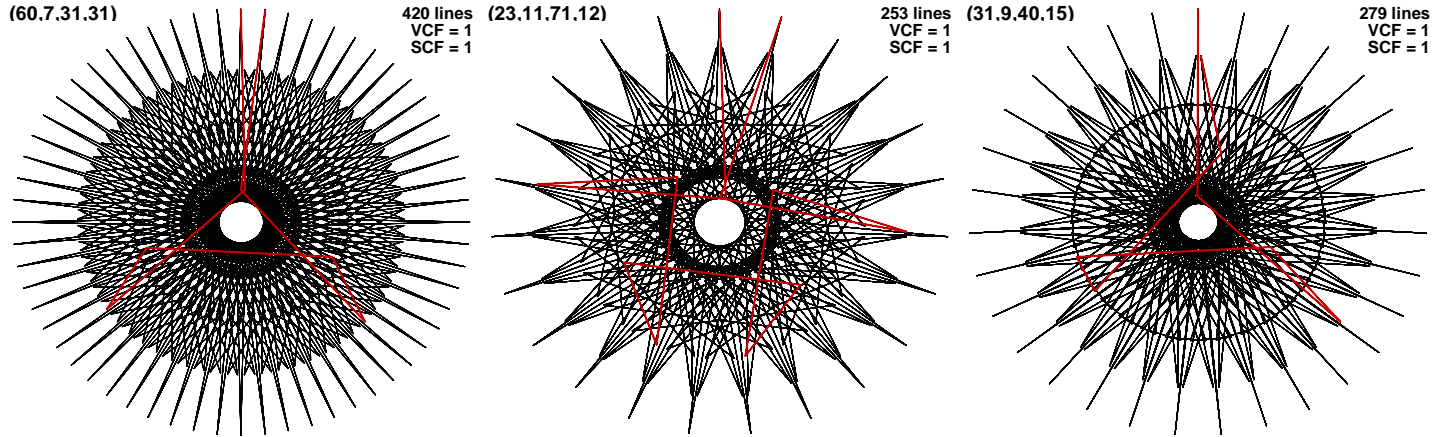


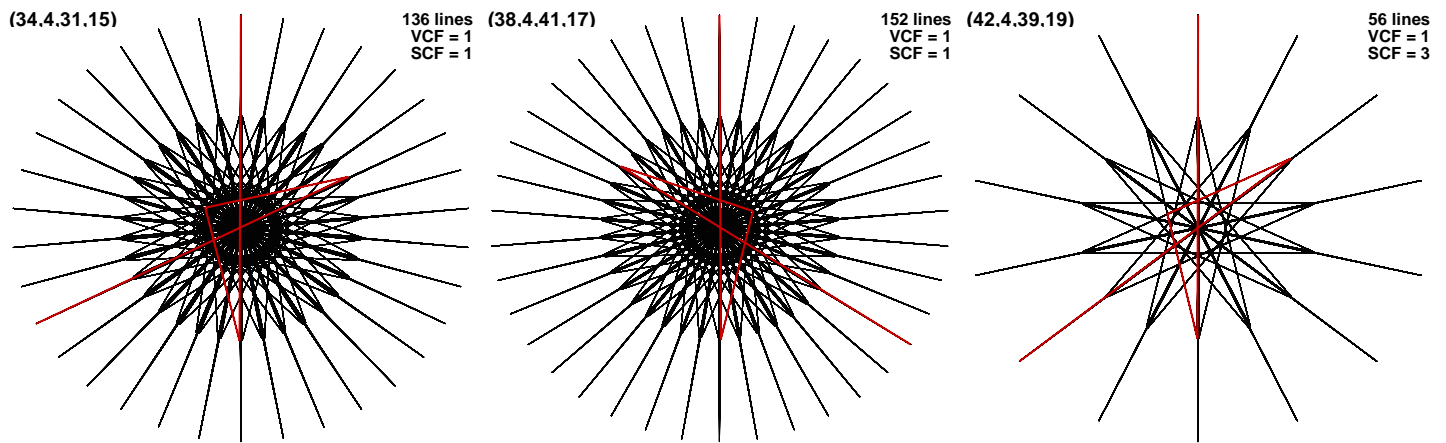
## Even Sharpest Central Needles with Shields

Needles with Shields images were originally examined in the context of *one-time around* images, [E5.2](#), such as the 60-second image [\(60,7,31,31\)](#) from E13.1 or like the one examined in the [Generative Art 2023](#) article, [\(23,11,71,12\)](#), both reproduced here. The **1<sup>st</sup> cycle in red** ends at vertex 1 and thus is filled in in a single rotation around the vertices.



Needles with shields that are *single-step* of length 7 like the [\(31,9,40,15\)](#) one at right (**1<sup>st</sup> 7 lines in red**) are found [here](#) and a more general rationale for finding such images even if they are not single step are noted [here](#). All images analyzed, except for the 60-second image, are based on odd  $n$  and they have  $S \geq 7$ . Here we provide even  $n$  images where  $S < 7$  and hence each needle is longer before it is surrounded by its shield. We consider  $S=4$  and 5;  $S=3$  shields appear too crude.

These are three consecutive  $n = 4k+2, J = 2k-1, S = 4, P = n-3 \cdot (-1)^k$  longest needles before shields with **1<sup>st</sup> cycle in red**. Every third  $P$  has  $SCF = 3$  so there are  $n/3$  needles. Note the  $P$  pattern is alternating 3 less than  $n$  and 3 more than  $n$ .



The final three are  $n = 4k, J = 2k-3, S = 5$  images. These do not appear to happen as often as the  $S = 4$  images. To find them, toggle *Show Subdivisions* on and look for a tight pair of subdivisions on the vertical diameter and scroll through  $P$ .

