UW Math Circle
Week 6 – Fold and Cut

1 Fold and Cut

The *Fold and Cut Theorem*—first proven in 1999 by father-and-son duo Martin and Erik Demaine and Anna Lubiw—roughly states that any drawing you can make with straight lines can be cut out with a single straight cut if the paper it was drawn on is first folded in an appropriate way. This week, we will be working out how to do this ourselves!

1. Cut out a rectangle along with the instructors. Let us know if you need any help

2. Work out how to fold and cut out a regular triangle. What is the fewest number of folds you need?

3. Work out how to fold and cut out a square. What is the fewest number of folds you need?

4. Do the same with the regular pentagon, hexagon, 7-gon, 8-gon, 9-gon, and 10-gon. Record how many folds were required for each in the table below.

n-gon	folds
3	
4	
5	
6	
7	
8	
9	
10	

5. What pattern do you see? Can you explain why that pattern holds?

6. Last week, before making hexaflexagons, we explored folding patterns. Folding patterns of origami (or in our case, shapes cut out by a single cut) are the pictures made by the fold lines used after folding a piece of paper and pressing it flat. Unfold the shapes you cut out and count how many line segments there are in the folding patterns. Record this number in the table below.

n-gon	line segments
3	
4	
5	
6	
7	
8	
9	
10	

7. What do you notice about the folding patterns? What symmetries do you see?