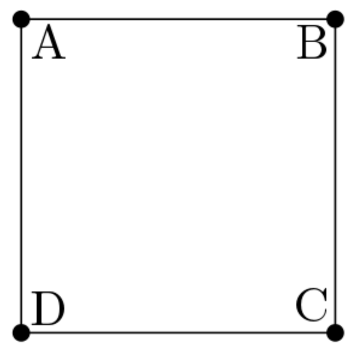
UW Math Circle, Fall 2019

Week 5, November 11

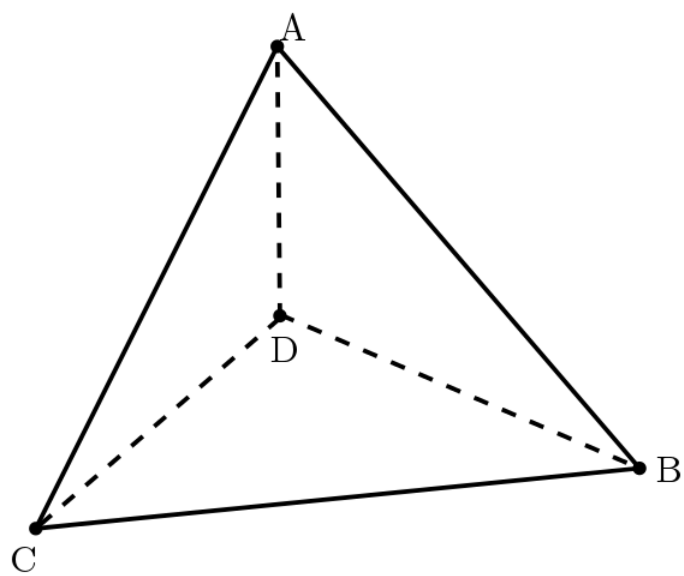
Mere ivy, mostly

Today we talked about the symmetries of a triangle. We used two operations on the triangle: rotation, and flipping, and then observed how the labels changed.

We can do the same thing for other shapes! For example, a square:



A 3-D version of a triangle is called a tetrehedron:



Here are some questions to think about for both the square and the tetrahedron.

- How many different symmetries do these shapes have? What are they, and how are they related?
- How many possible configurations of the labels $ABCD$ are there? Are there any configurations you can draw on paper that are impossible to obtain using symmetries?
- Which symmetries do you need to get all possible configurations? Are there any you don't need to use?
- How many operations do you ever need to get from one configuration to another? How would you prove it without showing all the cases?
- Does it make a difference if you are allowed to reflect the shape through a mirror?