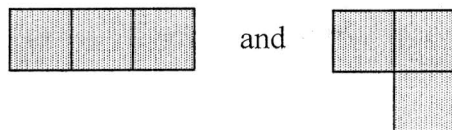


Habits of Mind #11

Area and Perimeter

For this problem you are to explore the relationship between the area and the perimeter of a polygonal shape made with congruent square regions. Start with some squares, all of which are congruent, and place them complete-side to complete-side. The outside “boundary” of the shape you form should be a polygon. In particular, we do not permit a shape with a “hole” in the middle. If you define the common side length of all the squares to be 1 unit, the perimeter and area of each polygon you form will be a whole number. For example, the two shapes below have the same perimeter (8 units) and the same area (3 units).



- (1) Find examples to show that two shapes can have:
 - (a) the same area but different perimeters; or
 - (b) the same perimeters but different areas.
- (2) Make two tables with column headings like the tables below and gather data about the minimum and maximum perimeter that is possible for a specified area and the minimum and maximum area that is possible for a specific perimeter.

Area	Perimeter		Perimeter	Area	
	Minimum	Maximum		Minimum	Maximum
1			4		
2			6		
3			8		
4			10		
5			12		
6			14		
7			16		
8			18		
9			20		
10			22		
etc.			etc.		

- (3) What generalizations can be obtained from the work you have done and the tables you have created? For example, for a given area, how should one “build” a polygon with the minimum or maximum perimeter? Also, for a given perimeter, how do you “build” a polygon with the minimum or maximum area?

Bonus: Can you find formulae that give the minimum or maximum perimeter for a given area? The minimum or maximum area for a given perimeter? (Some are easy, one is quite difficult.)

Due Date: At the beginning of class on Wednesday, December 1.