

Name _____ Block _____ Date _____

Newton's 2nd Law Investigation

Lisa Peck

Task: Design an investigation to answer the question: **How are force and mass related to acceleration of an object?**

Develop each component of the investigation including a hypothesis, procedures, data collection, data analysis, and conclusions.

Implement your procedure only when it has been approved by Mrs. Peck.

Materials:	balloon	string
	meter stick	tape
	scissors	washers ($m = 10g$)
	straws	stop watch
	fishing line	sharpie

Part 1 Procedure:

1. Design an investigation to determine how force is related to acceleration.

Answer:

a. What is force?

b. Using a balloon, how can you change the amount of force?
(how can you manipulate the variable force?)

c. What is acceleration?

2. Have design approved by Mrs. Peck

3. Perform experiment and collect data.

4. Using a spreadsheet, create a graph of data. (follow tutorial)

5. Analyze the data to determine the relationship between force and acceleration.

Part 1: How is force related to acceleration?

2

1. Design investigation:

Hypothesis: (if....then)

Independent Variable (variable you change on purpose)

Dependent Variable (the variable that will change or depend on the manipulating of the independent variable)

Constants: (other variables that you will hold constant or not change)

Experimental Design: draw picture and explain

Part 1: How is force related to acceleration?

3

Circumference (meters)	Distance (meters)	Time (seconds)	Acceleration $a = \frac{2d}{t^2}$ (m/ s/ s)

3. Perform experiment and collect data
4. Using a spreadsheet, create a graph of the data (diameter vs. acceleration).
5. Analyze the data to determine the relationship between force & acceleration.
Hypothesis restated:

Was your hypothesis supported?

Why or why not?

Analysis: Using actual data, how did changing the force (related to the circumference of the balloon) effect the acceleration of the balloon?

Part 1: How is force related to acceleration

4

Conclusion: How is force related to acceleration?

Reflection:

1. If you were to do this experiment again, what would you change?

2. Design another investigation to determine how force is related to acceleration. (note: you will not have to perform this experiment)

Part 2 How is mass related to acceleration? 5

1. Design an investigation to determine how mass is related to acceleration.

a. What is mass?

b. Using given materials, how can you change the amount of mass? (how can you change the variable mass?)

c. What is acceleration?

How is mass related to acceleration?

1. Design investigation:

Hypothesis:

Independent Variable (variable you change on purpose)

Dependent Variable (the variable that will change or depend on the manipulating of the independent variable)

Constants: (other variables that you will hold constant or not change)

Part 2 How is mass related to acceleration?
Experimental Design: draw picture and explain

6

3. Perform experiment and collect data (mass of washer = 10g)

Mass (grams added)	Distance (meters)	Time (seconds)	Acceleration $a = \frac{2d}{t^2}$ (m/ s/ s)

4. Using a spreadsheet, create a graph of the data (mass vs. acceleration).
5. Analyze the data to determine the relationship between mass & acceleration.

Hypothesis restated:

Was your hypothesis supported? _____

Why or why not?

Part 2: How is mass related to acceleration

7

Analysis: Using actual data, how did changing the mass (related to adding pennies to the balloon) effect the acceleration of the balloon?

Conclusion: How is mass related to acceleration?

Reflection:

1. If you were to do this experiment again, what would you change?

2. **Design another investigation to determine how mass is related to acceleration.** (note: you will not have to perform this experiment)