Name ______________________ Pd ____ Date ______________________

NEWTON'S 3RD LAW

Newton's third law of motion states that if one object exerts a force on another object, then the second object exerts a force of equal strength in the opposite direction of the first object.

Or more commonly said: "Every action has an equal and opposite reaction."

When you jump, you are exerting a force on the ground. However, based on Newton's 3rd Law of Motion, the ground is also exerting an equal and opposite force on you, thus propelling your feet upward off the ground!

With your elbow partner, think of another example of how we experience Newton's 3rd Law of Motion in every day life. Write your thoughts below:

- a ball bouncing on the ground.
- a gymnast propelling himself upward on the vaulting horse.

MOMENTUM

Momentum is a characteristic of a moving object that is related to the mass and the velocity of the object.

Momentum = Mass x Velocity

Law of Conservation of Momentum:

In the absence of outside forces, the total momentum of objects that interact stays the same.

APPLY WHAT YOU LEARNED!

1. Buster, a playful golden retriever, and Winston, a small terrier, were playing in a field. They turned a corner and found they were heading straight for a fresh-water stream. Both dogs had the same velocity. They both tried to slow down, but one of the dogs couldn't stop in enough time. Into the water he went! Which dog, Buster or Winston, went into the water?

Buster

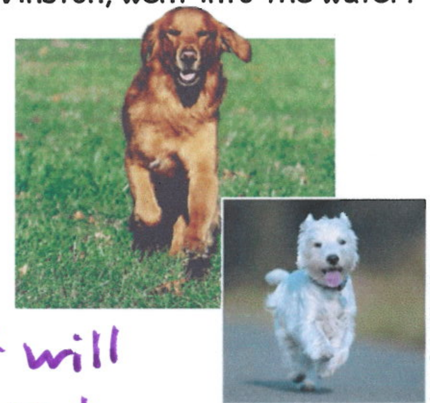


Image Source/Alamy Images

Using what you know about momentum, explain your answer:

Buster has a greater mass than Winston. They are both going the same velocity, but it will be harder for Buster to slow down because his mass is greater.

2. Fill in the velocity for each train car into the momentum equations below. Then complete the calculations to prove the Law of Conservation of Momentum.

A Two Moving Objects

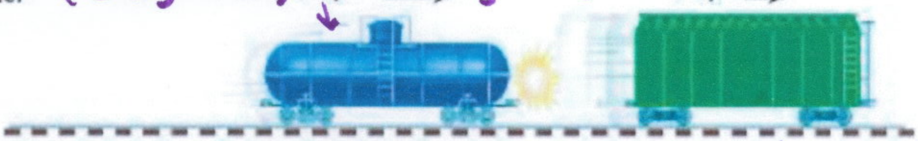
Before 2 m/s → 1 m/s →

Before the collision, the blue car moves faster than the green car. Afterward, the green car moves faster. The total momentum stays the same

(4 kg x 2 m/s) + (4kg x 1 m/s) = 12 kg·m/s

(8 kg·m/s) + (4 kg·m/s)

After 1 m/s → 2 m/s →



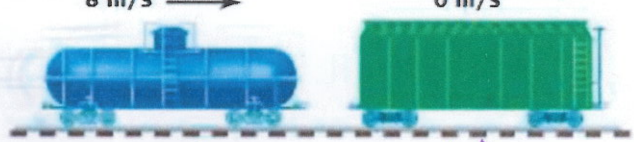
(4 kg x 1 m/s) + (4kg x 2 m/s) = 12 kg·m/s

(4 kg·m/s) + (8 kg·m/s)

B One Moving Object

When the green car is at rest before the collision, all of the blue car's momentum is transferred to it. Momentum is conserved.

Before 8 m/s → 0 m/s



(4 kg x 8 m/s) + (4kg x 0 m/s) = 32 kg·m/s

After 0 m/s 8 m/s →

(4 kg x 0 m/s) + (4kg x 8 m/s) = 32 kg·m/s