Examining Free Fall Acceleration of Common Household Objects

VIDEO:

INTRODUCTION:

Sports announcers will occasionally say that a person is accelerating if he/she is moving fast. Yet acceleration has nothing to do with going fast. A person can be moving very fast and still not be accelerating. **Acceleration** has to do with changing how fast an object is moving.

CONSTANT Acceleration

Time (s)	Velocity (m/s)
0	0
1	4
2	8
3	12
4	16

CHANGING Acceleration

Time (s)	Velocity (m/s)
0	0
1	1
2	4
3	5
4	7

Sometimes an accelerating object will change its velocity by the same amount each second (shown to the right). As mentioned in the previous section, the data table shows an object changing its velocity by 4 m/s in each consecutive second. This is referred to as a **constant acceleration** since the velocity is changing by a constant amount each second. An object with a constant acceleration should not be confused with an object with a constant velocity. Don't be fooled! If an object is changing its velocity -whether by a constant amount or a varying amount - then it is an accelerating object. However, do all falling objects TRULY have the same acceleration? Use your inquiry skills to find out!

The average acceleration (a) of any object over a given interval of time (t) can be calculated using the equation

$$\text{Acceleration} = \frac{change\ in\ velocity}{time\ taken}$$

$$\text{Acceleration} = \frac{final\ velocity - initial\ velocity}{time\ taken}$$

$$a = \frac{Vf - Vi}{t}$$

PURPOSE:

Use math and computational skills to collect evidence to determine the acceleration of falling objects

PROCEDURE:

1. Determine a displacement that you will drop the objects
2. Drop the first object and time how long it takes to reach the ground
3. Repeat step 3 for multiple trials and determine the average time
4. Calculate the Velocity of the object (disp/time)
5. Calculate the acceleration of the object (V_f-V_i/t)
6. Repeat Steps 1-5 with a different object

DATA/OBSERVATIONS:

Objects	Displacement (m)	Avg Time (s)	Velocity (m/s)	Acceleration (m/s^2)

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CONCLUSION:

1. Which object had the greatest free fall acceleration? Explain why you think this happened?

2. Are the differences between your values of acceleration SIGNIFICANTLY different? What factors do you think may have led to these differences?

3. Discuss possible errors that may have occurred during data collection and what you would revise about the procedure if you had to repeat this investigation.

4. **Explain**, what force is causing the acceleration of these objects. Are there any other forces that may have been ignored? How would they affect the acceleration of these objects?