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Title: Projectile motion

Purpose: To analyze projectile motion using video analysis

Background: Projectiles are defined as objects moving:
1. Under the force of gravity
2. No propulsion
3. No wings
4. In ideal situations, we ignore air resistance
5. When graphed over time, it creates a parabolic curve of the form $y = Ax^2$

Materials:

Logger Pro

video capture device

meter stick

ball

thrower

Marking cones

Procedure:
1. Choose a ball
2. Setup camera, including meter stick for calibration
3. Start camera capture
4. Throw ball
5. Stop camera, and analyze
6. Using Logger Pro, track with dots
7. Analyze the graphs

Data:

Observation: When we threw the ball, the ball ascended, then descended symmetrically. The data shows a parabolic curve for the Y velocity, and a negative linear slope for the X velocity.
Analysis: The distance graph looks similar to the dot track in that they are both parabolic. The velocity decreases constantly, due to friction. The slope of X Velocity is about -2.5 m/s. The error percentage is 4.6%. Acceleration is -4.45, which when doubled, it would be -9.9, close to -9.8 m/s2. The slight air resistance made our g value higher than -9.8 m/s2.
Conclusions: Next time, I would use a camera system that takes faster shots and frames. I would throw the ball higher for more data points and more accuracy. Overall, the experiment was a success because we graphed a parabola that very closely matches the freefall acceleration of 9.8 m/s2.