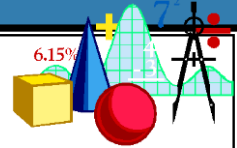


Mathematics, Geometry
Unit XI: Lesson 1

Activity: **Graphcodes**



It is an interesting activity to derive equations that when graphed resemble letters of the alphabet, digits, or punctuation marks. Hyman Gabai calls these sets of equations "graphcode." It is convenient to begin by defining a "code region" consisting of an eight-by-eight square on a piece of graph paper. An equation can be written for each letter, digit, or punctuation mark by multiplying the individual equations of the segments of the letter together. For example, the letter A could be:

$$\text{a line through } (0,4) \text{ and } (-4,-4) \Rightarrow 2x-y+4 = 0$$

$$\text{a line through } (0,4) \text{ and } (4,-4) \Rightarrow 2x+y-4 = 0$$

$$\text{and a line on the } x\text{-axis} \Rightarrow y=0$$

To make coding more difficult, the three equations above are multiplied together, $(2x-y+4)(2x+y-4)y = 0$. Simplifying, this results in $4xzy-y^3+8y^2-16y=0$. This last equation is the "graphcode" for the letter A. A series of letters in a sentence can also be written as one equation; even "graphcodes" of lower case letters are possible.

Develop an equation for each letter, digit, and punctuation mark as shown above. Prepare a display, either serious or humorous, with part of the message in "graphcode."