Explorations with Geogebra

Bekki George and Jeff Morgan
Department of Mathematics
University of Houston
bekki@math.uh.edu
jmorgan@math.uh.edu

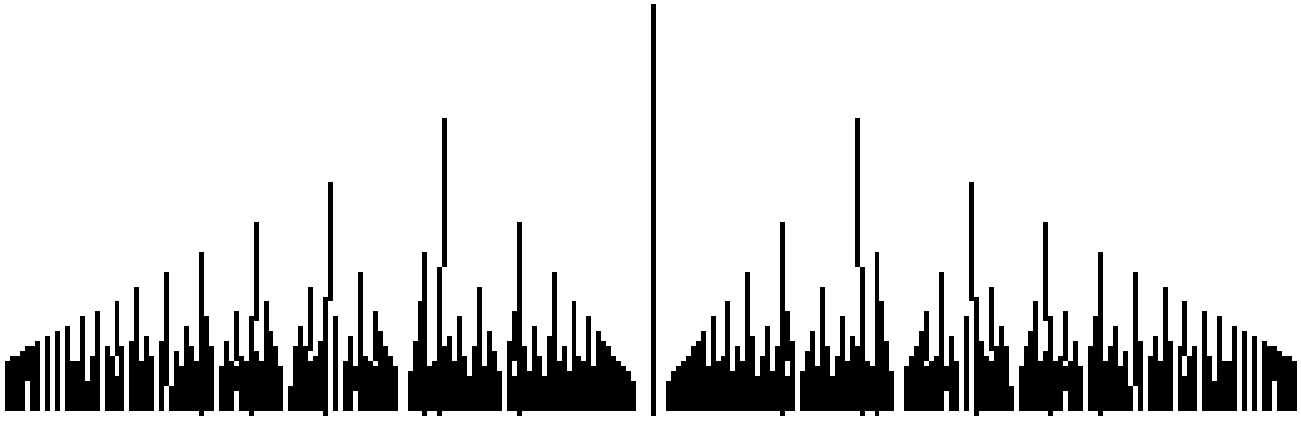
Introductions

- What is your name?
- Where are you from?
- Tell us about your education.
- Where are you currently going to school?
- Tell us something special about you.

Quick Challenge

Warm up

A set of line segments is shown below. Believe it or not, they all have the same length. What do you think you are looking at?

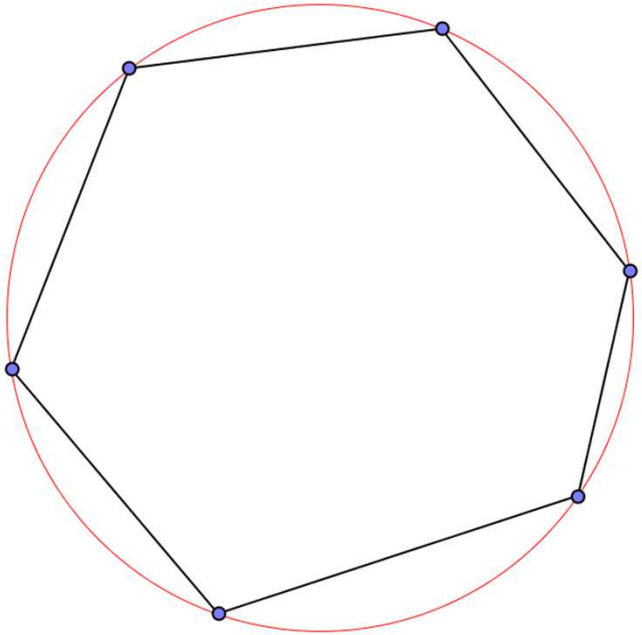


Introduction to Geogebra

- Free, proven software with the capability of Geometer's Sketchpad. It's a great tool for exploring mathematics!
- Install on your computer or run it through a browser by using an applet. Both can be found at http://www.geogebra.org.
- Introduction to Geogebra.
- Earlier explorations explored in Geogebra.

Exploration 1

Create a circle, and then select 6 points on the circle. Create a hexagon using the points. Draw lines through each pair of opposite sides and mark the point of intersection. What do you observe? You might have to zoom out to make your observations.



Do you know what “opposite sides” means?

Exploration 2

Create a special function *f*. The domain of this function is the set of natural numbers larger than 2. The range of this function is the set of nonnegative integers. Given a value *n* in the domain of *f*, the value *f* (*n*) can be found by determining the largest number of distinct lines that can be drawn in the xy plane, along with *n* distinct points in the *xy* plane, so that each line passes through exactly 3 of the points. Complete the chart below and show supporting Geogebra sketches.

n	***f* (*n*)**
3	
4	
5	
6	
7	
8	
9	

Exploration 3

slowly leading to IV below…

I. A line with slope -3 passes through the point $(2,3)$. Give the equation of the line in slope-intercept form.

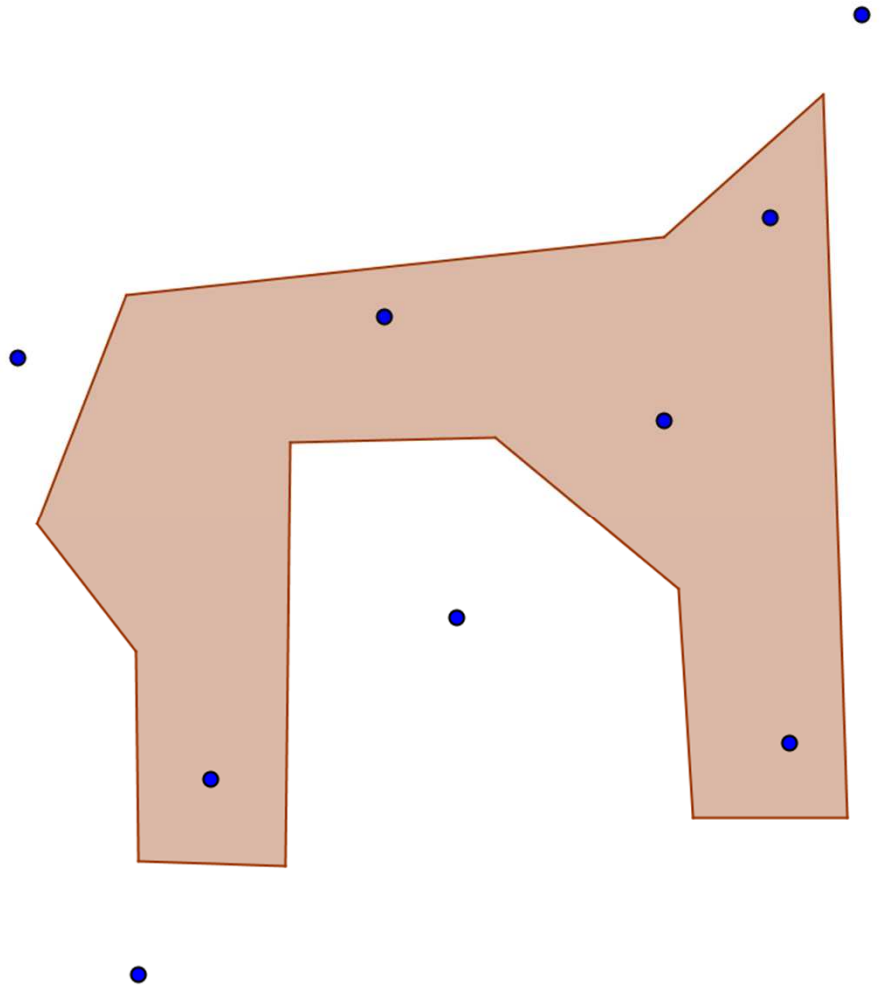
II. A line with slope $-3a$ passes through the point $(2a, 4a-1)$. Give the equation of the line in slope-intercept form.

III. A line with slope $-3a$ passes through the point $(2a, 4a-1)$. Is there a value of a for which $(-1,-2)$ is on the line?

IV. For each real number a, a line L_a is created with slope $-3a$ that passes through the point $(2a, 4a-1)$. Are there any points that fail to be on any of these lines?

Exploration 4

In or out? A shaded region is shown along with several points. Some of these points are in the shaded region, and some of them are outside of the shaded region. Draw a ray starting from each point and count its intersections with the boundary. Ignore rays that pass through vertices of the region. Can you see any pattern?



Exploration 5

In or out - revisited? A shaded region is shown along with several points. Some of these points are in the shaded region, and some of them are outside of the shaded region. Choose a point, and then draw a line segment to one of the vertices. Rotate this line segment to move *counter clockwise* through all of the vertices until you return to the origin vertex. Make any observations.