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One Cut Geometry
Grades 6-8

Introduction

This is a mind-blowing activity! We love it here at Youcubed and every time we have used it people walk away celebrating the challenge and their mistakes! The goal is to create 2-D geometrical shapes by cutting them out of a folded piece of paper with just one cut. Are you intrigued? Join us on a wonderful adventure.

Agenda

Activity	Time	Description	Materials
Mindset Message	5 min	Play the mindset video.	Mindset Video
Task Exploration	45 min	Explore the task, make conjectures and record your findings on a poster paper.	• Square paper, patty paper, or origami paper • Poster paper • Scissors • Glue
Class Discussion	15 min	1. Share and discuss findings 2. Share who the mathematician Erik Demaine is and the Fold and Cut theorem	
Debrief Mindset Message	5 min	Debrief the mindset messages for this activity.	

Adapted from The Fold-and-cut Problem from the www.artofmathematics.org, Chapter 3, "Straight-cut Origami"

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Activity
Provide students plenty of paper and scissors for this task. We like to use Patty Paper since it is inexpensive and sold in large quantities. This is an individual task but students will enjoy working together where they can share ideas and strategies as well as celebrate their mistakes.

Pose the task:

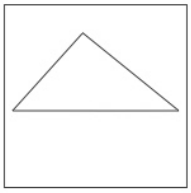
Using a square piece of paper, draw a scalene triangle in the middle of the paper. No side of the triangle can be on the edge of the paper. Cut out your triangle with only one straight cut.

Create any of these shapes or add some of your own.

Equilateral triangle	Rectangle
Scalene triangle	Rhombus
Right Triangle	Trapezoid
Acute scalene triangle	Hexagon
Obtuse scalene triangle	Octagon
Square	5 Pointed Star

What types of shapes do you think can be obtained in this way? Justify your response using words, drawings, examples, etc. Don't forget to color code!

Position triangles like this:



***Not** like this:*

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When students have completed the scalene triangle ask them to justify the method they used to cut the triangle. During the work time we tell students they can move on to other shapes when they are ready. You may want students to create visual displays of their methods and solutions. When we do this activity we celebrate all of the mistakes. We like to collect them and display them on a fantastic mistake poster!

When teams are ready to make conjectures they will likely do this in different ways. If they seem challenged with finding conjectures encourage them to organize their creations in the middle of the table so that the whole group can see and sort creations to make conjectures.

After teams have had lots of time exploring and making conjectures bring them together to share their conjectures, focusing on question number 4, "In general, what types of shapes do you think can be obtained in this way? Be as precise as you can." Record all conjectures then make space for students to ask questions about the conjectures. Keep the discussion going as needed by asking for students to clarify, show things visually, and looking for connections.

Remind students of the video messages they heard – that there is no such thing as a math brain or a math person! Anyone can learn any level of math with hard work and effort!

Extensions

- Tell the class about the mathematician, Erik Demaine, and the theorem that every pattern created by line segments can be made by folding and one complete straight cut. If you want to go deeper with this you might want to check out Erik Demaine's website http://erikdemaine.org/foldcut/. There you can find the problem, along with the history and a video of two strategies for solving the problem.

Materials

- Square paper, patty paper, or origami paper
- Poster paper
- Scissors
- Glue

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One Cut Geometry
Handout

For this problem you will need lots of paper and your most creative thinking!

Celebrate your mistakes!

Using a square piece of paper, draw a scalene triangle in the middle of the paper. No side of the triangle can be on the edge of the paper. Cut out your triangle with only one straight cut.

Create any of these shapes or add some of your own.

Equilateral triangle	Rectangle
Scalene triangle	Rhombus
30 – 60 – 90 triangle	Trapezoid
Acute scalene triangle	Hexagon
Obtuse scalene triangle	Octagon
	5 Pointed Star

What types of shapes do you think can be obtained in this way? Justify your response using words, drawings, examples, etc. Don't forget to color code!

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