

Activity Follow-up Questions

Ball on an Inclined Plane

1. How did Galileo's rolling ball experiments contribute to the development of the scientific method?
2. This experiment uses video data recorded at 30 frames per second. How many frames would need to be recorded to capture 2 minutes of data?
3. In the experiment plots, the distance measurements closely follow the polynomial model, but the measured velocity values show noticeably more scatter. The measured acceleration values are even more scattered, even though the ball is expected to accelerate at nearly a constant rate. Each time we calculate average values, we are subtracting two nearby measurements. Errors in the original position measurements therefore become larger in the average velocity, and larger still in the average acceleration. Why do average acceleration values show much more scatter than the measured distance values compared to the plotted models?
4. Given the equation $\Delta x = v_0 t + 1/2 a t^2$ if the ball starts at rest and has an acceleration equal to the constant acceleration obtained from the polynomial model in Step 6 of the experiment, how far will it have traveled (in m) after two seconds?

Please include your value for a in your answer.

Gravitational Acceleration on the Moon

1. In part 3, the equations for the distance fallen by the hammer and the feather are given as a function of time when the data is plotted. Knowing that the equation for velocity is determined by taking the derivative of the function $x(t)$ with respect to time, what are the equations for velocity for the hammer and the feather?
2. The actual value for gravitational acceleration on the Moon is 1.62 m/s^2 . Calculate the percent error for the gravitational acceleration for both the hammer and the feather. Please include the acceleration values found for each object.
3. Calculate how long it would take the hammer to fall the same distance (1.6 meters) on Earth using the equation $\Delta x = v_0 t + 1/2 a t^2$ where the hammer starts from rest and $a = 9.81 \text{ m/s}^2$.