One Cut Geometry: Axis of Symmetry

Grade Levels

This activity is intended for students grade 3rd – 5th.

Materials and Resources

- The handout below
- Scissors
- Pencils
- Rulers

Objectives and Outline

A regular polygon is drawn on a sheet of paper. The question here is, how can you fold the sheet to be able to cut out the polygon with only one straight cut with a pair of scissors?

In this activity, students work together to discover the axes of symmetry. Students begin by working either alone or in small groups of two or three, with a handout for each student. Prior to the first fold, have the students trace the axis of symmetry on the polygon. This will be their reference line for where and how to fold. For polygons with an even number of sides, there are two choices are possible: along a diagonal or along a center line. After the first fold, the students continue to fold, always along an axis of symmetry of the original polygon, *which is not necessarily an axis of symmetry of the folded shape*. With every fold made, the subsequent polygon should be the same on the front and back of the paper. Once all of the sides of the polygon are on top of each other (only one edge of the polygon is NOT a creased side), the student can now make the cut.

Initially, the students may not understand the relationship between making one straight cut with scissors, and cutting out a polygon. A reformulation of the problem is: how can you fold the paper to put all sides of the polygon on top of each other (to align all sides). Eventually, discuss the outcome as a class when a majority of the students have successfully completed the handout.

Discussion

After the students have completed the activity, have them describe the result of folding, for example, a student can explain which sides are on top of each other after making the folds.

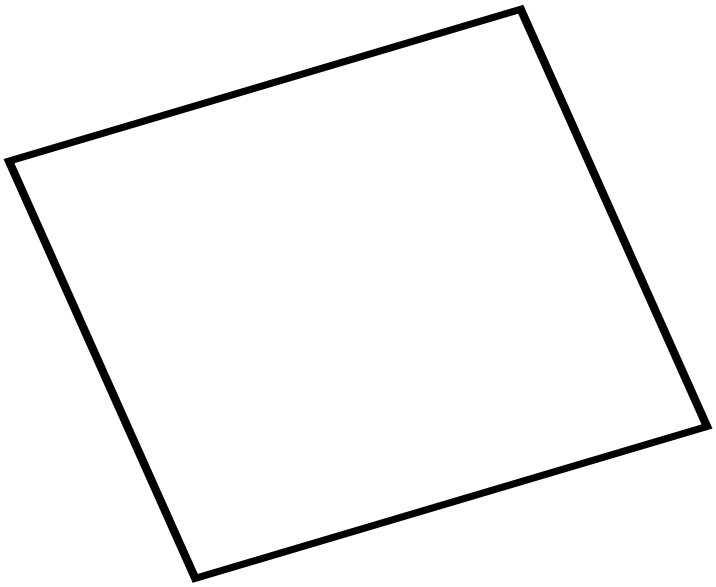
Unfold the polygons that have been cut out and observe the creases made by folding the paper. The goal is to lead the students to create a definition of axes of symmetry of the polygon. The teacher can use the students' thoughts and definitions to formalize the concept.

You may also discuss whether one method is more effective than another, in terms of the number of folds. For example, always folding in half along the diagonal is often the most efficient method (only two folds in the square, versus three or more otherwise).

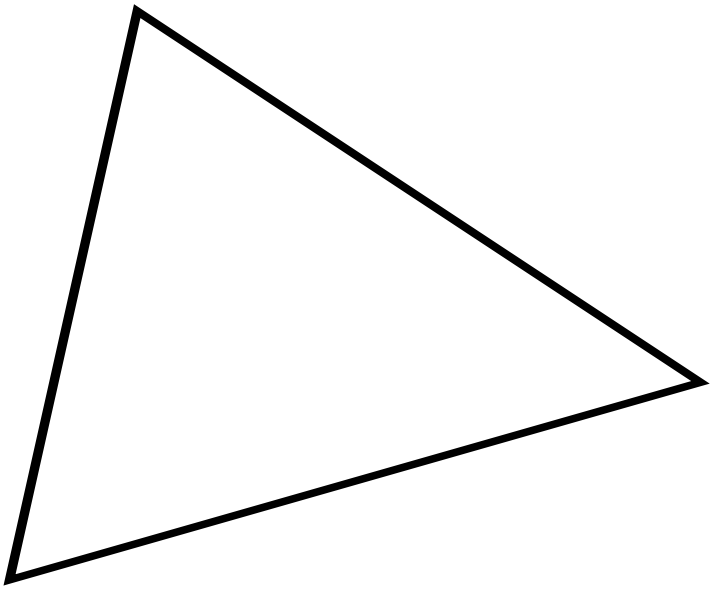
One-cut Geometry

Cut the paper into two pieces along the line. Can you fold the paper so that only one cut is need to cut out the following shapes?

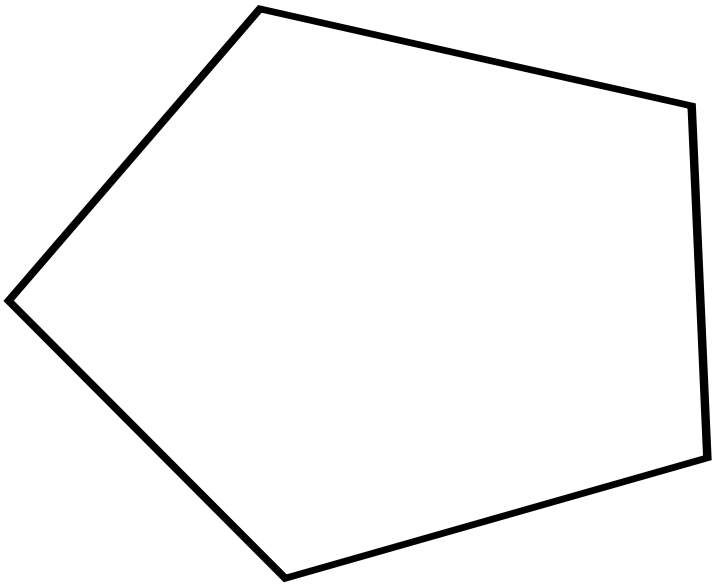
Square



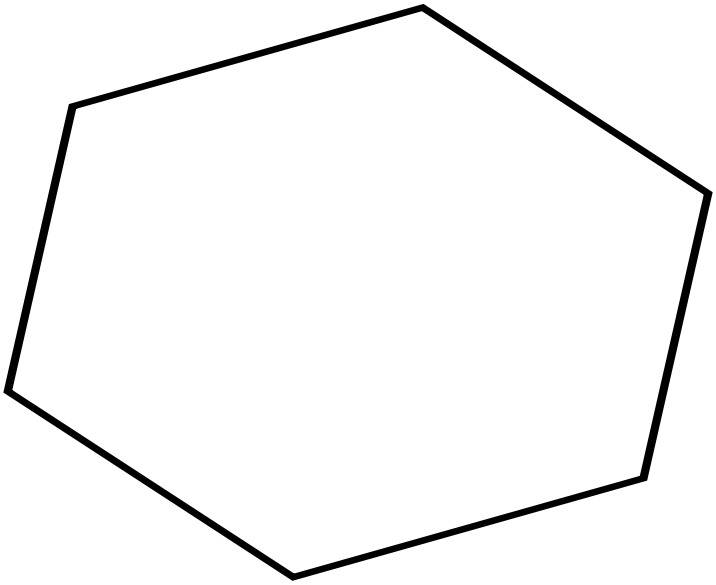
Triangle



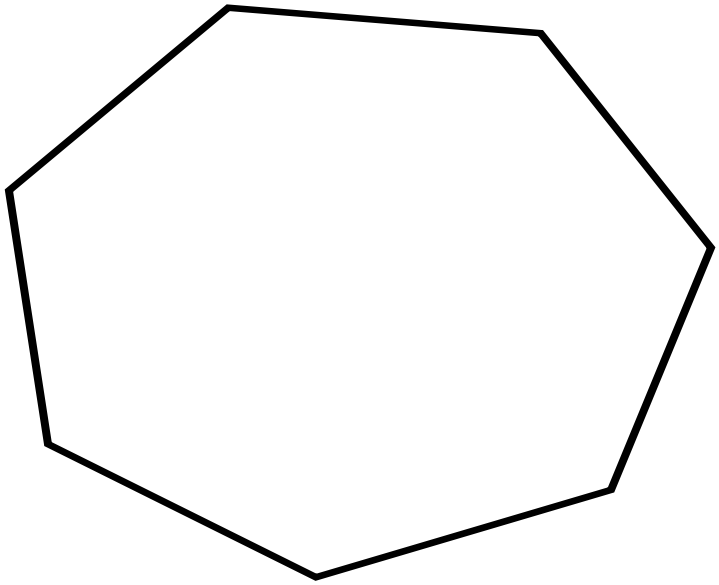
Pentagon



Hexagon



Heptagon



Octagon