Experiment 3 Equations of Motion

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We used a grooved ruler, a block of some sort and the phone app phyphox to set up ramps of 10˚, 8˚, 5˚. We then rolled a ball down the ramp and down a 50cm path made with 2 sheets of paper, recording the times. We then calculated the acceleration using the values we got from the experiment. The values calculated were often lower than the predicted values, but this is likely due to a mix of friction and human error.

Results

For every angle, using final velocity to find acceleration had the lowest uncertainty, using distance traveled landed in the middle in terms of uncertainty, and using both distance and final velocity had the greatest uncertainty. For example, at 10˚ the uncertainty using final velocity was ±0.25 while using distance was ±0.35 and using both distance and final velocity had an uncertainty of ±0.72. Another difference I noticed was that for every angle other than 5˚, the uncertainty from using final velocity and the uncertainty from using distance were similar but the uncertainty from using final velocity and distance was vastly greater.

Questions for Discussion

1. Describe the motion of the ball as it rolls down the inclined plane and compare it to the motion of the ball rolling along the horizontal surface.

While rolling down the inclined plane, the ball accelerated while the ball maintained a mostly constant velocity rolling down the horizontal surface.

1. How does the angle of the inclined plane affect the motion of the ball rolling down the inclined plane? What is the reason for this? Draw a force diagram for all three angles to help to explain your reasoning.

The acceleration increased with the angle of the inclined plane. This is because with a greater angle, there would be a greater force in the x direction.A close up of a sign

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1. Ideally, an object should move down an inclined plane under the force of gravity with an acceleration of: . The value for g is 9.81 meters/sec2. Do the accelerations that you determined for each angle compare to this expected value? If not, state why they do not.

The accelerations determined do not compare with this expected value. This is likely because of the existence of friction, but there could also have been some human error when collecting data.

1. If the length of your inclined plane was increased to twice its length, how would this affect the acceleration determined for each of the angles of the inclined plane?