# 1 Two-Dimentional Kinematics

Many things move along curved paths. These curved paths are observed in two dimensions in kinematics. Blah Blah, I hate myself so much haha

## 1.1 Introduction

### 1.1.1 Two-Dimensional Motion: Walking in a City

If you walk from one point to another in a city with uniform square blocks, you can break down your travel by how many block you walked along each axis, with the direction included. Ex: 9 blocks East then 5 north. The straight-line path would be founf with the Pythagorean theorem: $a^2 + b^2 = c^2$, with $c$ as the straight-line distance.

$$c = \sqrt{a^2 + b^2}$$

$\sqrt{(9blocks)^2 + (5blocks)^2} = 10.3blocks$, much shorter than the combined 14 block you would have to travel otherwise.

The straight-line distance being shorter than the total walked distance is one of the general characteristics of vectors

When working with one-dimensional kinematics, only one arrow is used. In two-dimensional Kinematics, we can use up to three: The final straight-line path, the vertical component, and the horizontal component. The Horizontal and vertical components(vectors) add up to make the straigh-line path.

### 1.1.2 The Independence of Perpendicular Motions

Each Direction is affected only by the motion in that direction. Ex.: If 2 balls fall from a table, one dropped off (no horizontal motion) and one rolled off(Horizontal Motion), the horizontal motion will not be affected by the vertical motion. (remember the lab photo).

The two-dimensional surved path of a thrown object is called *projectile motion.*

## 1.2 Vector Addition and Subtraction: Graphical Methods

### 1.2.1 Vectors in Two Dimensions

Vector - quantity that has a magnitude and direction. Displacement, Velocity, acceleration, and force are all vectors. When working with one-dimensional vectors, direction can be given with a plus or minus sign. In two-dimensional vectors, we specify direction in relation to a reference frame.