**\*\*Forces and Motion Scope #4 Newton’s three laws of motion\*\***

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| **MS-PS2.A.1** | **Standard** | Forces and Motion: For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton’s third law). |

**What you will learn:** The student is expected to apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.

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| **ACTIVITY** | **PRE/POST DISCUSSION QUESTIONS** | **IMPORTANT FACTS** |
| **Illuminate** | * Read each of the choices below the image and choose the statement that makes the most sense. Justify their thinking.
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| **Hook****Pre-Activity Discussion** | 1. What is a bathroom scale used for?
2. What is weight?
3. A scale is used to measure the amount of a force. What is a force?
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|  | **Post-Activity Discussion**1. What can you conclude about the relationship between mass and force?
2. What does a Newton unit measure?
 | **IMPORTANT FACTS** |
| **Pre-Activity Discussion****Do Now #1** | 1. What is a system?
2. Games make good analogies for systems of scientific investigations. What are some of the parts of a board game?
3. What determines how the pieces and the processes of the game are related?
4. How are the physical boundaries of the system set?

5. Give an example of how this system might respond to a change in the environment outside the system. |  |
|  | **Post-Activity Discussion**1. What is the boundary for the system?
2. When this system is working, what does it do?
3. For this system to work, must it receive any input?
4. What, if any, output does this system produce?
5. What are the parts of this system?
6. What is the function of each part?
7. Can any one part of the system do what the whole system does? Explain.
8. Can a part be removed and have the system still function?
9. Identify at least two parts of the system that must interact if the system is to function. Describe how they interact.
10. Could these interacting parts of the system be arranged differently and the system still function?
11. Can you identify a subsystem within the whole system? Describe the parts that make up this subsystem.
12. Give an example of how this system might respond to a change in the environment outside the system.
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| **Do Now # 2****Pre-Activity Discussion** | 1. What are Newtons three laws of motion?
2. Lets focus on Newton’s Third Law. Try out the third law of motion at your desk.
3. Press on your desk with your hand.
	* What do you feel?
	* According to Newtons Third Law of Motion, you are pressing on the surface and the surface is pressing on you. You are pressing down with the same amount of force that the surface is pressing up. What would happen if you were pressing down with more force than the desk was pressing up?
	* How would I draw a diagram to show the forces acting on the hand and the desk?
	* What are the system boundaries?
	* What are the system components?
	* If the size of the arrow represents the amount of force, how should the arrows in our diagram be drawn?
	* Should the arrows be pointing away from each other, toward each other, or in the same direction?

**Post-Activity Discussion**Although all action-reaction events occur at the same moment, with equal magnitude, in the opposite direction on different objects, choose the station that you think was most helpful as a demonstration of the following and explain why:1. The force pairs are interchangeable; either could be called the action or reaction force.
2. The force pairs occur in opposite directions.
3. The force pairs are equal in magnitude.
4. The force pairs occur at exactly the same moment.
5. The force pairs act on different objects.
6. The interacting objects at some stations clearly demonstrated different motion after the action-reaction event. What affects motion differences that result from action-reaction events?
7. Which station most clearly demonstrated that mass and composition affect the resulting motion of interacting objects?
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