Physics: Lab 3.2

Bull's Eye!

Name _____ Hour _____

Lab Partners _____

Purpose:

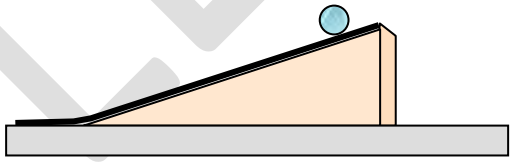
Predict the landing position of a marble when it is released from a given height with a horizontal velocity.

Equipment:

Ramp with attached track
Marble
Target
Tape
Meter Stick

Preparation:

1. Position the marble ramp on the edge of the lab table, as shown in the diagram at right. The end of the track should bend so that it is horizontal at the bottom of the ramp, but should not extend past the edge of the lab table. Use tape to mark a starting point on the ramp. This starting point should be used for each trial in the lab. Practice rolling the marble off the ramp, making sure that the marble leaves the table in a horizontal direction.

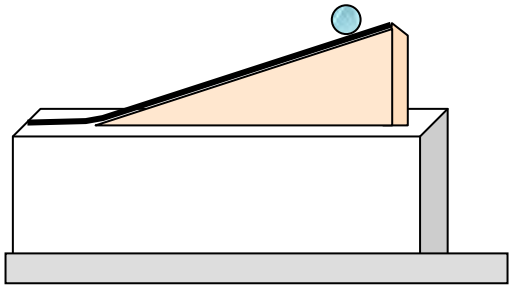


Procedures: Calculating Initial Velocity

1. In order to predict the landing position of the marble, you will need to determine the initial velocity of the marble as it leaves the lab table. Decide what measurements will be required to determine this initial velocity. To improve accuracy, time should be calculated and not measured directly with a stopwatch. In addition, several trials may be required. In the space below, record any measurements taken and show each step of your calculations, including any equations used.

Initial Velocity (v_x): _____

Procedures: Calculating a Predicted Horizontal Distance



2. In this portion of the lab, the marble ramp will be placed on a platform above the surface of the lab table. Because the initial velocity of the marble will not change, you can calculate the expected landing position of the marble when released from the platform. You may measure the platform to determine the additional height of the marble ramp, but do not use trial and error to test where the marble will land. Decide what measurements will be required to determine the predicted horizontal landing distance of the marble when it is released from the ramp on the platform. In the space below, record any measurements taken and show each step of your calculations, including any equations used. In addition, draw a diagram showing the path of the marble as it leaves the ramp and any important distance measurements taken.

Predicted Horizontal Distance *(d_x)*: _____

3. When you have completed calculating the predicted horizontal distance, attach a target to the floor at the expected landing area. Have your teacher initial your prediction. Then place the marble ramp on the platform to test your results!

4. Mark the actual landing position of the marble and record this horizontal distance below. If there are significant differences in the predicted and actual landing positions of the marble, check your calculations and try again. If your marble strikes the target or near the target, complete the summary questions on the next page.

Actual Horizontal Distance *(d_x)*: _____

Summary Questions:

1. Did the marble land in the target area when it was released from the platform? If so, how close were your measurements? If not, what errors might have contributed to a difference in actual and predicted landing areas?

2. Why is it important for the marble to leave the table with only horizontal velocity and no vertical velocity?

3. How would the horizontal distance traveled by the marble change if the platform was taller? . . . shorter? Why would these changes occur?

4. When the marble is released at the top of the ramp, it has no velocity in either the horizontal or vertical direction. What causes the marble to have a horizontal velocity when it leaves the table?

5. Suppose a fast-moving bullet were shot out of a gun positioned on the lab table at the same height as the marble ramps. How long would it take the bullet to fall to the floor? How would the horizontal distance traveled by the bullet compare to the horizontal distance traveled by the marble projectiles? Explain your answer.