1 Dimensional Folding

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.

Consider the one dimensional *foldability game*: Begin with a set of two points $S_1 = \{A_0, A_1\}$. We use the convention that the distance between the first two points is one unit and A_0 has coordinate 0. We can create new points to append to the set S_n by using either of the following methods:

1. We can use a point A_i as a crease of a fold ϕ and apply ϕ to another point A_j to create a new point $A_{n+1} = \phi(A_j)$.
2. We can fold a point A_i onto the top of another such as A_j. This fold ϕ will create a new point A_{n+1} at the crease of the fold.

Both of these methods will give us another point that we can add to our set $S_{n+1} = \{A_0, A_1, ...A_n, A_{n+1}\}$. The set S_∞ is considered to be the set of *foldable points*. Use these rules for the following:

1. Find the point with coordinate $\frac{5}{8}$.

2. Find the smallest set of coordinates needed to produce the point with coordinate $\frac{5}{8}$.

3. Mark four points A, B, C, and D. Find a point E so that $C - D - E$ and $DE = AB$. That is, add the length of $\overline{AB}$ to $\overline{CD}$. What is the smallest number of folds it takes you?

Postulate C-1. *Let $\lambda > 0$ be given. Given any two distinct points, there is a 1-1 correspondence, called a* ruler, *between all the points on the circle and the real numbers modulo 2λ that sends one of the two given points to 0 an the other to some number $x > 0$. The number p assigned to a point P is called its* coordinate.

Definition 3.1. *If A and B are arbitrary points with coordinates a and B respectively, then the* distance *AB from A to B is defined as:*

$$AB = \begin{cases} |a-b| & \textit{if } |a-b| \leq \lambda \\ 2\lambda - |a-b| & \textit{if } |a-b| > \lambda \end{cases}$$

4. Let $\lambda = \pi$. Find the distance between $\frac{2\pi}{3}$ and $-\frac{2\pi}{3}$. How about between 2 and 10?

5. Recall on the line that B is *between* A and C if $AB + BC = AC$. Let us define *between* similarly on the circle. Identify three points on the circle such that no point is between the others.