KIPP Nashville

AmplifyScience

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KIPP/2024/_____

Remote Learning Packet

Assignment# 1

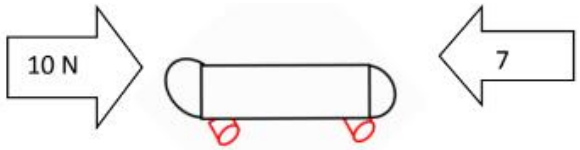
Review of Force and Motion

Directions: Try the first 3 problems to help you remember the concepts from our first unit.

1. If a ball is thrown into the air, it will continue to move upwards, until acted on by a _____, which will cause it to return to the _____ .

2. Which skateboard will not move? Why?

A



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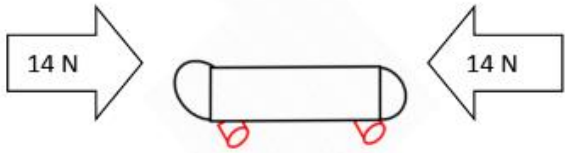

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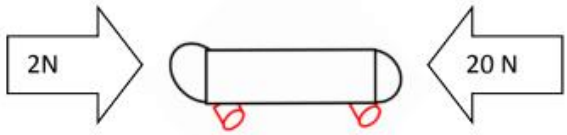

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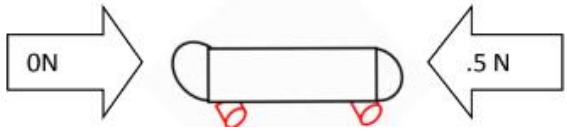

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3. Gio and Amadre take a road trip from San Francisco, CA to Houston, TX . It takes them 25 hours to make the 1400 mile trip. What was their velocity?
** Hint: Velocity is speed **with direction.**

Show work below:

Directions: Read and **Annotate** the following text to help you to review Newton's Laws of Motion.

Newton's Laws Using Seatbelts

Have you ever wondered why seatbelts are so crucial, and more importantly, why they work and are the one biggest reason for reduced mortality in car accidents? Well, the answer has to do with Newton's Laws

Newton's first law of motion tells us that if you're moving at a particular speed, you will **continue moving at that speed indefinitely unless an outside force acts on you** to stop you. Now think about this in the context of sitting in a moving car. You are moving at the same speed as the car that you're in, even though you appear to be sitting still relative to the car.

If the car comes to a sudden stop, you will continue to move forward. Here's the part that really stinks - you continue to move forward at the same speed the car was moving! This is why you always slow down before stopping the car, so that your body slows down too and comes to rest with the car. But if the car stops suddenly, such as when it hits a lamp post, your body has not had time to slow down and keeps moving at the same speed the car was moving at before its sudden stop, until some outside force stops it, such as the dashboard.

Newton's third law of motion states that **to every action there is an equal and opposite reaction.** In other words, if you slam your fist into a wall with a force of 40 N, the wall will slam your fist right back with a force of 40 N. **Ouch!** So this means that if you're hurled from a vehicle and you hit the ground, or a tree, or even the dashboard, ***the object that you hit hits you back*** with a force of ***the exact same magnitude*** as the force you hit it with. The impact of this becomes more apparent when you think about Newton's second law.

Newton's second law of motion tells us that the force that acts on you or that you exert on another object **depends on your <u>mass</u> and <u>how fast</u> you're moving,** to be more accurate, how fast you're accelerating. Let's look again at you sitting in a moving vehicle. The car you're in is building up speed, accelerating, and then it hits an object, say another vehicle, or a tree. You weren't wearing a seatbelt so

you continue to obey Newton's first law and you continue moving, and hit something, probably the dashboard. ***You will hit that object with a force that is the product of your mass and the acceleration of the vehicle that you were in.*** And according to what we said about the third law, the thing that stops your motion will ***hit you back with the same force***. This is why you can get injuries even from a seatbelt to your tissues or internal organs, because that seatbelt hits you with the same force you hit it with, and that force depends on your mass and the acceleration of the vehicle.

Post Reading Questions:

1. Restate Newton's 3 Laws of Motion below.

First Law	
Second Law	
Third Law	

2. If you are riding in a car that is traveling 40 mph, how fast are you moving?
    a. You are not moving because you are sitting still.
    b. You are moving at the same speed of the car, which is 40 mph.
    c. You are moving slower than the car because you are inside of the car.
    d. You are moving half the speed of the car, which is 20 mph.

3. During a collision, how much force does each object experience? Which Newton's Law tells you this?

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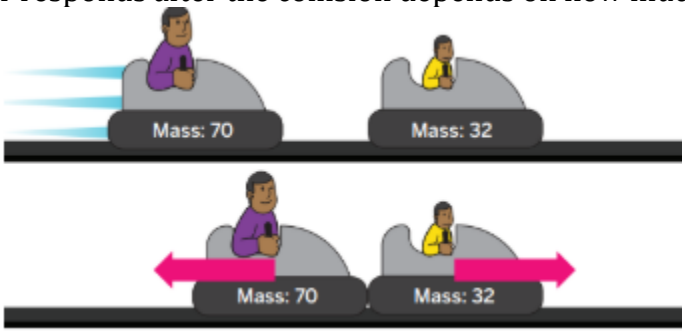
4. When two bumper cars collide, both cars experience the **same amount of force**. How each car responds after the collision depends on how much mass each rider has.



Using the picture above, which car would experience the greatest change in velocity during this collision? Explain how you know.

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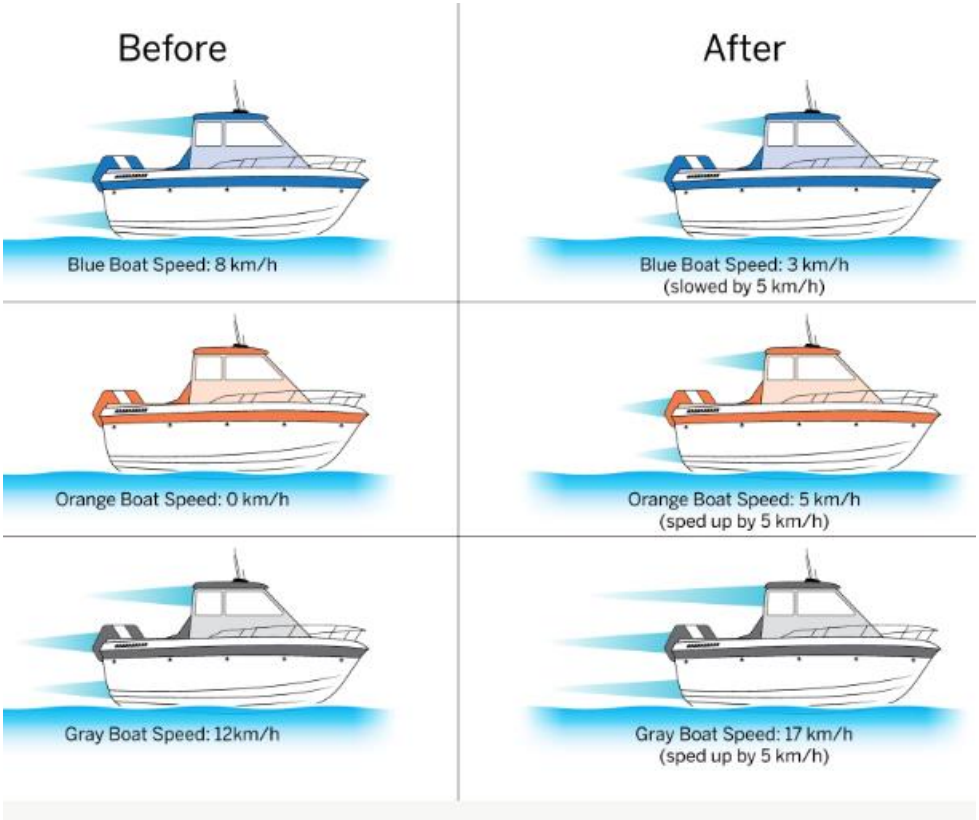
Independent Practice Problems

Three toy boats with the same mass were in a lake. Two boats were moving and one was stopped. Each boat got bumped by another boat, but not in the same direction. All the boats changed speed as a result of being bumped.

Which toy boat(s) experienced the strongest force when it was bumped? How do you know?



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An object is moving to the left at 2.5 m/s, as shown in the picture.

a. In which direction would a force need to be exerted to make this object speed up?

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b. In which direction would a force need to be exerted to make this object slow down?

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c. In which direction would a force need to be exerted to make this object stop?

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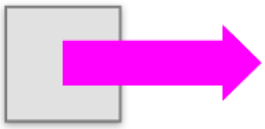
Object A:
Mass 1



Object B:
Mass 4

The same strength force was exerted in the same direction on both Object A and Object B. Why did Object A go faster than Object B? Use Newton's Laws to explain your answer.

The same strength force is exerted in the same direction on objects of different mass.

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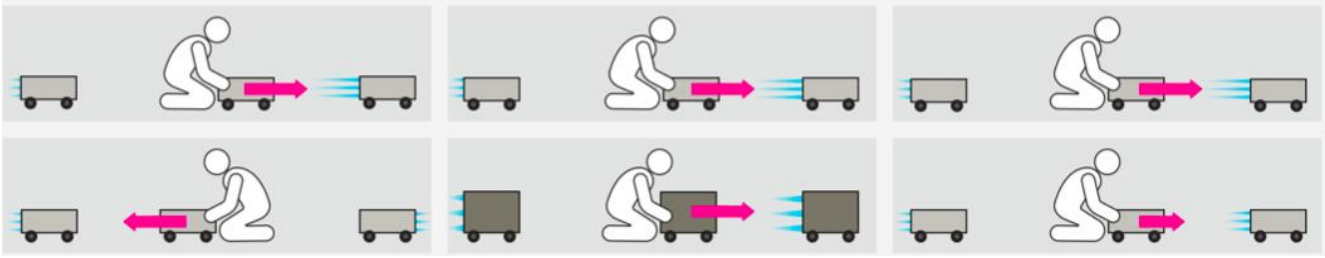
Using the pictures below, match the key concept to the pair of diagrams that illustrate its cause-and-effect relationship labeling them A, B or C.



1. _____ 2. _____ 3. _____

A	B	C
KEY CONCEPT If the same strength force is exerted on two objects but the objects have different masses, the object with less mass will have a greater change in velocity.	**KEY CONCEPT** A stronger force can cause a greater change in velocity.	**KEY CONCEPT** How an object changes velocity depends on the direction of the force exerted on that object.