Name _____

A Day at the Races

Objective: To determine that for every force, there is an equal and opposite force.

Materials:

Balloons	plastic straws	tape	fishing line
Stop watch	meter stick		

Procedure:

1. Have one teammate hold the end of the fishing line so that it is taut and horizontal.
2. **MARK THE SPOT WHERE THIS PERSON WOULD STAND SO IT IS ALWAYS CONSTANT AS TO WHERE THE BALLOON SHOULD START!** The line must be held steady and **MAY NOT BE MOVED UP AND DOWN DURING THE EXPERIMENT!**
3. Have one teammate blow up a balloon and hold it shut with his or her fingers.
4. Have another teammate tape the straw along the side of the balloon.
5. Find the circumference of the balloon using the measuring tape– record in data table.
6. Thread the fishing line through the straw and hold the balloon at the far end of the line.
7. Assign one teammate to time the event. The balloon should be let go when the time keeper yells "GO!" Observe how your rocket moves toward the wall.
8. Have another teammate stand next to the blackboard and yell "STOP!" when the rocket hits its target. If the balloon does not make it all the way to the wall, "STOP!" should be called when the balloon stops moving.
9. The time keeper should record the flight time in seconds.
10. Measure the exact distance the rocket traveled in <u>meters.</u>
11. Calculate the speed at which the balloon traveled. Fill in your results for Trial 1 in the table below.
12. Each team should conduct 2 more races and complete the sections in the table for trials 2 and 3.
13. Then calculate the average speed.

Data Table 1: Balloon Speed and Circumference

	Distance (m)	**Time (seconds)**	**Speed (m/s)**	**Circumference of Balloon in centimeters**
Trial 1				
Trial 2				
Trial 3				

Average Speed of the Balloon = <u>Total Distance =</u>
Total Time

Conclusion Questions:

1. What made your rocket move?

   _____

   _____

2. How is Newton's Third Law of Motion demonstrated by this activity?

   _____

   _____

3. How is Newton's 1st Law demonstrated by this activity?

   _____

   _____

4. Did the circumference of the balloon affect the speed of the balloon? Why? Explain. What law does this relate to specifically.

   _____

   _____

   _____

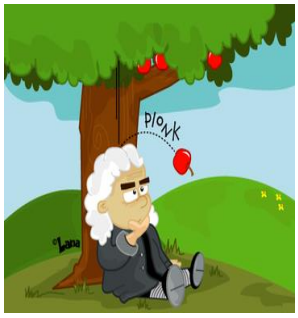
5. Draw pictures using **labeled arrows** to show the **action and reaction forces** acting on the balloon **after it was released.**

We are told that Sir Isaac Newton discovered some things about motion when an apple dropped on his head. Whatever "force" was behind his discoveries, we have benefited from his discoveries. Tell which law fits and describes each example below.

6. _____ A frog leaping upward off his lily pad is pulled downward gravity and lands on another lily pad instead of continuing on in a straight line.

7. _____ As the fuel in a rocket ignites, the force of the gas expansion and explosion pushes out the back of the rocket and pushes the rocket forward.

8. _____ When you are standing up in a subway train, and the train suddenly stops, your body continues to go forward.



9. _____ After you start up your motorbike, as you give it more gas, it goes faster.

10. _____ A pitched baseball goes faster than one that is gently thrown.

11. _____ A swimmer pushes water back with her arms, but her body moves forward.

12. _____ As an ice skater pushes harder with his leg muscles, he begins to move faster.

13. _____ When Bobby, age 5, and his dad are skipping pebbles on the pond, the pebbles that Bobby's dad throws go farther and faster than his.

14. _____ When you paddle a canoe, the canoe goes forward.

15. _____ A little girl who has been pulling a sled behind her in the snow is crying because when she stopped to tie her hat on, the sled kept moving and hit her in the back of her legs.