Origami Knots

Dao, Nhi (School: Caddo Parish Magnet High School)

Both knot theory and origami have many relations to mathematics and the overall broader scientific world. The main problem in mathematical knot theory is identifying knot equivalence. In this project, I determined if origami could be used to diagram prime knots with seven or fewer crossings and identify knot chirality, which is if a knot is equivalent to its mirror image or not. I hypothesized that the origami diagrams of those knots would differ in folded form, fold number, fold pattern, crease line pattern, and overall polygonal shape. I started the experiment by creating physical diagrams of each knot and their mirror images out of parachute cords. After carefully studying the reduced forms of those physical diagrams, I constructed an origami diagram for each knot through the use of paper strips and origami techniques. I analyzed characteristics of both the final folded forms and the unfolded strips. The results of the experiment showed that there was a distinction between the origami diagrams of knots of different crossing numbers, knots of the same crossing number, and knots that are distinct from their mirror images. This was clear from examining the final folded form of each diagram. Furthermore, some interesting knot properties were discovered through the patterns I analyzed. These origami diagrams could possibly become an alternative method to the regular way of diagramming and be used to introduce knot theory to students of younger ages as the origami diagrams mainly require just visual analysis to understand the concept of knot equivalence.