

Mystic Roses

A mystic rose is an image in which each vertex is connected to every other vertex. The top image is a mystic rose with $n = 19$. There are 18 lines emanating out of each vertex or a total of $171 = 19 \cdot 18/2$ lines. This is the largest mystic rose possible using the Stacked Stars via equations *Excel* file since $k = 9$ is the largest k allowed in this file. The web version can create much larger mystic roses.

To create a mystic rose, you need to know how many jumps to set for a given n . The ending image must have $VCF = 1$ so that all vertices have a full complement of lines connecting that vertex to all other vertices.

Commonality issues. Setting $k = \text{INTEGER}(n/2)$ jumps in the jump set with $c = 0$ and $d = 1$ produces a jump set of $(k, k-1, \dots, 2, 1)$. Unfortunately, this does not guarantee that each vertex connects to all other vertices because there may be commonality between the sum of jumps and n . For example, decreasing n by 1 to 18 produces an image with only 18 lines because the sum of jumps is $45 = 9 \cdot 10/2$ and $\text{GCD}(45, 18) = 9$.

Consider an attempt to create a bit smaller mystic rose, one based on $n = 16$. Clearly $k = 8$ should work but the 32 line image to the right, results. The sum of indices is $36 = 8 \cdot 9/2$ and $\text{GCD}(36, 16) = 4$ (which confirms that lines = $k \cdot n / VCF = 8 \cdot 16 / 4$).

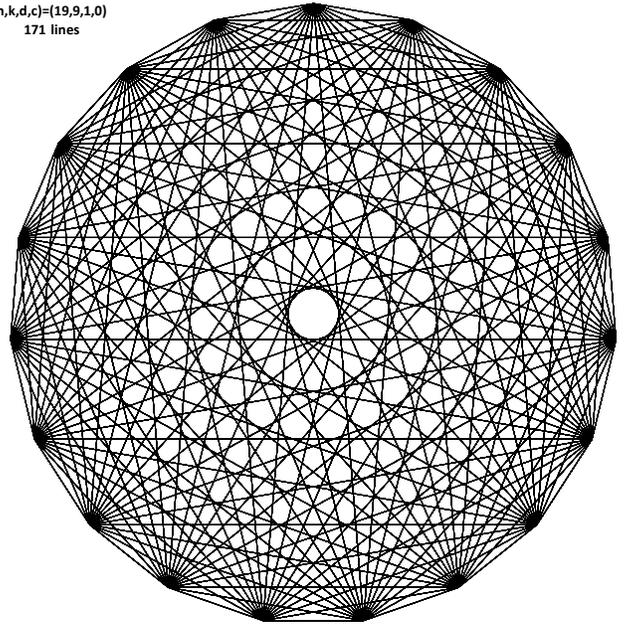
What is needed is to have a jump sum that has no common divisor with n . We can do that by increasing the jump set size.

Increasing jumps to complete the image. Two alterations turned the middle image into the bottom one. Increase k to 9 and decrease c to -1. The jump set $(9, 8, 7, 6, 5, 4, 3, 2, 1)$ results. The sum of jumps is 45 and $\text{GCD}(45, 16) = 1$. Note however that the *number of lines used to create this image*, 144, is larger than the *number of lines in the image* = $16 \cdot 15/2 = 120$. The remaining 24 lines were used multiple times in order to complete the *continuously-drawn* mystic rose. Finally, note that a mystic rose has spokes in the center when n is even.

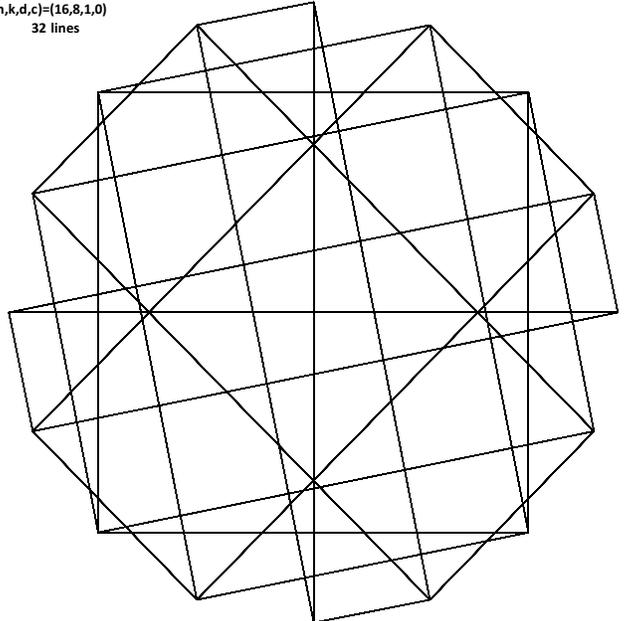
A hint for adding jumps in the web model. You may be used to thinking in declining terms when using the web version because the Stacked Stars via equations *Excel* file decreases jumps in the jump set [due to the way the jump functions were created](#). A better solution is to use the jump labels to tell you what to set the jump value as, Jump 1 is 1, Jump 2 is 2, etc. That way, as you add jumps, you do not need to go back and adjust all earlier jumps. A mystic rose is a vertex frame, so set $S = P$.

When $VCF = 1$, the static VF does not depend on jump order ([but does change the image if \$S \neq P\$](#)). If $VCF > 1$, the order matters (for example, a jump set of $(1, 2, 3, 4, 5, 6, 7, 8)$ produces a mirror image to the $(8, 7, 6, 5, 4, 3, 2, 1)$ middle image above).

$(n,k,d,c)=(19,9,1,0)$
171 lines



$(n,k,d,c)=(16,8,1,0)$
32 lines



$(n,k,d,c)=(16,9,1,-1)$
144 lines

