LAB 9. THE PENDULUM CHALLENGE

Introduction

You will swing a fishing sinker attached to a thread so that when the sinker reaches the bottom of its swing, a sharp blade cuts he thread. Your challenge is to predict exactly where the sinker will land on the floor. You don't get to test your prediction until your instructor witnesses it.

Supplies

Vertical stand, horizontal bar, fine thread, fishing sinker, white paper, carbon paper, tape, target, plumb line, measuring tape, utility blade

Activity

1. Tie the thread to the fishing sinker. Hang the sinker by the thread from the horizontal bar so that the knot is just below the level of the table top. (When the sinker is released as a pendulum, a blade fastened to the table top will cut the string right above the knot.) You may make the string any length you like.
2. Decide how to release the pendulum so that the blade cuts the swinging thread. Calculate where the sinker will land after the thread is cut.
3. Tape the target to the floor exactly where you predict the sinker will land.
4. Call the instructor. Allow the instructor to attach the blade to the table top directly under the point where the thread is attached, so that the swinging thread meets the edge of the blade at a glancing angle.
5. Place a piece of carbon paper, carbon side down, atop the target.
6. While the instructor watches, position and release the sinker so that its thread is cut at the bottom of its swing and the sinker lands on the floor at the predicted spot.
7. Allow the instructor to remove the carbon paper and observe the carbon mark left by the landing sinker.

Evaluation

1. If the carbon mark is within 2.0 cm of the target, you have completed this lab!
2. If the mark is more than 2.0 cm distant from the target:
   a. Measure where the sinker actually landed.
   b. Determine what went wrong in your calculation or execution.
   c. Explain your findings to the instructor.
   d. Try once more.
3. If the carbon mark is within 2.0 cm of the target, you have completed this lab!

4. If the mark is more than 2.0 cm distant from the target, your group must make a report. Measure and record the mass of the sinker. Record the specifics of your apparatus: thread length, table height, height of release of the sinker, etc. You will need them for your report.

Report

If the sinker failed to hit the mark twice, write a complete report detailing your activities and findings.

Apparatus

Describe your system: length of thread, mass of sinker, height of table, and all other quantities needed to fully specify it.

Model

Describe the mathematical model you used to simulate the system. Include the formulas you used, the variables you were trying to find, and the values of all quantities. Report the results of your predictions.

Procedure

Describe the steps you followed in "launching" the pendulum.

Results

Report where the sinker actually landed in both attempts.

Analysis

Explore why you missed the target. Were there effects that you did not consider? Were any quantities measured in error? Were incorrect quantities used in formulas? Did your model use correct physics concepts?

Does further consideration lead you to a revised prediction? If so, explain how you arrived at the prediction. Does your revised prediction match the actual results?