Name: _____
Partners: _____
Date: _____
Period: _____

Newton's Laws Activities

Dominoes Dash (1st Law of Motion)

Background Information:

Isaac 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, meter stick, stopwatch, and a calculator.

Procedure:

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 centimeters (cm). 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.
4. Calculate the speed at which the dominoes fell. Record the data in the table.
5. Set up another row of a different length. Repeat steps 3 – 4.
6. Repeat for a total of 5 trials.

Data:

Speed of Falling Dominoes		
Length of domino row (cm)	**Time to fall (sec)**	**Average speed of falling dominoes (cm / sec)**

Data Analysis:

Make a line graph 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 .

Title: _____

Data Analysis:

What relationship do we see between the variables? In other words, how does the independent variable affect the dependent variable?

_____

_____

_____

Conclusions:

1. What effect does distance have on the speed of a moving object?

2. What effect does time have on the speed of a moving object?

3. What was the independent variable in this experiment? Why?

4. What was the dependent variable in this experiment? Why?

5. What are the controlled variables (constants) in this experiment?

6. Why did we use a line graph to display the data?

7. How does this activity relate to Newton's 1st Law of Motion (Law of Inertia)?

Marble Motion (2nd Law of Motion)

Background Information:

Isaac 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 or $F = m \times a$

Materials: ping pong ball, small marble, golf ball, softball, straw, and tray with raised side to capture moving balls

Procedure:

1. Set ball over marked area of the tray and apply force by blowing through a straw on the ball to reach the other side of the tray with the raised side. 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.

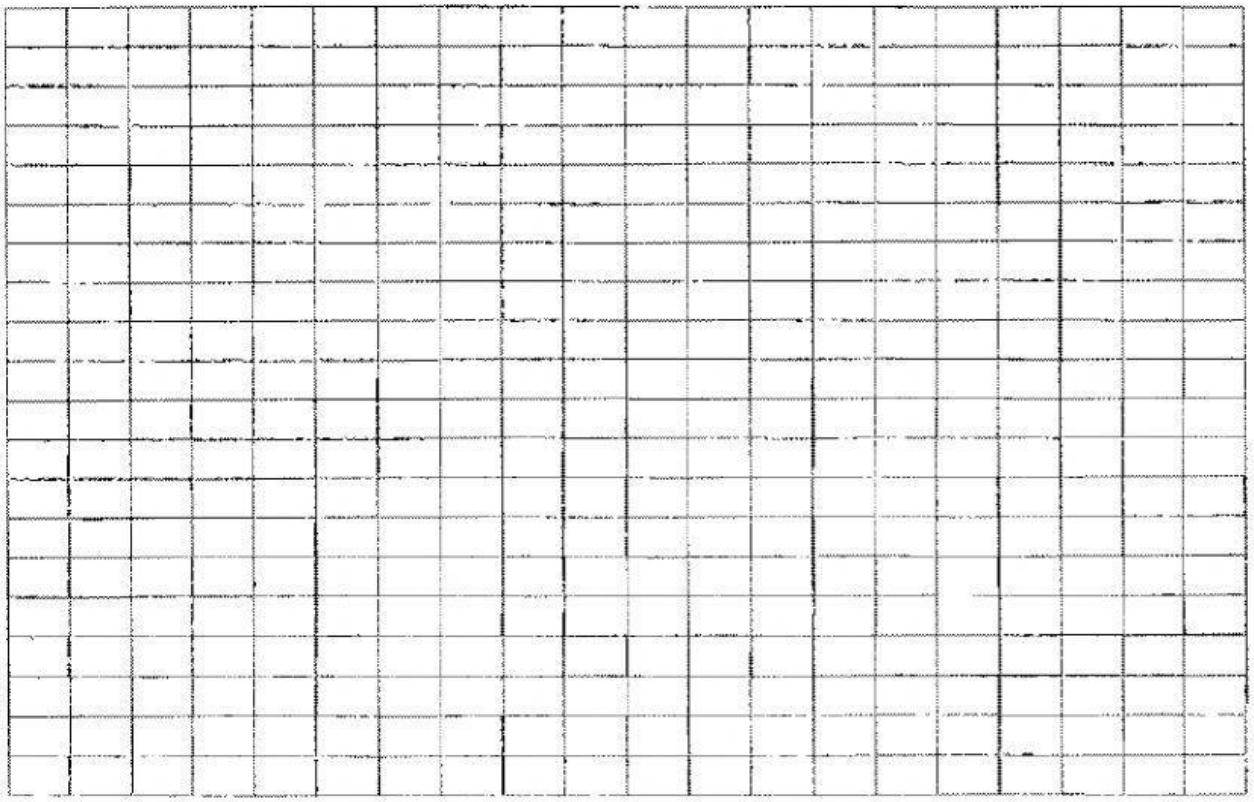
Data:

Balls and their weights in grams (g)	Acceleration Rate of the Balls		
	Slow speed	Medium speed	Fast speed
Ping Pong g			
Marble g			
Golf ball g			
Softball g			

Data Analysis:

Make a bar graph 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.

Title: _____



Conclusions:

1. What was the independent variable in this experiment? Why?

2. What was the dependent variable in this experiment? Why?

3. What are the controlled variables (constants) in this experiment?

4. Why did we use a bar graph to display the data?

5. How does this activity relate to Newton's 2st Law of Motion (Law of Acceleration)?

Balloon Rockets (3rd Law of Motion)

Background Information:

A rocket's movement depends on Newton's third 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 ga 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 th gas.

Materials: fishing string stretched across a room, straw, medium size balloon, and tape.

Procedure:

1. Blow up a balloon, but do not tie it.
2. Surround a long piece of scotch tape around one straw located on the fishing line and attach to one end of the inflated balloon. Add tape around the other straw and tape it to the other end c the balloon in order to secure the inflated balloon to the hanging string.
3. Slide the balloon-straw system down at equal distances to your other classmates.
4. Release the balloon. Record your observations.
5. Obtain same balloon and blow it up half-way and repeat steps 2-4.

Data:

Draw your observation of the experiment.

Questions:

1. What is the action force in this experiment?

   _____

2. What is the reaction force in this experiment?

   _____

3. What happened when the amount of force (amount of air in the balloon) was changed?

   _____

4. How does this activity relate to Newton's 3rd Law of Motion (Law of Action/Reaction)?

   _____

   _____

   _____

5. Explain how bumper cars at an amusement park apply the third law of motion.

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