An Introduction to Triple Jump Models, VCF = 1

As the number of jumps increases, so does the difficulty in keeping track of what is happening in vertex frame creation. The line, VCF, and SCF rules are the same as laid out before, except that now **k** = 3.

In order to articulate most clearly some of the things that can be created with 3 or more jumps per set, and to provide a bit of an artistic capstone to multiple jump set models, the *Excel* files in this chapter restrict **n** to **n** = 12 in order to make discussions as intuitive as possible but provides the ability to stack up to four colors in the image. Click boxes allow you to add or remove a color and **S** and **P** values must be entered by typing numbers into cells while jumps are controlled by ⬍ arrows. One and two jump four-color files are also provided. There is no web counterpart to the four-color model, but the web version can readily create triple jump sets and more as we will discuss later.

Start with the VF. It helps to set **S** = **P** to see the vertex frame. The top image shows the VF of the image beneath it. The (2, 5, 4) jump set means that the first three vertices used are 2, 7, and 11 and the next three are 1, 6, and 10, and so on.

When VCF = GCD($J_1+J_2+J_3,n$) = 1, all vertices are used three times. In this instance, six VF lines are visible at each vertex, just like one sees in the top image. However, if one of the jumps is **n**/2 (or 6), the number of lines will appear as 5 not 6 as you can see at bottom left.

When VCF = 1, the VF is stars stacked on top of one another. The upper right has 3 such stars: a 12,2-star (two hexagons), a 12,4-star (four equilateral triangles), and a 12,5-star. The bottom left shows a 12,2-star, a 12,5-star, and a 12,6-star (six diameter lines). Even without seeing the VF of the bottom middle and right images, you should be able to visualize the 12,3-star (three squares), 12,4-star and 12,6-star that comprise the VF of both images.

Even if VCF = 1, the order of jumps matters. The two blue images have the same VF, but if you look closely, you will notice that the images differ from one another. Consider the curved angles (of 75°, 30°, and 45°) at vertex 0. The middle has curves created from 9-0-4, 8-0-6, and 6-0-3 but none from 8-0-3, 6-0-4, and 9-0-6. *The right image has the reverse.*

To see why, consider the angle created by the first two jumps. Both start at 0 and end at 7 so both are 75° angles but the middle has vertex at 3 (the 0-3-7) while right has vertex at 4 (0-4-7). Or view this in a slightly different way by considering the outer 90° angle created by 0-3-6 in both images. This is composed of the 75° 0-3-7 curve plus the 15° uncurved 7-3-6 angle in the middle image, but the 15° uncurved 0-3-11 angle plus the 75° 11-3-6 curve at right.

*Note: Visualizing these differences is easier if you use a single color and adjust the curved tip stars to **P/S** < 0.5.*