Newton's Third Law Worksheet - (Action-Reaction) Name: _____

Try to answer the questions below.

1. A diver dives off of a raft - what happens to the diver? The raft? How does this relate to Newton's Third Law?

   Action Force: _____ Reaction Force: _____

2. A tennis racquet hits a tennis ball. Why doesn't the racquet swing backwards when the ball hits it? (Shouldn't it swing back because of action-reaction forces?)

3. What action-reaction forces are involved when a rocket engine fires? Why doesn't a rocket need air to push on?

   Action Force: _____ Reaction Force: _____

4. What forces are acting on a book sitting on a table? Are action-reaction forces involved in this situation?

5. If two people each standing on a scooter board push off of each other what happens (Newton's 3rd Law)?

6. In #5 how would the distance moved by the scooter boards compare if one person had a lot more mass than the other person?

7. If a person standing on a scooter board pushes off of a wall, what happens? Can this situation be explained in terms of Newton's 3rd Law (action-reaction)?

8. How is shooting a shotgun related to Newton's 3rd Law? b. Why does a rifle have less "kick" than shotgun?

Newton's Third Law Worksheet - (Action-Reaction) - KEY

1. The diver moves "forward" and dives into the water. The raft moves "backwards" in the water because of the reaction force. The action force is the diver pushing off of the raft, and the reaction force is the raft pushing back on the diver (causing the diver to go forward and into the water).

2. The racquet does not swing backwards because the force of your arm keeps it from going back. The action force is the ball hitting the racquet (which your arm "absorbs"), the reaction force is the racquet pushing back on the ball causing it to go back across the net.

3. The action force is the rocket pushing out the "hot" gases produced by the engine. The reaction force is the hot gas pushing back on the rocket propelling it into outer space. There is no need for air to push on because the hot gases produced by the rocket allow the action and reaction forces to operate.

4. The forces on the book are gravity pulling the book down and the table pushing the book back up. These two forces are equal and opposite (action-reaction) forces.

5. When the two people push off of each other they move away from each other on the scooters because of the equal and opposite action and reaction forces. The speed at which and the distance each person moves depends on their mass, friction of the scooter, etc.

6. The person with less mass would move away faster and would most likely move a greater distance if the two scooters were identical (had the same amount of friction). This can be explained by Newton's 2nd Law (F=ma) because they both have the same force (action-reaction) the person with less mass will accelerate more.

7. The person moves away from the wall. In terms of action-reaction the person applies a force on the wall and the wall pushes back on the person with an equal and opposite amount of force (reaction force). Hopefully the person does not apply enough force to make the wall move.

8. When shooting a gun the action force is the gunpowder in the shell pushing on the little BB's in the shotgun shell. The reaction force is the BB's pushing backwards. This backwards force gets transferred to the gun and eventually to your shoulder (holding the gun). This is known as the "kick" of the shotgun.

   b. A rifle shell is smaller and has less mass than all of the BB's in a shotgun shell. Because of this less gunpowder is included in a rifle bullet to fire and move the bullet forward than a shotgun shell. In other words, because we are shooting less mass we need less force (which is provided by the gunpowder). This force is the "kick."