Slow Down: Post Lab

Physics 203: Profs. Yaverbaum, Bean, Lu, Kitayama, Alexander
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1. The Epistemological Table

Claim	Type of Knowledge
$\Sigma F = ma$	
The distance the ball traveled up the ramp in trial 3 was 53.4 cm.	
The time the ball took to reach its highest point in trial 3 was 1.2 s.	
$\bar{v} = \frac{x - x_0}{t - t_0}$	
The average velocity of the "up" trip for the metal ball was 43.2 cm/s.	
The average velocity of any trip under constant acceleration is the instantaneous velocity halfway through the trip.	
The ball was under constant acceleration during the up trip.	
$\bar{a} = \frac{v - v_0}{t - t_0}$	
The final velocity of the up trip and the initial velocity of the down trip were both 0.	
The average acceleration on the down trip was 15.32 cm/s^2	
The angle between the table and the ramp was 5^o.	
$\mu = \frac{F_f}{F_N}$	
The ave. force of friction between the marble and the ramp was 0.3 N	
The coefficient of friction between the marble and the ramp was 0.31.	

2. Research Design Chart

You are to select a measurement you have made in this lab to analyze.

3. The Counter-Factual

i) Imagine you decided to repeat the experiment, but instead of flicking a metal ball up a slightly tilted, frictional ramp, you pushed a glider up a slightly tilted, ***frictionless*** air track. How would you expect the time intervals for the up trip and the down trip to differ? Explain how you reached your answer as thoroughly as you can. Use any diagrams you feel necessary.

ii) Imagine the angle to which you had raised your frictional ramp was 5 degrees higher than it actually was. How would you expect the forces on the marble to be altered from the actual experiment? How will this affect the accelerations, velocities, and time intervals for the up and down trips? Provide numbers.

4. **Wild Card**

i) Look back at your experiment. Think about the times when your experiment had to be repeated because the ball had rolled off the top of your ramp. Using the data you obtained from the experiment, find the maximum ***initial*** velocity of the mass relative to the ramp during the up trip that would still allow the marble to stop and roll back down the ramp before it went off the edge—in other words, with what initial velocity should you flick the ball in order to make it go all the way up the ramp and stop just before falling off the edge. What was the maximum ***final*** velocity the ball could achieve during the down trip?

ii) A lab group performing the "Slow Down" lab began timing at the beginning of the "flicking" motion, so that the time taken for the flick was ***included*** in their time data. Why is this data ***not*** useful? How is the period of time during which the marble is being flicked completely ***different*** from the rest of the trip? In what ways does your analysis of the marble on the plane ***not*** apply to the time during which the marble is being flicked? Please answer these questions in detail, in one, coherent paragraph.