**Investigation Types of Forces**

**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Item # \_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_**

**Instructions:** Each station has been set up for you. Carefully read the instructions below and make sure you return all materials when you finish the station for the next group.

**STATION 1: Marble Ramp**

You will release a marble from different starting points to determine the forces acting on the marble.

*TASK:*

1. Use the pipe insulator taped against the wall. Place the marble on the pipe insulator at 50 cm and release it. Observe and measure how far up the other side the marble traveled. Write your observations below.

3. Repeat step 2 from a height of 30 cm, 20 cm, and 10 cm. Observe and analyze the results.

*OBSERVATIONS*

|  |  |  |
| --- | --- | --- |
| **Starting Height (cm)** | **How far up did the marble travel?** | **Observations (What did you notice?)** |
| **50** |  |  |
| **30** |  |  |
| **20** |  |  |
| **10** |  |  |

*ANALYZING*

1. What force(s) are acting on the marble?

2. What was the effect of each of the forces(s) on the object?

**STATION 2: Ramp Rally**

This station has three ramps covered with different materials. Release your car and observe how it moves along each of these surfaces to investigate the forces acting on the car.

*TASK*

1. The ramps have been placed on three books and the surface has been prepped for you.

2. Release the car at the top of each ramp.

3. Time how long the car takes to get down the ramp, and measure how far the car continues once down the ramp. Write your observations below.

*OBSERVATIONS*

|  |  |  |
| --- | --- | --- |
| **Ramp Surface** | **How long did it take the car to travel down the ramp?** | **How far did the car travel beyond the ramp?** |
|  |  |  |
|  |  |  |
|  |  |  |

*ANALYZING*

1. What force(s) are being observed?

2. What was the effect of each of the force(s) on the object?

**STATION 3: Helicopters**

There are two pre-made paper helicopters at this station, one with short and wide blades, the other with long and narrow blades. You will release each helicopter (one at a time) from an elevated area. Observe the motion of the helicopters and record the how long it takes for it to fall to the ground.

*TASK*

1. Release each helicopter, one at a time, by holding it above your head (the tallest person in your group should probably do this).

2. Time how long the helicopter takes to get to the ground. Write the time below.

3. Observe how each one moves to the ground. Describe its motion in the box below.

*OBSERVATIONS*

|  |  |  |
| --- | --- | --- |
| **Model of Helicopter** | **How long did it take for the helicopter to reach the floor?** | **Describe its motion** |
| **1**  **Short and Wide Blades** |  |  |
| **2**  **Long and Narrow Blades** |  |  |

*ANALYZING*

1. What force(s) are being observed?

2. What was the effect of each of the force(s) on the object?

**STATION 4: Clingy Clips**

In this station, you are trying to lift paperclips through three different types of plastic cups.

*TASK*

1. Place paperclips under inverted plastic cup #1.

2. Bring the magnet close to the cup and try to lift the paperclips. How strong is the magnetic force? Add more paperclips to find out.

3. Repeat this process using cup #2 and cup #3.

4. Record the type of cup and each observation below.

*OBSERVATIONS*

|  |  |  |
| --- | --- | --- |
| **CUP** | **How many paper clips were held?** | **Observations (What did you notice?)** |
| **Cup 1:** |  |  |
| **Cup 2:** |  |  |
| **Cup 3:** |  |  |

*ANALYZING*

1. What force(s) are being observed?

2. What was the effect of each of the force(s) on the object?

**NEWTON’S LAWS of MOTION**

Read the scenarios on each card in the envelope. Organize the cards according to Newton’s Laws of Motion. Write Newton’s Laws in your own words, then write the matching card numbers for each of Newton’s Laws below.

**Newton’s First Law of Motion:**

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

**Newton’s Second Law of Motion:**

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

**Newton’s Third Law of Motion:**

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_

Card \_\_\_\_\_\_ Card \_\_\_\_\_\_