Math Teachers' Circle
Rutgers University, New Brunswick
February 2015

Part A: Icebreaker: Introduction to geoboards.

Please use the geoboards provided, or the online tool at http://www.mathlearningcenter.org/web-apps/geoboard.

1. Show a square with area 5 square units.

Here are some other questions to try if you have extra time:

2. Show 2 triangles that are similar but not congruent. What is the area of each? What is the perimeter of each? What is the similarity transformation that changes one into the other?

3. (Challenge) Show an equilateral triangle, if possible, or explain why it is not possible.

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Part B: A theorem on area of polygons

There is a relationship between the area of a polygon, the number of geoboard nails (lattice points) inside the polygon, and the number of nails on the boundary.

1. By experimentation using the geoboard, try to identify the formula.

2. What possible strategies for justifying the formula can you identify? Carry out a strategy if possible.

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Part C: How many ways of making change for a dollar are there?

1. Make an educated guess on the number of ways. Try listing a few ways to help. (Do not take the time to write out all the ways, it takes too long.)

2. List the number of ways of making change for twenty cents using pennies, nickels and dimes. (Standard MP1: ..... consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution.)

3. Represent each combination of coins in Part 2 as a dot on graph paper with horizontal coordinate the number of nickels and the vertical coordinate the number of dimes. (You will need to draw coordinate axes before you start.)

4. Construct the shape you found in Part 3 on your geoboard. How does the number of nails inside your shape correspond to the number of ways of making change?

5. How can the number of ways of making change for twenty cents be found without actually counting the nails or listing all the ways? (Mathematicians love avoiding work!)

6. (Challenge) Find the number of ways of making change for a dollar using pennies, nickels, dimes, and quarters, without actually listing them all.