# Lab 2 (Trajectory Ball Experiment)

**Discussion – Part A**

The motion type undergoing in this experiment is *projectile motion*. The motion can be broken down by 2 components:

* **Horizontal Motion**: The motion in the x-direction is constant-velocity motion because the x-component of the acceleration is zero.
* **Vertical Motion**: The motion in the y-direction is constant-acceleration motion. This is due to the force of gravity, which causes the y-component of the acceleration to be directed downward and have a magnitude of 9.80 m/s².

As for the mass of the object, it would not affect the shape of the graph or the path of the projectile. This is because, according to Newton’s second law of motion, both the gravitational force and the inertia of an object are proportional to its mass. As a result, all objects fall to Earth with the same acceleration (ignoring air resistance). Therefore, an object with a different mass would follow the same trajectory and yield a similar graph. However, an object with more mass may have a higher impact force upon landing due to its greater momentum.

In summary, a vertical displacement vs. horizontal displacement graph provides a comprehensive view of an object’s two-dimensional motion.

**Discussion – Part C**

The theory couldn’t be proved because we didn’t attempt it. Therefore we cannot conclude that the theory is successful or not.

**Conclusions**

In our projectile motion experiment, we observed that the path of a projectile follows a parabolic trajectory, which is consistent with the theory of projectile motion. We also found that the initial velocity and launch angle significantly affect the range and height of the projectile.

Our measurements showed that the range of the projectile is maximum at a launch angle of 15 degrees, which aligns with theoretical predictions. However, due to factors such as air resistance and measurement errors, there were slight discrepancies between our experimental results and theoretical calculations.

Overall, this experiment provided valuable insights into the principles of projectile motion and demonstrated the importance of considering real-world factors in scientific investigations. It also highlighted the significance of accurate measurement and data analysis in experimental physics.

The major sources of error are vertical and horizontal distance.