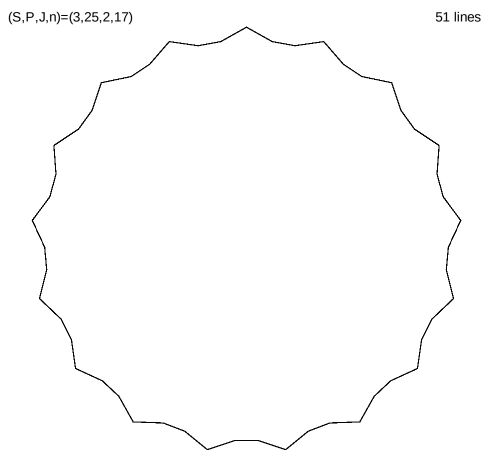
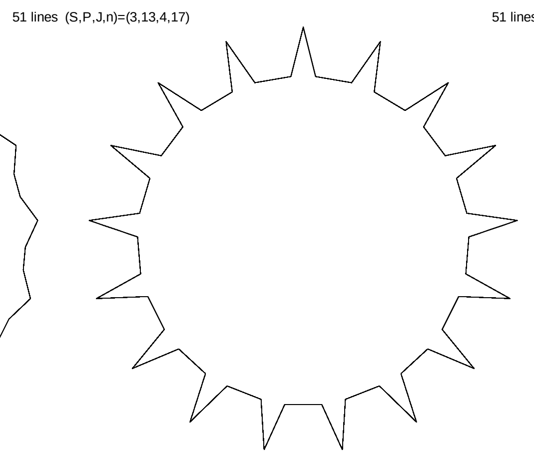
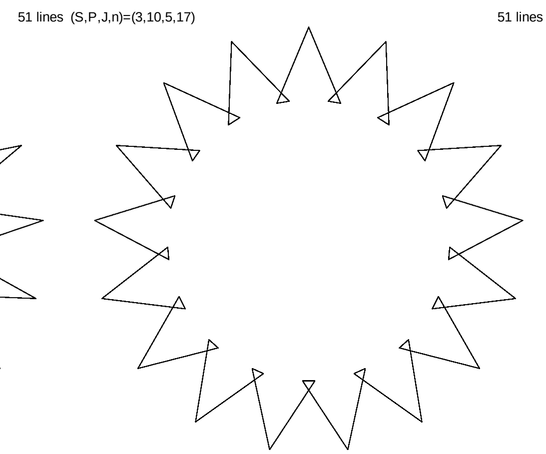
Variations on Sunbursts: Increasing *S* beyond 2 while maintaining polygonal status

All the sunbursts previously examined were polygons with ***S*** = 2. We can still obtain interesting alternative polygons when we increase ***S*** beyond 2. The strategy for finding ***P*** in ***S*** = 2 sunbursts applies here: you want the "nearest" subdivision to be the first and last point used to create the image. A relation that often works is to set ***J*** and ***P*** relative to the number of lines used to create the image, ***S****n*. In particular, choose ***J*** and ***P*** such that ***S****n* ± 1 = ***J****P*.

Not all values of ***J*** and ***P*** satisfying this equation produce polygons. If ***J*** is "too large" the lines cross and the image is no longer a polygon. These three ***n*** = 17, ***S*** = 3 examples show that ***J*** = 2 and 4 work but 5 does not, despite having ***J*P*** = 50.

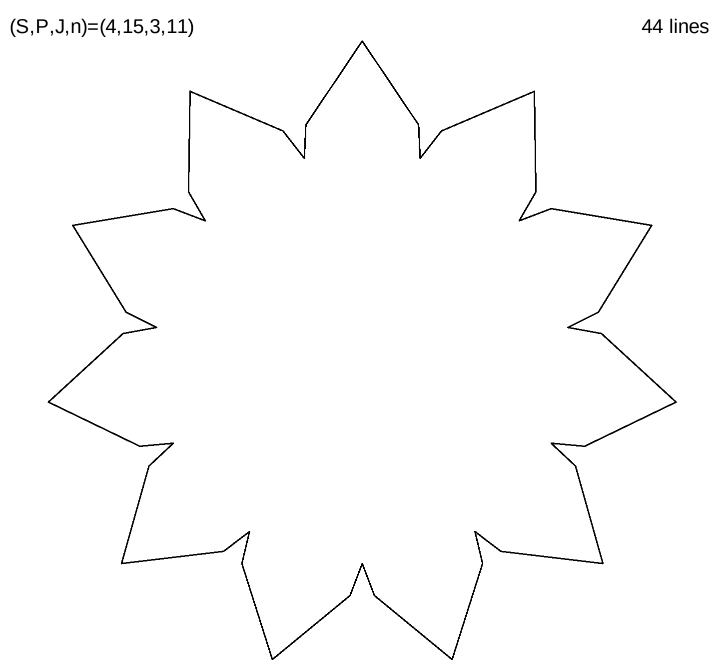


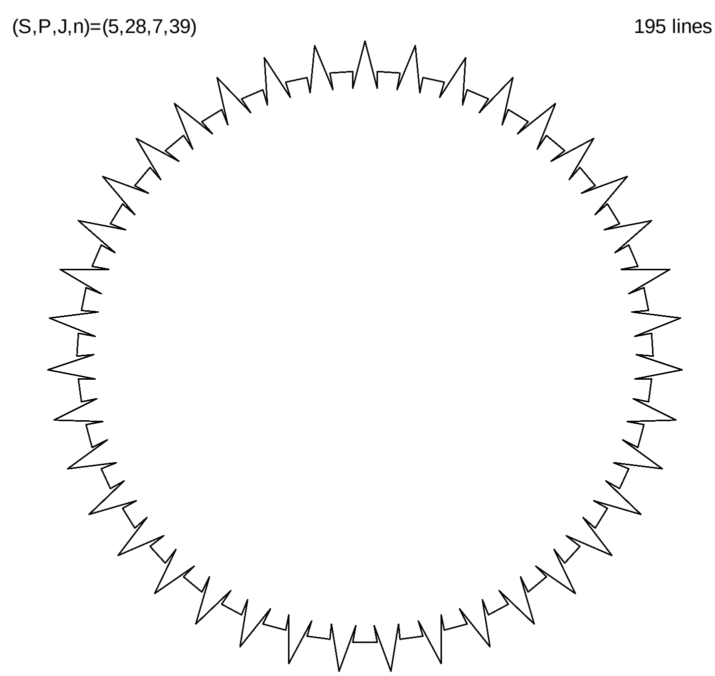




Note that when ***S*** = 3, flats occur between spikes. Sometimes the spikes can be substantial as the ***n*** = 13, ***J*** = 4 version at this link shows: https://www.playingwithpolygons.com?vertex=13&subdivisions=3&points=10&jumps=4

For larger ***S***, note that if ***S*** is even, then ***J*** must be odd in order to not have a subdivision point right beneath a vertex. Below are two examples, one for ***S*** = 4, the other for ***S*** = 5.





The link below takes you to an ***n*** = 23, ***S*** = 7 example where ***J*** = 5. As it turns out, for this ***n***, ***S*** combination, the largest ***J*** for which the image is still a polygon is ***J*** = 5. Note that when ***J*** = 6 and ***P*** = 27, crossovers occur. As an exercise, find ***J*** and ***P*** combinations whose product is either 160 or 162 for ***J*** = 2, 3, 4.

https://www.playingwithpolygons.com?vertex=23&subdivisions=7&points=32&jumps=5