Name: _____ Period: _____

Newton's Race

Newton's Second Law of Motion

Newton's Second Law of Motion states that the greater the mass of an object, the more it resists being moved and therefore the smaller its acceleration will be. It also says that the greater the force applied to an object, the greater the objects acceleration will be. Newton's second law is often referred to by its accompanying formula, which is:

Force = mass x acceleration or F = ma

In this activity, we will be exploring what happens to force when the mass of an object increases and the acceleration remains the same. We will be working with cars where we will assume the acceleration of the car is constant – that the car increases its speed as it comes down the ramp at the same rate no matter what the mass of the car is. The distance the car is able to travel from the bottom of the ramp is the measure of the force it exerts.

Procedure:

1. Set up a ramp using a board and several books. Place one end of the ramp on the books and line up the other end with a piece of masking tape on the floor. Secure the board to the books so that it does not move.

2. Using a triple beam balance, find the mass of the car. Record this value in the proper column on the data table.

3. Place the vehicle at the top of your ramp and let it roll down the ramp. **DO NOT PUSH THE CAR!!** (This is important because you need the acceleration of the car to be constant.) Use a meter stick to measure how far the vehicle rolls. Measure to the front of the car. Record this value in the chart under trial 1. Repeat this step for trials 2 and 3.

4. Add a weight to the car. Find the new mass of the car and repeat the process from step 3. Make sure the weight remains in the car during the entire process. Record your measurements in the chart.

5. Find the average distance traveled by your car for both the weighted and unweighted trials. Record this value in the space provided.

Newton's Race Data Table

Description	Mass	Distance			Average distance
		Trial 1	Trial 2	Trial 3	
car alone					
car with weight					

Conclusion Questions:

1. How does increasing the mass of the car affect the force of objects in motion (distance the car rolls)? Explain your answer using data from the chart.

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2. What would happen if you added an additional 100 g of mass to the car with the weight? Predict how far the car would roll.

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3. Explain the results of your experiment in terms of Newton's Second Law. (HINT: read the introduction, and write about what happens to force when the mass of the object is increased.)

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