

2 Dimensional Geometry

definitions & theorems from Origametry by Daniel Heath.

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

Postulate 1. *Any two points determine a unique line.*

Postulate 2. *Given any two distinct points on a line, there is a one-to-one correspondence, called a ruler between all points on the line with the real numbers that sends one of the two given points to 0, and the other to some number greater than 0. The number p assigned to a point P by the ruler is called the coordinate.*

Theorem 4.1. *Two distinct lines can intersect in at most one point*

1. Critique the following proof for Theorem 4.1.

Proof. Pick distinct points A , B , and C . Then Postulate 1 implies that both \overleftrightarrow{AB} and \overleftrightarrow{AC} determine unique lines, and then intersect in point A , so there is one point of intersection. \square

Definition 4.1. *If two lines l and m do not intersect, we call them parallel lines and write $l \parallel m$. Otherwise, we call them intersecting lines.*

Postulate 3. *Every line l determines a decomposition of the plane into three distance sets: H_0 , H_1 , and l , where:*

- *Every pair of points in one of the H_i are on the same side of l .*
- *Every pair of points where one is in H_0 and the other is in H_1 are on opposite sides of l .*

2. Consider an infinitely long cylinder (like a paper towel roll but longer). Here a “line” could mean a meridional (horizontal) loop, longitudinal (vertical) lines, and helices (like RNA).

(a) Which of these lines satisfies Postulate 1?

(b) Which of these lines satisfies Postulate 2?

(c) Which of these lines satisfies Postulate 3?

Definition 4.8. *Two rays with common endpoint B are called an angle with vertex B . If $A \neq B$ is on one ray, and $C \neq B$ is on the other, then the angle is denoted by $\angle ABC$.*

If \overrightarrow{BA} , \overrightarrow{BC} are the same ray, then we call $\angle ABC$ a degenerate angle. If they are opposite rays, then we call $\angle ABC$ a straight angle. If $\angle ABC$ is neither degenerate nor straight, we say that it is a proper angle. If $\angle ABC$ is a straight angle and $D \notin \overleftrightarrow{AC}$, then we call angles $\angle ABD$ and $\angle DBC$ supplementary angles..