1 Dimensional Congruence

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.

Mark distinct A and B points on a string. Use a ruler to measure the distance AB, and then mark any other two points C and D so that $AB = CD$.

1. Can you find a fold ϕ so that $\phi(A) = C$ and $\phi(B) = D$? If so describe how to define ϕ given arbitrary points X, Y, Z, and W so that $XY = ZW$.

2. Can you find a fold ϕ so that $\phi(A) = D$ and $\phi(B) = C$? If so describe how to define ϕ given arbitrary points X, Y, Z, and W so that $XY = ZW$.

3. Is *both* 1 and 2 possible for arbitrary points X, Y, Z, and W so that $XY = ZW$? How can you justify your answer?

4. Review #1 and 2 from the front of this activity and notice that one of these could not be done. Try this problem again but now see if you can find *two* folds ϕ and ψ such that the composition satisfies the conditions in the given problem. How about three folds?

Definition 2.7. *A finite composition σ of folds is called an* isometry

Definition 2.8. *The isometry I that doesn't move anything is called the* identity*. In other words, for every point A, $I(A) = A$. Given an isometry σ, its* inverse *(denoted σ^{-1}) is the function that "undoes" σ. In other words, for each X and Y, $\sigma(X) = Y$ if and only if $\sigma^{-1}(Y) = X$.*

Definition 2.9. *We say that two sets of points (on the line) are* congruent *if each set of corresponds to the other via a map that can be written as an isometry. If sets S and S' are congruent, we write $S \cong S'$.*

Definition 2.10. *A composition of two folds in (1 dimensional linear geometry) is called a* translation