

***Investigating Acceleration
Motion on an Inclined Plane***
Teacher Resource

Grade Level **6-12**

Objectives

1. The student will investigate mass and slope as factors for acceleration.
2. The student will employ simple equipment and tools to gather data.
3. The student will demonstrate the use of 21st century technology with a document camera.

National Standards

NS.K-4.1 ; NS.5-8.1 ; NS.9-12.1	Science as Inquiry
NS.K-4.2 ; NS.5-8.2 ; NS.9-12.2	Physical Science
NS.K-4.5 ; NS.5-8.5 ; NS.9-12.5	Science & Technology
NT.K-12.1	Basic Operations and Concepts
NT.K-12.3	Technology Productivity Tools
NT.K-12.6	Technology Problem-Solving & Decision-Making Tools

Teacher Background Information

In this experiment, the student will investigate if mass or slope effects the acceleration of a cart. Newton’s Second Law of Motion states that the acceleration of an object is dependent upon the net force acting upon the object and the mass of the object. As the net force increases on the object, the acceleration should increase as well, use the following equation below:

$$a=g\sin\theta$$

a =acceleration

g=gravity

θ =height/length

Gravity= 9.81 m/s²

MATERIALS

Document Camera

Personal Computer

Interactive White Board/Projector

Adjustable Track

Basic Wheeled Test Vehicle

Steel Marbles

Ruler

Timing Gate

PROCEDURE

1. Position the document camera so the track, timer, and vehicle with three steel marbles are present on the computer and interactive white board.
2. Set the vehicle with the three steel marbles to the specific measurement away from the timing gate.
3. Release the vehicle up against the rubber stopper each time and record the time in seconds for all four average trials.
4. Record all trials in the data table below.
5. For Trial 1, set the vehicle 5 cm away from the timing gate.
6. Record the time and repeat Trial 1 three times and take an average.
7. For Trial 2, set the vehicle 15 cm away from the timing gate.
8. Record the time and repeat Trial 2 three times and take an average.
9. For Trial 3, set the vehicle 25 cm away from the timing gate.
10. Record the time and repeat Trial 3 three times and take an average.
11. For Trial 4, set the vehicle 35 cm away from the timing gate.
12. Record the time and repeat Trial 4 three times and take an average.

Data Table

h (cm)	Time (s)				
	Trial 1	Trial 2	Trial 3	Trial 4	Average
5					
15					
25					
35					

QUESTIONS

1. What is the acceleration for Trial 1-4? Show all your work in the space provided below.
2. Identify the following:
 - a. Independent variable
 - b. Dependent variable
 - c. The constants
3. What acceleration rate do you expect if the ramp is horizontal?
4. Suppose the ramp is completely vertical. What acceleration does your model predict?
5. Plot a graph of your data.

PRESENTATION

Have students prepare a lab report including the data, images, and video to give a presentation on the interactive white board or projector for the class.

EXTENSION

- Have the students explore how to increase and decrease acceleration.
- Have the students explore free fall acceleration.