Name: _____ Date: _____

Lab – Projectile Motion – Effect of Mass

Objective: To use the horizontal speed of a ball leaving a ramp to predict where a ball will hit the floor.

Hypothesis: I predict the ball with hit the floor:

Trial 1 – _____ m away

Trial 2 – _____ m away

Trial 3 – _____ m away

Equipment:
ball ramp cup meterstick

Procedure:
1. Set up a ramp on a lab table making sure there is plenty of room for the ball to roll off the table and hit the floor.
2. Make sure the ball will roll across at least 20 cm of flat table before rolling off the table's edge. Record the exact horizontal distance below.
3. Have a time keeper record the time it takes for the ball to travel from the bottom of the ramp to the edge of the table (the horizontal distance you measured before). Do not let the ball roll off the table.
4. Determine the vertical height the ball must fall to reach the cup.
5. Use this value to determine the time the ball spends in the air.
6. Finally, determine the horizontal distance the ball will travel. Measure this distance on the floor and secure the cup at this point. This is the predicted horizontal distance.
7. Locate a position on the ramp. Mark it with tape so it can be certain that the release point is constant. Roll the ball down the ramp. Does it land in the cup? Mark the exact spot the ball lands and measure this as the actual horizontal range.
8. Repeat this procedure two more times with balls of a different mass.

Data:

Mass of ball	_____	_____	_____
Horizontal distance	_____	_____	_____
Time of ball rolling off table	_____	_____	_____
Horizontal speed	_____	_____	_____
Vertical distance ball will fall	_____	_____	_____
Time ball spends in the air	_____	_____	_____
Actual horizontal range	_____	_____	_____

Name: _____ Date: _____

Lab – Projectile Motion – Effect of Angle

Objective: To use the horizontal speed of a ball leaving a ramp to predict where a ball will hit the floor.

Hypothesis: I predict the ball with hit the floor:

Trial 1 – _____ m away

Trial 2 – _____ m away

Trial 3 – _____ m away

Equipment:
ball ramp cup meterstick

Procedure:
1. Set up a ramp on a lab table making sure there is plenty of room for the ball to roll off the table and hit the floor.
2. Make sure the ball will roll across at least 20 cm of flat table before rolling off the table's edge. Record the exact horizontal distance below.
3. Have a time keeper record the time it takes for the ball to travel from the bottom of the ramp to the edge of the table (the horizontal distance you measured before). Do not let the ball roll off the table.
4. Determine the vertical height the ball must fall to reach the cup.
5. Use this value to determine the time the ball spends in the air.
6. Finally, determine the horizontal distance the ball will travel. Measure this distance on the floor and secure the cup at this point. This is the predicted horizontal distance.
7. Locate a position on the ramp. Mark it with tape so it can be certain that the release point is constant. Roll the ball down the ramp. Does it land in the cup? Mark the exact spot the ball lands and measure this as the actual horizontal range.
8. Repeat this procedure two more times with the ramp oriented at a different angle.

Data:

Angle of ramp	_____	_____	_____
Horizontal distance	_____	_____	_____
Time of ball rolling off table	_____	_____	_____
Horizontal speed	_____	_____	_____
Vertical distance ball will fall	_____	_____	_____
Time ball spends in the air	_____	_____	_____
Actual horizontal range	_____	_____	_____

Analysis/Calculations:

For each procedure, each member must show the calculation for a unique trial.

1. Show how the horizontal speed was determined.
2. Show how the vertical distance was determined.
3. Show how the time spent in air was calculated.
4. Show how the horizontal range was calculated.
5. Calculate the percent error for your horizontal range. Remember the predicted and actual values are different for each trial.

Conclusion:

1. Describe in a paragraph what factors could cause the ball to have missed the cup.
2. Is it possible to let the ball hit the ground and use the horizontal range to determine the horizontal speed the ball left the table? Explain.
3. Explain how the mass of the ball makes a difference in your data.
4. Explain how the angle of the ramp makes a difference in your data.