

Force Interactive Frictionless Situations

Purpose:

The purpose of this activity is to investigate the variables that affect the acceleration of an object and the manner in which those variables affect the acceleration.

Background:

When forces are unbalanced, objects accelerate. But what exactly affects the acceleration of the object? You will explore this question by running a collection of simulations in the absence of friction. Set the friction value to 0.00 and run the following trials. Collect sufficient velocity-time information (fifth column) for determining the acceleration in the last column.

Data:

Trial	Applied Force (N)	Mass (kg)	Net Force (N)	Velocity-time Information	Acceleration (m/s/s)
1	10.0	2.0			
2	20.0	2.0			
3	40.0	2.0			
4	60.0	2.0			
5	80.0	2.0			
6	100.0	2.0			
7	40.0	1.0			
8	40.0	3.0			
9	40.0	4.0			
10	40.0	5.0			

Use the collected data to answer the questions in the **Analysis** section.

Analysis:

1. What affect does a doubling of the net force have upon the acceleration of the object? Be quantitative. (Don't just say it decreases or increases; indicate *the factor* by which acceleration decreases or increases.)

Identify a set of two trials that support your answer above: _____

2. What affect does a tripling of the net force have upon the acceleration of the object? Be quantitative.

Identify a set of two trials that support your answer above: _____

3. What affect does a doubling of the mass have upon the acceleration of the object? Be quantitative.

Identify a set of two trials that support your answer above: _____

4. What affect does a quadrupling of the mass have upon the acceleration of the object? Be quantitative.

Identify a set of two trials that support your answer above: _____

5. Lab partners Vera and Bill Confuzzens attempted to use Trials 5 and 8 to show the affect that a doubling of force has upon the acceleration. Explain why these two trials cannot be used to show the affect of force upon acceleration.

Conclusion:

Consider the original question that prompted this investigation:

What variables affect the acceleration of an object and in what manner do they affect the acceleration?

Make a **claim** in which you attempt to answer this question. Then support the claim with **evidence** (specific references to trials of data) and **reasoning** in which you explain how the data support the claim that you have made.