**Newton’s Laws Activities**

**Dominoes Dash (1st Law of Motion)**

**Background Information:**

Newton’s 1st law of motion, also called the Law of Inertia, states that objects at rest stay at rest and objects in motion will remain in motion until pushed or pulled by a force. When objects are not moving, they are said to be at rest.

Average speed is the rate of motion calculated by dividing the distance traveled by the amount of time it takes to travel that distance. Average speed = total distance traveled / travel time or s = d/t.

**Materials:** 28 dominoes, yardstick, stopwatch, and a calculator

**Procedures:**

1. Set up all 28 dominoes with equal spacing between them. Set the dominoes in a straight line to cause a chain reaction when the first domino is pushed.
2. Measure the length of the domino row from the first to the last domino in inches (in.) Record this data in the table.
3. Use the stopwatch to measure the time it takes for the entire row of dominoes to fall after the first domino is pushed until the last is down in seconds (sec). Record the data in the table below.
4. Calculate the speed at which the dominoes fell. Record the data in the table.
5. Set up another row at a different length. Repeat steps 3 and 4.
6. Repeat for a total of 4 trials.

**Data:**

Speed of Falling Dominoes

|  |  |  |
| --- | --- | --- |
| **Length of Domino Row (in)** | **Time to Fall (sec)** | **Average Speed of falling dominoes (in/sec)** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Data Analysis:**

Make a line graph on your graph paper to show the relationship between the length of the domino row and the time it takes to fall. Put the length of the row on the X-axis and the time to fall on the Y-axis.

**Conclusions:**

1. What effect does distance have on the speed of a moving object? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What effect does time have on the speed of the moving object? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How does this activity relate to Newton’s 1st Law of Motion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Various Ball Motion (2nd Law of Motion)**

**Background Information:**

Newton’s 2nd law of motion, also called the Law of Acceleration, states that the acceleration of an object is proportional (similar) to the force that’s applied to it, and inversely proportional (opposite) to the mass of the object. In other words, if the force remains constant (the same) as the mass of an object increases, its acceleration will decrease and vice versa. Force is calculated by multiplying mass times acceleration of F = m x a

**Materials:** ping pong ball, dice, foam ball, golf ball, straw, and tray with raised side to capture moving balls.

**Procedures:**

1. Set ball over marked area on the counter and apply force by blowing through a straw on the ball until it reaches the textbook. Record the acceleration rate on the table as slow, medium, or fast by placing a check on which applies.
2. Apply the same force (blow with the same force) on the next ball and record your observation.
3. Repeat the same procedure with the other balls and record your observations.

**Data:**

Acceleration Rate of the Balls

|  |  |  |  |
| --- | --- | --- | --- |
| Balls and their weight in grams (g) | Slow Speed | Medium Speed | Fast Speed |
| Ping Pong ball g |  |  |  |
| Foam golf ball g |  |  |  |
| Golf ball g |  |  |  |
| Dice g |  |  |  |

**Data Analysis:**

Make a bar graph using the back side of your graph paper to show the relationship between the weight of the balls and the acceleration rate. Put the weight of the balls on the x-axis and the acceleration rate on the y-axis (slow, medium, fast). Mark slow, medium, and fast rates at equal distances on the graph.

**Conclusions:**

1. As the weight increases, what happens to the acceleration? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Why did we use a bar graph to display the data? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How does this activity relate to Newton’s 2nd law of motion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Balloon Rocket (3rd Law of Motion)**

**Background Information:**

A rocket’s movement depends on Newton’s 3rd law of motion, also termed Law of Action/Reaction, which states that for every action, there is an equal and opposite reaction. When a rocket blows out gas in one direction (action force), the rocket is pushed in the opposite direction (reaction force). In other words, when there is a force on one thing in one direction, another force is acting on something else in another direction. The gas pushes against the rocket and the rocket pushes back just as hard against the gas.

**Materials:** string, straws, medium size balloon, and tape

**Procedures:**

1. Blow up a balloon, but do not tie it.
2. Tie the string around two chairs located about five feet apart.
3. Using the straw and tape, fasten the balloon to the straw in order to secure the balloon to the string using the straw.
4. Release the balloon. Record your observations.
5. Obtain the same balloon and blow it up halfway, repeating step 4. Record your observations.

**Data:**

Draw your observations of the experiment.

**Conclusions:**

1. What is the action force in this experiment?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is the reaction force in the experiment?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What happened when the amount of force (amount of air in balloon) was changed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. How does this activity relate to Newton’s 3rd law of motion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_