Hopper Lab (Guided LT)

PSI Physics

Name:_____

Problem: The goal of this lab is to determine:

1. the time (t) a hopper is in the air and
2. the initial velocity (v_0) of the hopper.

Materials:

- One large hopper
- One small hopper
- Meter stick

Procedure: Gather your data using the following procedure:

1. Invert the hopper and place it on your lab top.
2. Using a ruler, determine the maximum height the hopper reaches.
3. Repeat this process 5 times for each of your two hoppers.
4. Fill in the chart with your data.

Data:

	Large Hopper Height, Δx	Small Hopper Height, Δx
Trial 1		
Trial 2		
Trial 3		
Trial 4		
Trial 5		
Average Height		

Equations:

$$\boldsymbol{v = v_o + at}$$

$$\boldsymbol{x = x_o + v_o t + \frac{1}{2} a t^2}$$

$$\boldsymbol{v^2 = v_o^2 + 2a(x - x_o)}$$

$$\boldsymbol{g = -9.8 \frac{m}{s^2}}$$

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Analysis:

1. What is the speed of a hopper when it reaches the highest point of its trajectory?

2. Using the equations above, calculate the initial velocity of each hopper using the average height.

   a. Large hopper

   b. Small Hopper

3. Find the time each hopper was moving up in the air using the average height.

   a. Large hopper

   b. Small Hopper

Interpretation and Application Questions:

1. What is the velocity of the large hopper at the instant before it hits the table? Prove your answer using one of the given kinematics equations (*).

2. A coin was flipped in the air and reached a maximum height of 1.5 meters. What was the initial velocity? How long was the coin in the air? Ignore air resistance.