https://blogs.dickinson.edu/playing-with-polygons/file-9/

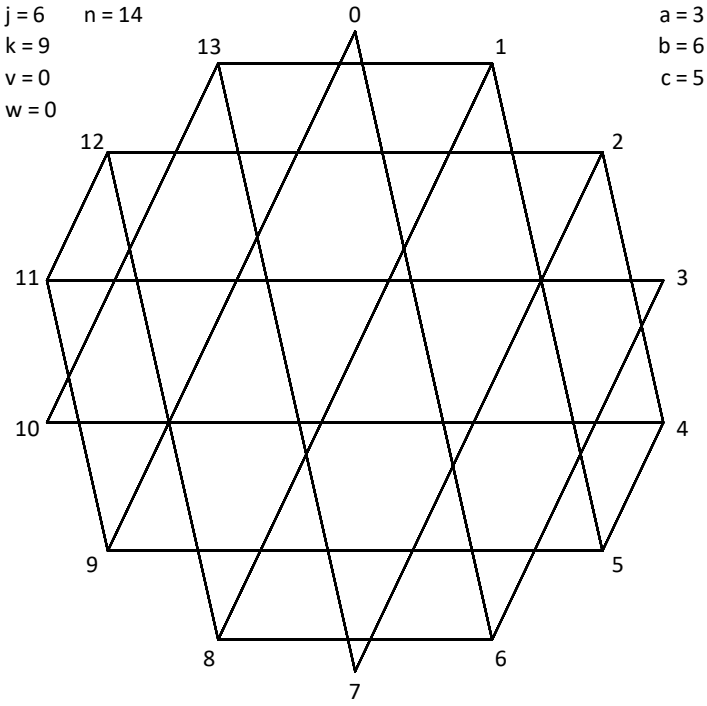
# Reverse Engineering the Image: Going from Angles to Images

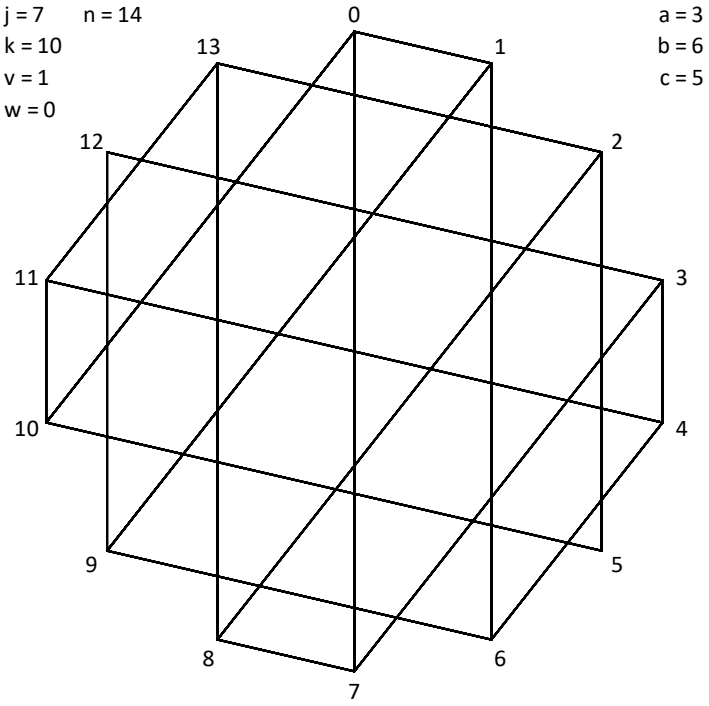
The *Attributes of Excel File 9* paper provides a description of how to manipulate and interpret the file. One of the outputs of that file is a set of numbers, ***a***, ***b***, and ***c***, each greater than zero that sum to ***n*** and represent the angles for triangles in the image (once multiplied by 180°/***n***). The discussion in the file (in cells M6:X8) shows how to get ***a***, ***b***, and ***c*** from ***j***, ***k***, ***v***, ***w***, and ***n***. Here we provide a method for going in the other direction. Given ***a***, ***b***, and ***c***, what values of ***j***, ***k***, ***v***, ***w***, and ***n*** produce an image with the necessary angles?

*An example*: Suppose ***a***, ***b***, and ***c***, are the values 3, 5, and 6 but no one value is tied to ***a***, ***b***, or ***c***. We know that ***n*** = 14 here. Due to rotational issues discussed in the *Attributes* paper, many answers provide an image with these attributes. But, when ***n*** is even, two distinct images (meaning one cannot be obtained from the other via rotation) satisfy this criterion (as noted in Files 7 and 8). In those files, we saw that one had a horizontal base and the other had a slanted base. These rules produce images with smallest (apex) angle at 0 tilted less steeply in the positive direction:

HORIZONTAL: ***j*** = largest of (***a***, ***b***, ***c***),
***k*** = ***n*** – next largest of (***a***, ***b***, ***c***),
***v*** = ***w*** = 0.

SLANTED: ***j*** = largest of (***a***, ***b***, ***c***) + 1,
***k*** = ***n*** – next largest of (***a***, ***b***, ***c***) + 1,
***v*** = 1, and ***w*** = 0.




If ***n*** is odd, both rules produce images that are the same (but rotated) from one another.