Newton’s Third Law of Motion

Objective

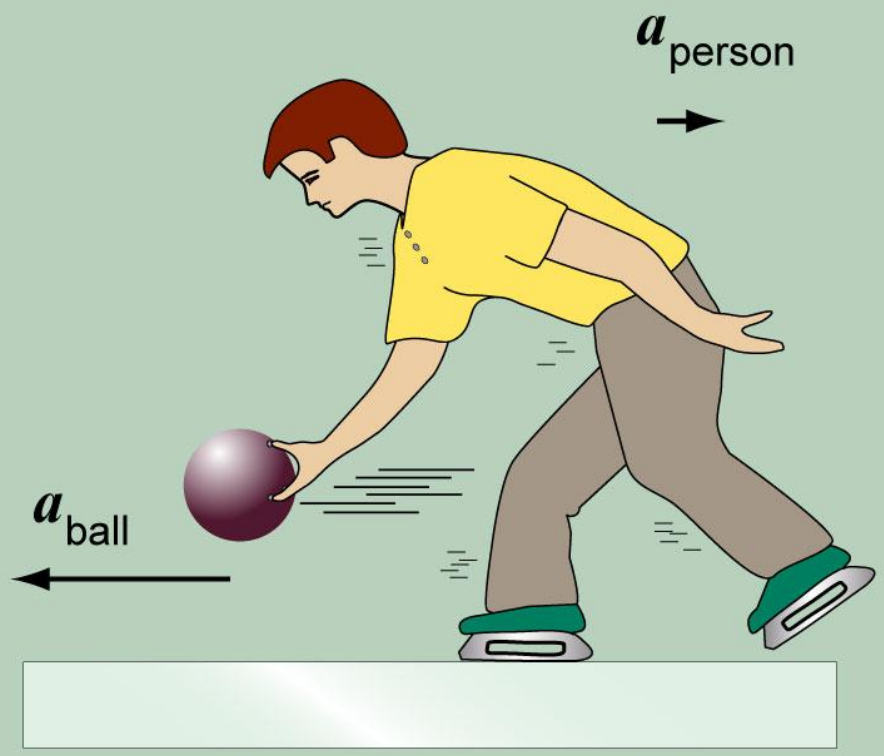
- SWBAT explain Newton's third law and use it to explain the movement of objects.

Do you want to do this? Why not?

How is dribbling possible?

Newton's Third Law of Motion

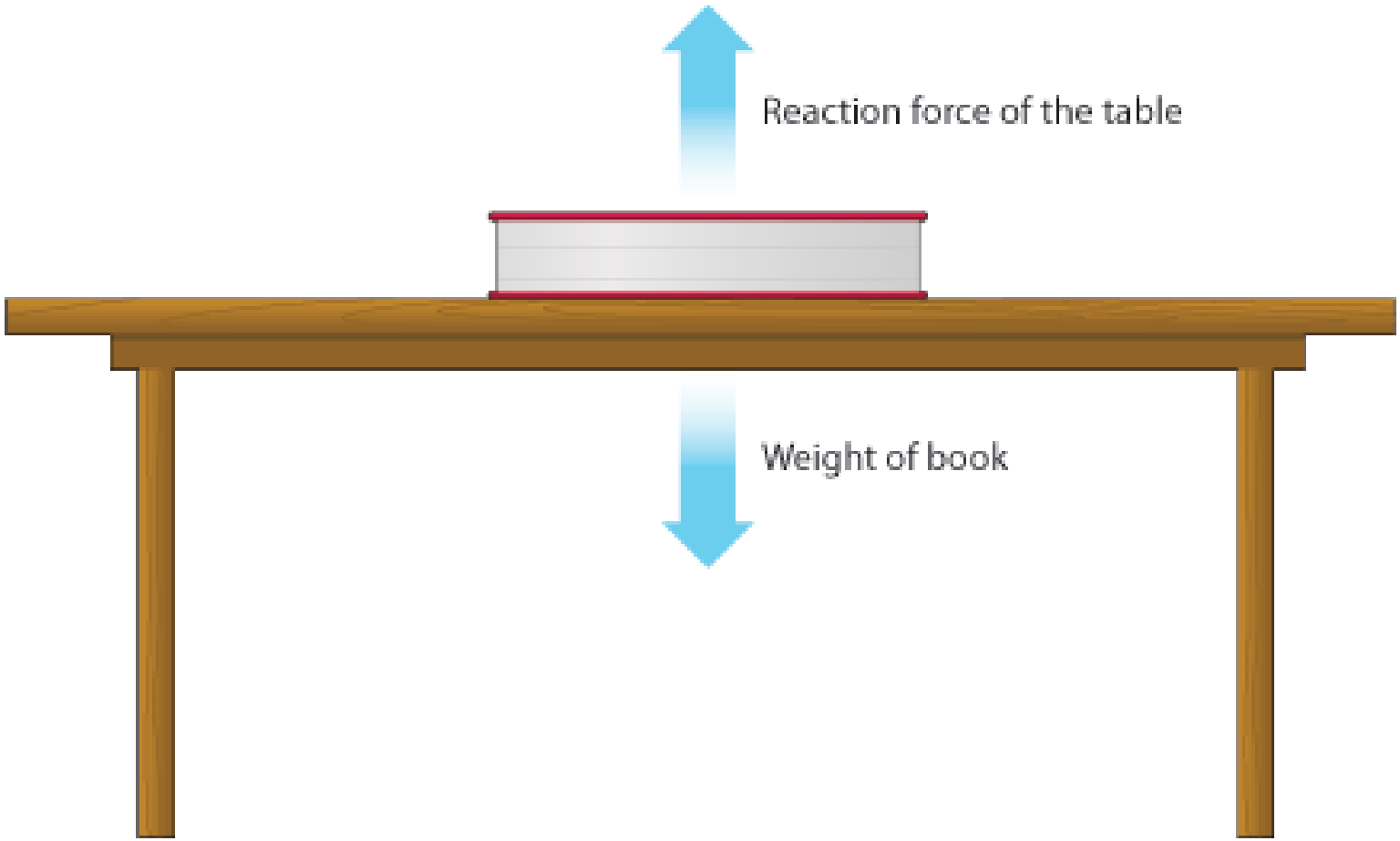
- For every action, there is an **equal** and **opposite** reaction.
- Whenever an **object** exerts a force on **another object**, the **second object** exerts a force that is *equal and opposite in direction* back on the **first object**.

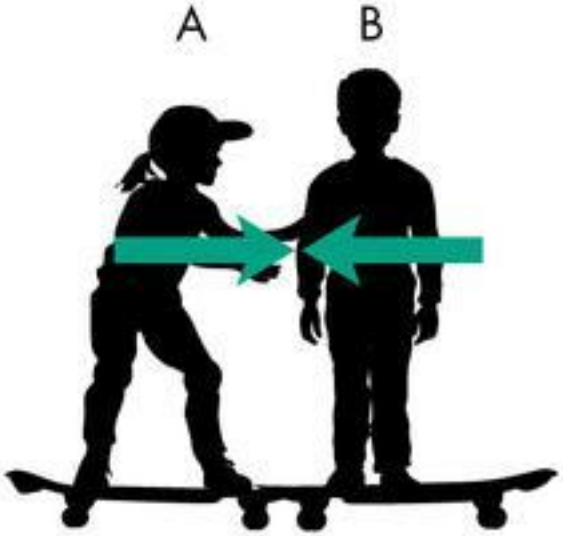


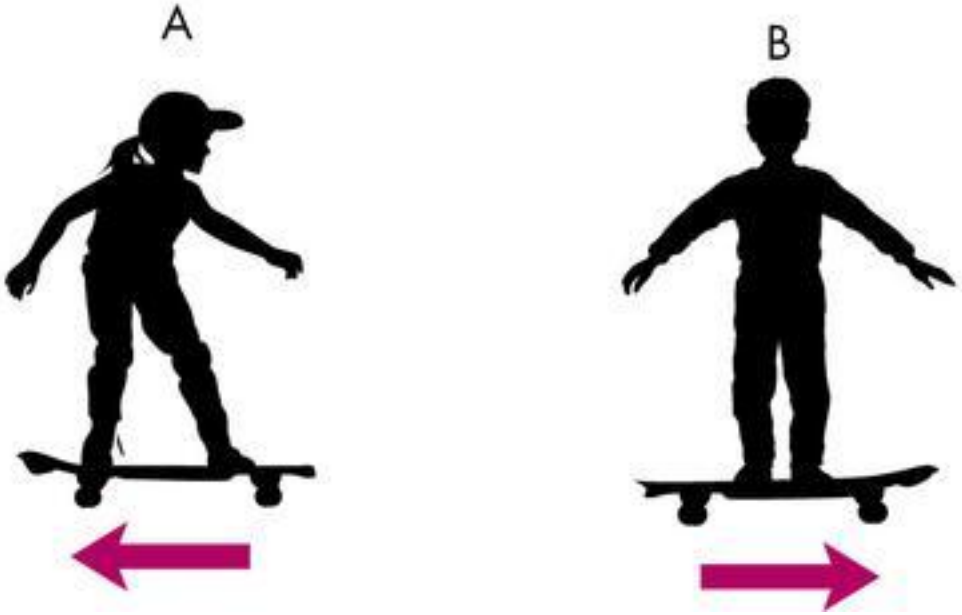
Action = reaction means the bowler and the ball get equal and opposite forces when the ball is launched.

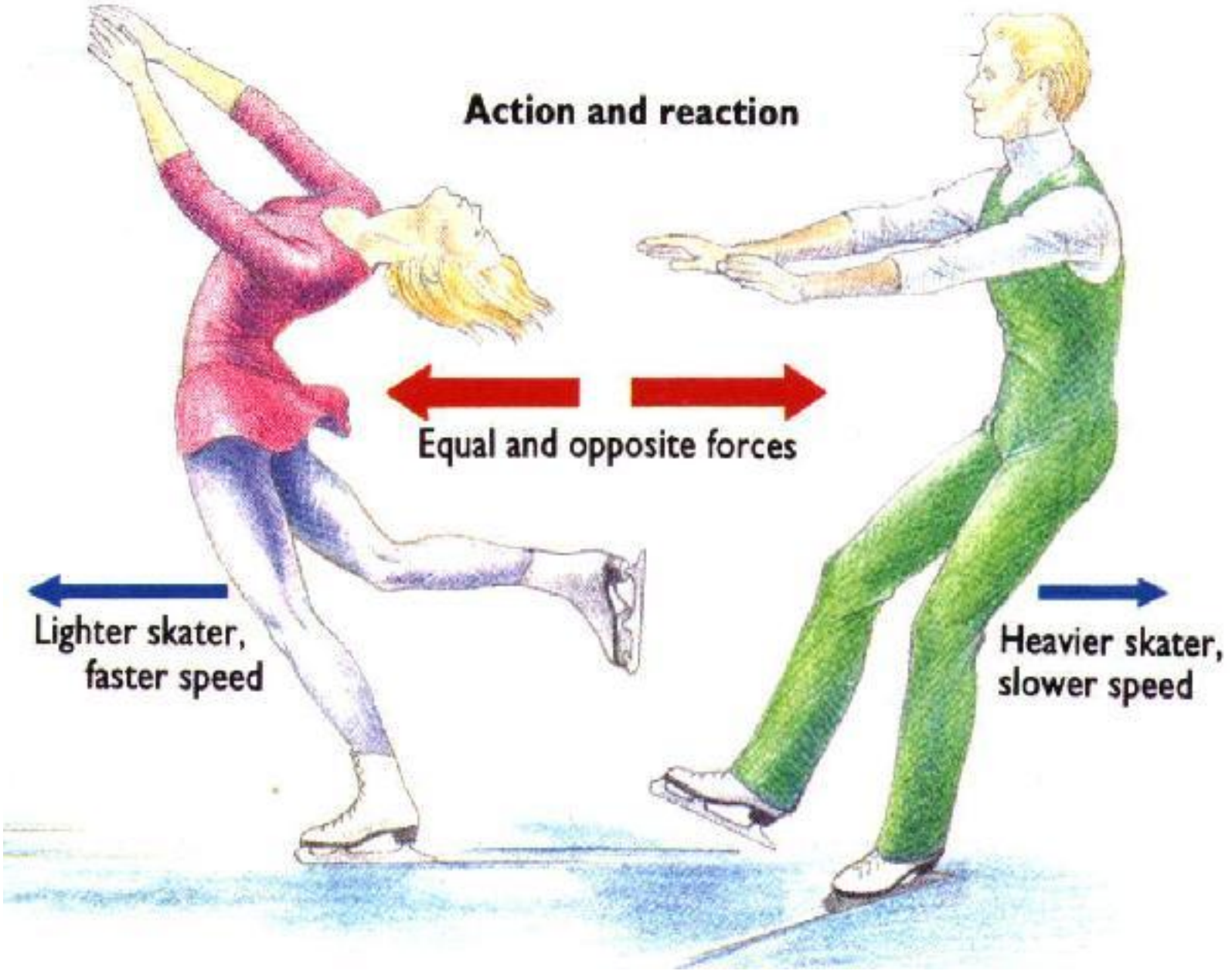
But since the bowler's mass is greater than the ball's mass, the bowler accelerates less than the ball.

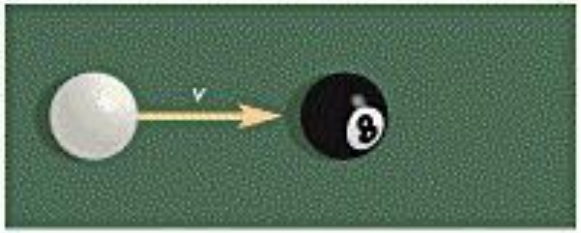
$$m_a = ma$$


Reaction force of the table
Weight of book

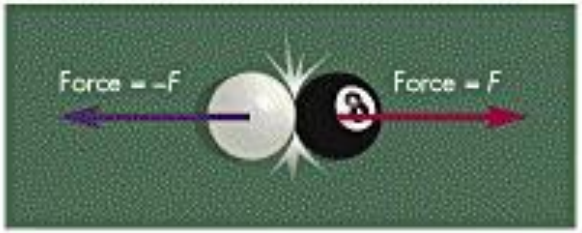

A
B


A
B


Action and reaction
Equal and opposite forces
Lighter skater,
faster speed
Heavier skater,
slower speed



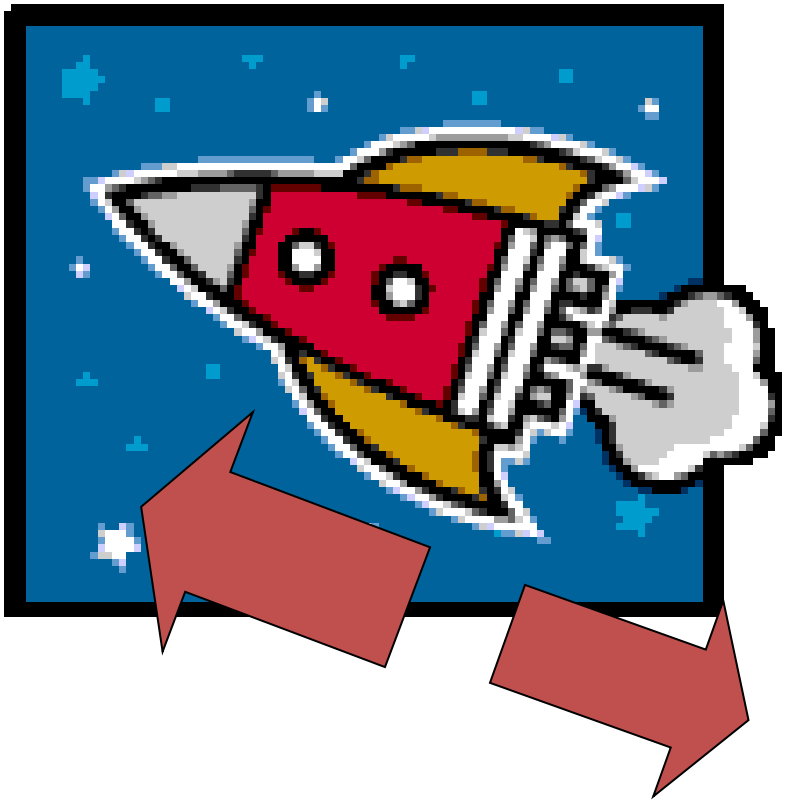
Before collision: Cue ball moves with velocity, *v*; eight ball is stationary



Collision: Cue ball exerts force (*F*) on eight ball; eight ball exerts equal but oppositely directed force (–*F*) on cue ball

After collision: Eight ball moves with velocity, *v*; cue ball is stationary

Let’s see an example.



ACTION:

Rocket Gases push DOWN on air.

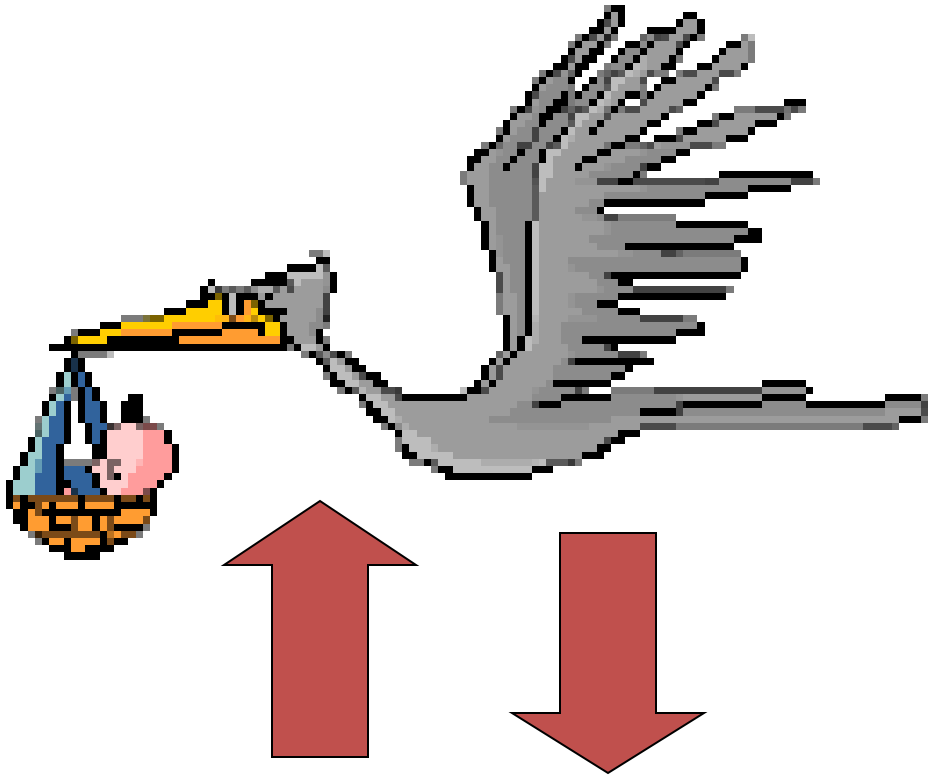
REACTION:

Air pushes up on rocket.

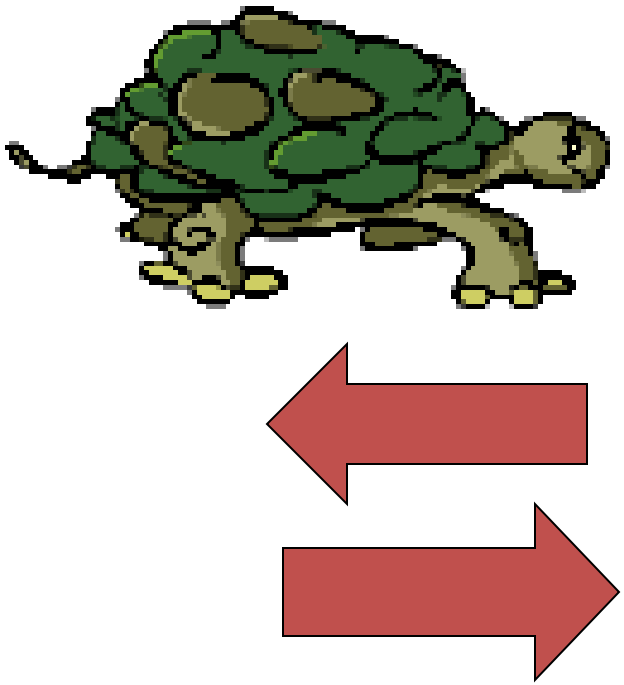
Try this one:

- ACTION:
- Wings push DOWN on air.

- REACTION:
- Air pushes UP on wings.



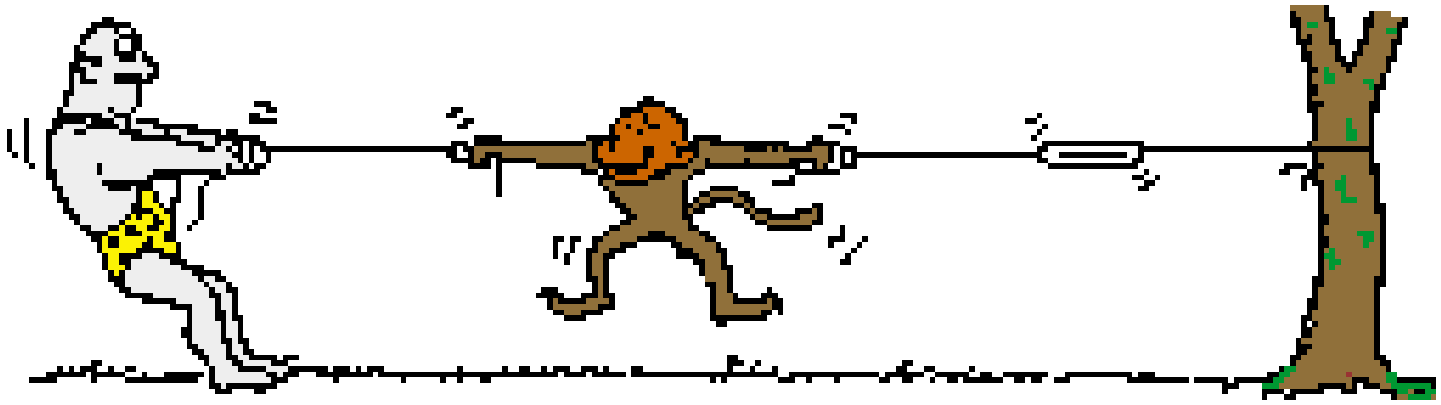
…And another!



- ACTION:
- Feet push back on the floor.

- **REACTION:**
- **Floor pushes forward on feet.**

Identify 6 pairs of action-reaction forces in the following picture



Exit Slip

1. Newton's third law states that for every action, there is an _____ and _____ reaction.

Exit Slip

2. Wherever there is an action force, there must be a reaction force that

A. acts in the same direction
B. is smaller than the action force and acts in the opposite direction
C. is larger than the action force and acts in the same direction
D. is equal to the action force, but in the opposite direction

Exit Slip

3. A soccer player kicks a 1-kg ball with a force of 75 N. What is the force that acts on the player's foot?

Exit Slip

4. You stand on a bathroom scale to measure your weight. If your force weight (due to gravity) down on the scale is 90 N, what is the normal force with which the scale pushes up on your feet?

Exit Slip

5. A basketball bounces because…

A. the reaction force of the ground pushes the ball up.

B. gravity pushes the ball down

C. inertia stops the ball from going through the ground.

D. F = ma