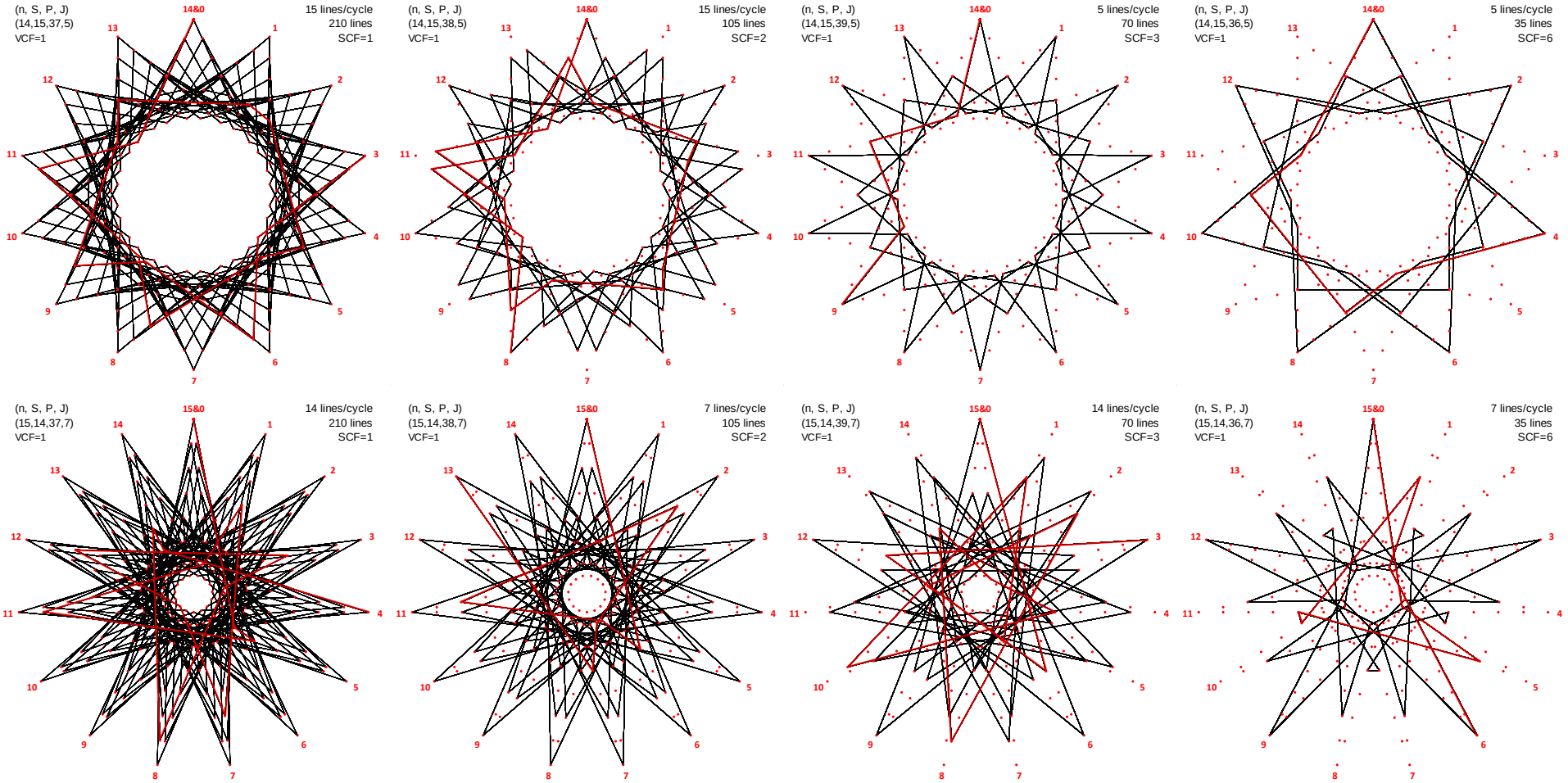
# How Image Density is Distributed between Concentric Circles of Internal Subdivision Points and Polygonal Vertices




The rows switch ***S*** and ***n*** so that ***nS*** = 210 and ***J*** produces the sharpest VF star possible: Top row, ***n*** = 14 = 2·7, ***J*** = 5, ***S*** = 15; Bottom row, ***n*** = 15 = 3·5, ***J*** = 7, ***S*** = 14. SCF varies by column from 1 to 2 to 3 to 6 by adjusting 36 ≤ ***P*** ≤ 39. As noted in 2.2i, image density depends on SCF and SCF depends on divisibility of ***P*** with ***n*** and ***S***, chosen here to have no factors in common with one another in order to clarify how the interaction occurs. The table below summarizes these interactions.

| 210 lines | | Fraction of vertices used | Fraction of ***S*** used per cycle, ◎ | Reason | | 105 lines | Fraction of vertices used | Fraction of ***S*** used per cycle, ◎ | Reason | | 70 lines | Fraction of vertices used | Fraction of ***S*** used per cycle, ◎ | Reason | | 35 lines | Fraction of vertices used | Fraction of ***S*** used per cycle, ◎ | Reason | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Density | | | | GCD(***n***,***P***) | GCD(***S***,***P***) | Density | | | GCD(***n***,***P***) | GCD(***S***,***P***) | Density | | | GCD(***n***,***P***) | GCD(***S***,***P***) | Density | | | GCD(***n***,***P***) | GCD(***S***,***P***) |
| Top | 1 | 1 | 1 | 1 | 1 | 1/2 | 1/2 | 1 | 2 | 1 | 1/3 | 1 | 1/3 | 1 | 3 | 1/6 | 1/2 | 1/3 | 2 | 3 |
| Bottom | 1 | 1 | 1 | 1 | 1 | 1/2 | 1 | 1/2 | 1 | 2 | 1/3 | 1/3 | 1 | 3 | 1 | 1/6 | 1/3 | 1/2 | 3 | 2 |

**Challenge Questions:** Without looking at the String Art file, suppose ***P*** = 77 = 7·11 or ***P*** = 91 = 7·13. Given (***n***, ***S***, ***J***) values for Top (14, 15, 5) and Bottom (15, 14, 7) rows, consider what the image might look like in each instance. In particular, what fraction of vertices and what fraction of ***S*** is used per cycle in each instance? **FACT:** One of these four ***n***, ***S***, ***P***, ***J*** values is a *Sunburst Polygon*. Can you guess as to whether ***n*** = 14 or ***n*** = 15 in this instance? Verify your answers with the file.