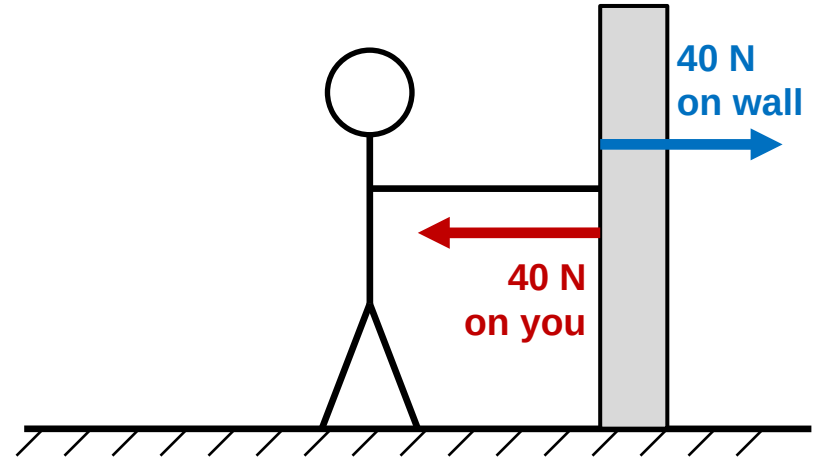


Essential Question

If you push on a wall, does the wall push back?

Newton's Third Law

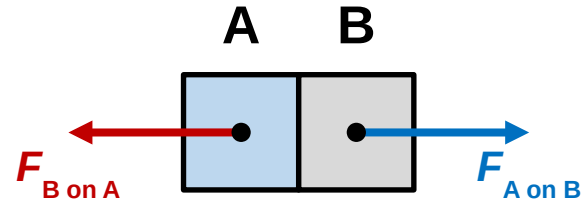
- Forces come in pairs
- Equal size, opposite directions
- Act on different objects



40 N on the wall, 40 N on you

Naming Force Pairs

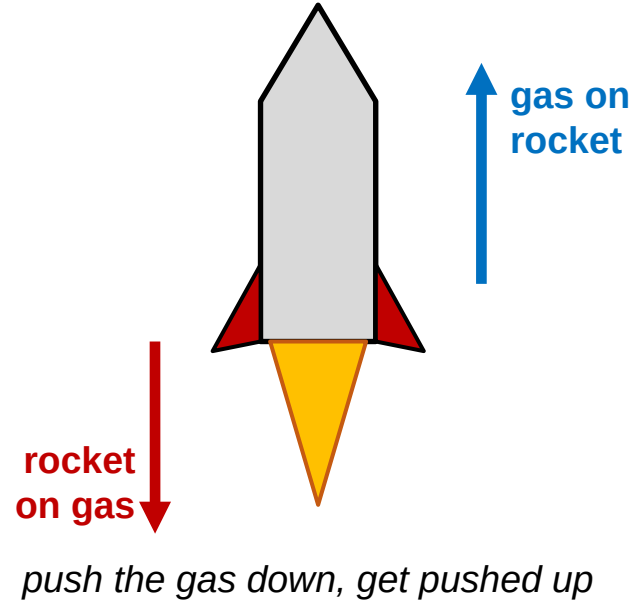
- A on B, then B on A
- Swap the two objects
- Same type of force



same size, opposite directions, different objects

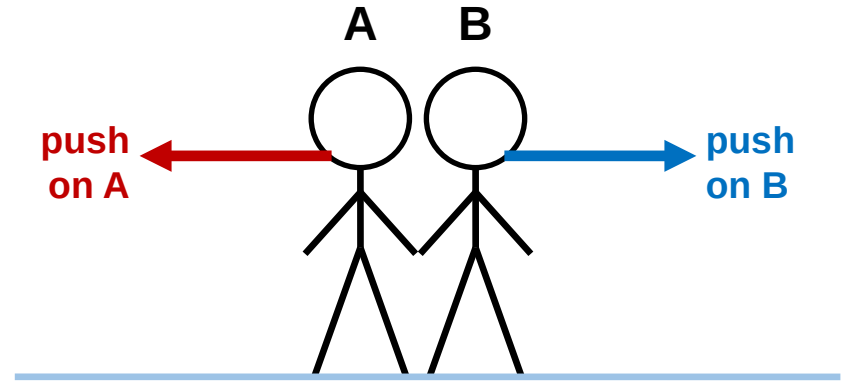
Action-Reaction Examples

- Walking: foot pushes ground back
- Swimming: hands push water back
- Rocket: pushes gas down



Why Pairs Don't Cancel

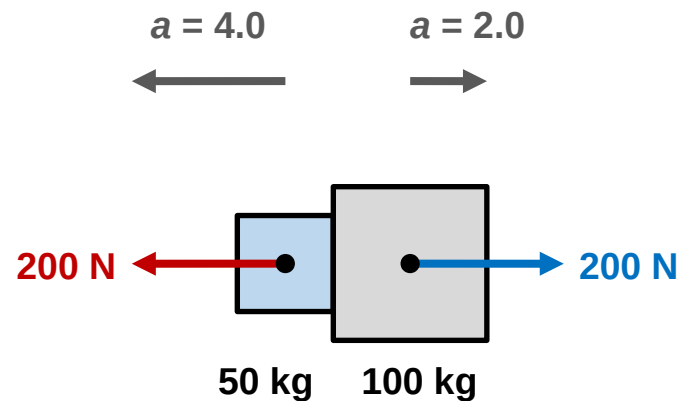
- They act on different objects
- Only forces on one object cancel
- Each object moves on its own



the skaters move apart

Same Force, Different Acceleration

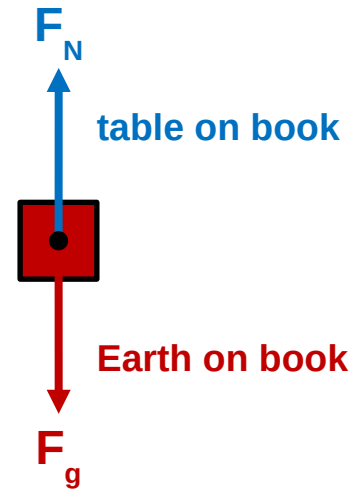
- Both feel the same force
- Each one: $a = F/m$
- Less mass, more acceleration



half the mass, twice the acceleration (m/s^2)

Pair or Not?

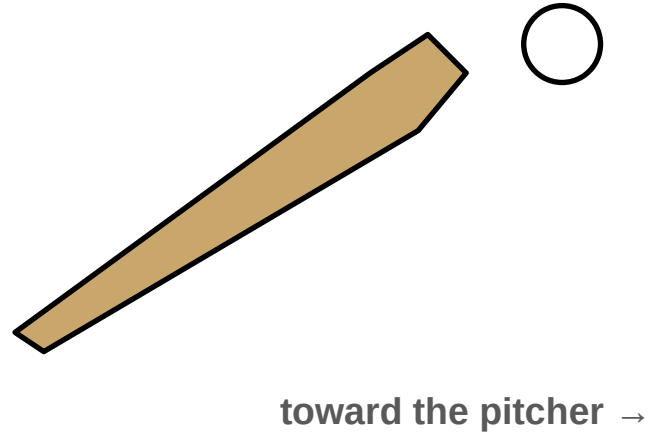
- Pairs: two objects, same type
- F_N and F_g on a book: not a pair
- Both act on the same book



balanced, but not a third-law pair

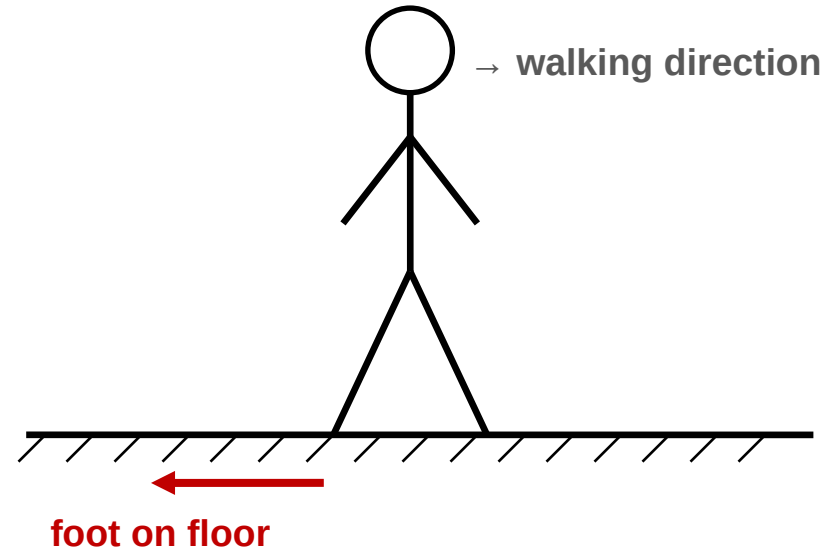
Example: Bat and Ball

A bat exerts a 1,500 N force on a baseball, toward the pitcher. What force does the ball exert on the bat?



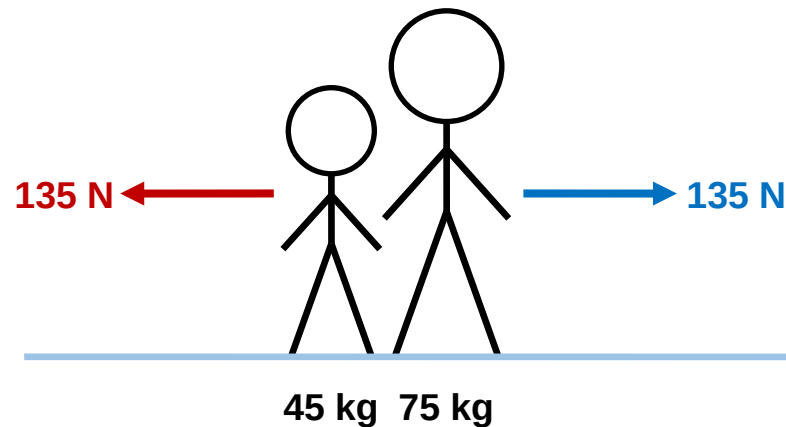
Example: Walking

As you walk, your foot pushes backward on the floor. Name the reaction force. What does it do to you?



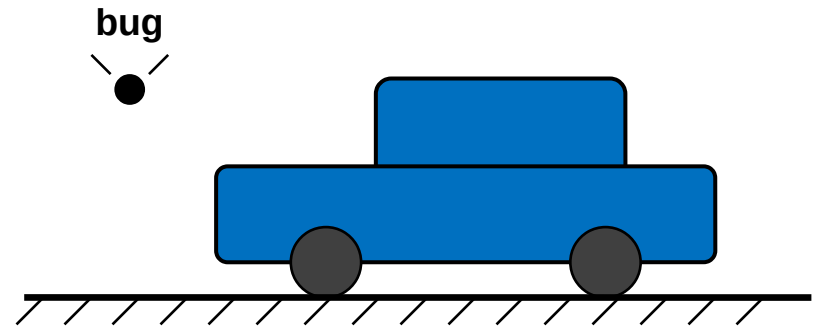
Example: Skaters Push Off

A 45 kg skater and a 75 kg skater stand on ice and push off each other. Each skater feels a 135 N force. Find each skater's acceleration.



Example: Bug vs. Truck

A 0.0020 kg bug hits the windshield of a 2,400 kg truck. The truck pushes on the bug with 1.2 N. Find the force on the truck and the acceleration of each.



Big Ideas

- Forces come in equal and opposite pairs
- Pair forces act on different objects
- Pairs never cancel each other out
- Same force, less mass: more acceleration