

PART III introduces *Drawing Modes*, discusses how to simplify values, and looks at $n = 12$

Drawing the first line The url above has $n = 4$, $S = 12$ and $P = 30$.

Images are continuously-drawn every P^{th} dot. It makes sense to see the first line, P dots from the top.

The top vertex will always have two lines, one starting and other finishing the image.

Therefore, once you see the first line, you can follow the rest of the lines until completion.

There are multiple *Drawing Modes*, but one in particular is useful in showing the first line.

Do this in 3 steps.

- 1 Click *Pause/Play*. This is done because the default is *Play* and we want to *Pause*.
- 2 Change *Drawn Lines* from 3 (where it starts) to 1.
- 3 Click the dropdown menu and choose the last option: *Single Lines Overlaid Drawing* mode.

The image will now show up with a single line highlighted with image behind it.

Change P to 29 or 31 and see how much easier it is to see where the first line ends.

Watching an image get drawn Set P back to 29, with $n = 4$ and $S = 12$.

Instead of pausing drawing, click *Pause/Play* once more (if you are doing this right after above).

This will cause the drawing modes to draw rather than remain static.

Choose the first *Drawing Mode: Fixed Count Line Drawing*.

Watch the image get drawn to completion after 48 lines.

Speed up or slow down the drawing as you wish.

Important Point: The static (*No Drawing*) image does not shout out: *I'm really a rotating star*.

But watching it get drawn does. In this case, it rotates clockwise. To see this most clearly, do three things.

- 1 Return to *No Drawing* mode. (Doing this resets *Drawing progress* to 0.)
- 2 Set *Drawn Lines* = 5.
- 3 Change to *Fixed Count Line Drawing*. See the star walk around the square as the image is drawn.

Simplifying Values Set $P = 18$, with $n = 4$ and $S = 12$.

This star looks the same as when $P = 30$ but notice that P is much smaller.

It takes less counting to create the image when $P = 18$.

Note: $18 = 48 - 30 = \text{Total Subdivisions} - \text{Original } P$. Both values of P produce the same final image.

Use the smaller number because it cuts down on counting.

Notice that both images ($P = 30$ and $P = 18$) use only one subdivision out of 6. This is because $\text{SCF} = 6$.

So, change *Subdivisions* to $S = 2$, and *Points* to $P = 3$.

The image looks the same, and notice that now $\text{SCF} = 1$.

We have an 8-point star using the vertices of the square and the midpoint between vertices.

But now we only have to count 3 to draw each line rather than 30.

Set $n = 12$ and see what happens as you vary J , and S and P . (Remember, there are 12 hours on a clockface.)

Only jumps 1, 5, 7, and 11 use all vertices. Overall, we have the following.

J	VCF	Image Created by Subdivision Dots (this is called the <i>Vertex Frame, VF</i>).
1	1	12-sided polygon (dodecagon)
2	2	6-sided polygon (hexagon)
3	3	Square
4	4	Triangle
5	1	12,5-star
6	6	vertical line
7	1	12,7-star (looks the same as the 12,5-star)
8	4	Triangle
9	3	Square
10	2	6-sided polygon (hexagon)
11	1	12-sided polygon (dodecagon)

Note the symmetry about the middle. This is why we often only consider J less than half of n .

Note: $J = 12$ is a single point since you always stay at the top.