Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_ Block \_\_\_\_\_\_\_\_\_

**Newton’s Laws of Motion**

**At Work**

Sir Isaac Newton discovered the three laws of motion that still hold true today. The **1st Law of Motion** states: An object at rest will remain at rest, and an object in motion will remain in motion, unless acted upon by an unbalanced force. This law is also called the **Law of Inertia**. The **2nd Law of Motion** states: The net force of an object is equal to the products of its acceleration and its mass (F = m X a). The **3rd Law of Motion** states: For every action there is an equal and opposite reaction.

Perform each of the following activities and determine which law of motion each is putting into effect.



**Activity #1 – Newton’s Race**

**Procedure**:

1. **Find the mass of each ball**; wood, cork and aluminum
2. Use the wood block to place the 28cm end of a metric ruler on the edge of.
3. Place the 0cm end of the metric ruler on the black line in the circle of the mat.
4. Place the opening of the plastic cup **even with the black line in the circle**.
5. Roll the **wood ball** down the metric ruler, **from the 28cm mark**, and record the distance it pushed the cup onto the data table below.
	1. Repeat 2 more times.
6. Repeat this process for each of the other balls; cork and aluminum.

**Data Table**:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Ball****Type** | **Mass****(g)** | **Trial #1** | **Trial #2** | **Trial #3** | **Ave Dist.****(cm)** |
| Wood |  |  |  |  |  |
| Cork |  |  |  |  |  |
| Aluminum |  |  |  |  |  |

**Analysis**:

1. Which law of motion does this best represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How did **increasing the mass** of the ball affect the distance that the cup traveled? \_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If you were to use a **Styrofoam ball**, how do you think it would affect the distance that the cup moved?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If you were to use a **Steel ball**, how do you think it would affect the distance that the cup moved?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Activity #2 – Balloon Torpedo**

**A balloon** is blown up and attached to a straw that is sitting on a tight string (pictured to the right). When the mouth of the balloon is released:

* Label the direction of the **applied force**, the force that moved the balloon.
* Label the direction of the **resulting motion**, the direction the balloon will move.

**Analysis**:

1. Which law of motion does this best represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Does this best represent a balanced or unbalanced force? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Activity #3 – Wacky Penny**



**Procedure**:

1. Place an index card on top of the cup.
2. Place a penny in the middle of the index card.
3. Flick the index card with your finger and record what you observe.

**Analysis**:

1. Which law of motion does this best represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is another name for this law? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What was the force that acted on the index card? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What happened to the penny? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. What is the name of the force that acted on the penny? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_