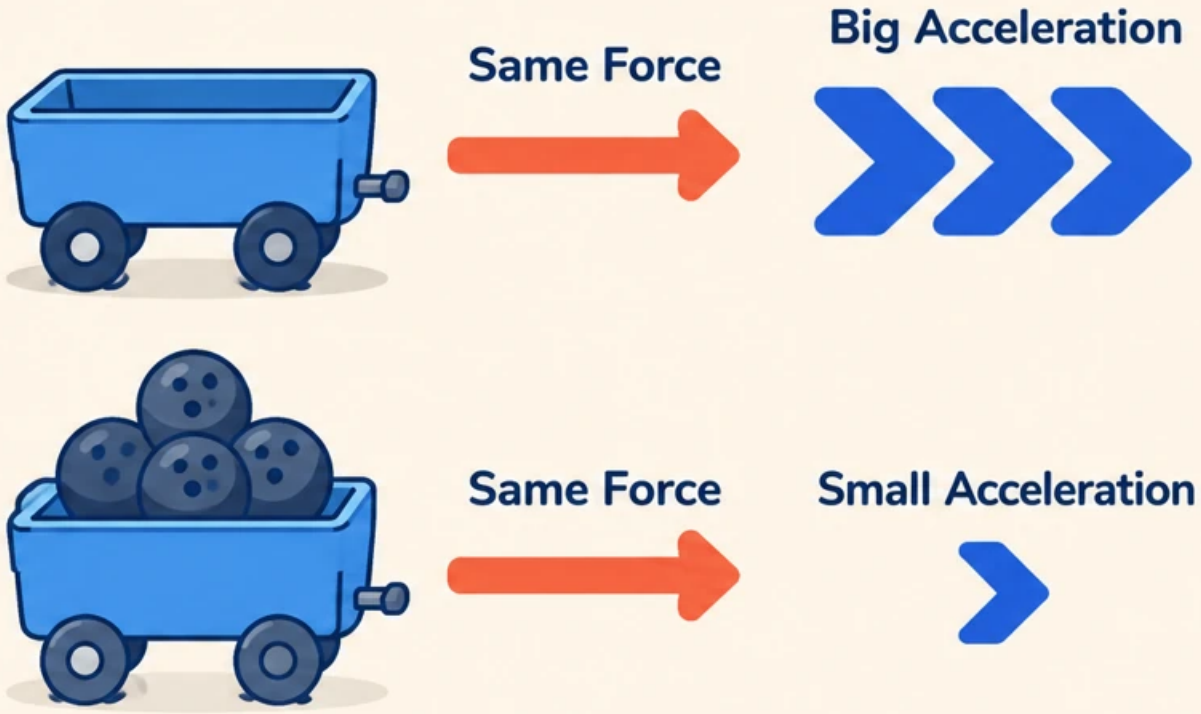
Answer 4: Newton’s Second Law (Force & Mass)

The empty cart speeds up much faster!

Newton’s Second Law explains that acceleration depends on two things: the force applied and the object’s mass.

- More mass means harder to speed up (more inertia).
- Less mass means easier to speed up.

If the pushing force is identical, lighter objects accelerate faster than heavy ones!



Question 5: Pushing Off

You are wearing roller skates and standing still on smooth pavement right in front of a sturdy brick wall.

You place both hands on the wall and shove it hard forward.

Which way do you move, and why does this happen?



You roll backward, away from the wall!

Newton's Third Law states: for every action, there is an equal and opposite reaction.

Crucial fact: the two forces act on different objects!

1. **Action force:** Your hands push forward on the wall.
2. **Reaction force:** The wall pushes backward on your hands with equal strength.

The massive wall stays anchored, but you roll backward on your skates!

