Definition

We define a **coordinate plane** to be represented by two perpendicular lines representing axes, and for their intersection to be the origin.

We define the distances of a point from the y and x axis to be the x and y **coordinates** of it respectively.

A line **perpendicular to a plane** N is a line X such that any line passing through the intersection point of N and X contained within plane N is perpendicular to X.

We define **perpendicular planes** N, M such that there is a line X in plane M such that X is perpendicular to N.

Notation

A point shall be expressed (x, y) in 2D, and (x, y, z) in 3D. We run out of letters for higher dimensions, but we won't be considering them in this handout.

Formulas

The shortest path from point P to line X is the perpendicular from P to X.

The shortest path from point P to plane N is the perpendicular from P to N.

The distance formula states that given (x_1, y_1) and (x_2, y_2), the distance of the two points is $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$.

The Shoelace Theorem states that given a polygon with coordinates $(x_1, y_1), (x_2, y_2)...(x_n, y_n)$ listed in a clockwise or counterclockwise order, its area is $\frac{1}{2}|x_1y_2 + x_2y_3 + ... + x_ny_1 - x_1y_2 - x_2y_3 - ... - x_ny_1|$.

Pick's Theorem states that given a non-self intersecting polygon with lattice coordinates, its area is $i + \frac{b}{2} - 1$ where i denotes the amount of lattice points in the interior of our polygon and b denotes the amount of lattice points on the boundary of our polygon.