

Two Type of Spiral Mirrors

By their very nature, spirals do not exhibit symmetry about a line through the origin. Each image is created by r connected lines, but each endpoint is a different distance from the center. As a result, the image is not symmetric about a line containing the center, even if a quick glance may suggest otherwise. ([Almost Polygons](#) are almost symmetric.)

We can introduce symmetry by creating a mirror image on a line through the center of the parent polygon. The *Excel* and web version of spirals create mirror images in different ways.

Excel mirror. The Spirals *Excel* file contains a toggle that allows a mirror image of the original image to be added to the (n, J, r) image. This mirror works in a very simple fashion: superimpose an $(n, n-J, r)$ image on top of the (n, J, r) image. The result will have $2r$ lines based on two spirals. Both start at the top and end at the center with the only difference being that *if* the initial spiral is clockwise (because $J < n/2$), *then* the superimposed spiral will be counterclockwise (since then $n-J > n/2$) and *vice-versa*.

In terms of coordinates in the (x, y) plane, if the i^{th} coordinate on the initial spiral is (x_i, y_i) then the i^{th} coordinate on the mirror spiral is $(-x_i, y_i)$ regardless of whether x_i is positive, negative, or zero. The *Excel* mirror is necessarily vertical.

Web mirror. The web spirals mirror is created in a different fashion. The first r lines are created by reducing the radius from 1 to 0 by $1/r$ per line. When *Toggle Show Mirror* is turned on, **the reduction in radius continues** for another r lines (even though now the “radius” is a negative number). The final image has $2r$ lines with the final point exactly opposite the ending vertex. This sounds counterintuitive but is easy to understand by simply looking at the images below. The left spiral has 5 [almost triangles](#) because $n = 3, J = 1, \text{ and } r = 15$. The mirrored right has 10, but the second 5 are inverted.

To be explicit, consider the location of the first 5 third endpoints (i.e., the triangle peaks at lines, 3, 6, 9, 12 and 15). Each peak is $3/15 = 1/5$ of the way in from the previous endpoint on the vertex 0 radius. If *Toggle Show Mirror* is turned off, the image ends after 15 lines at the center $(0, 0)$. If *Toggle Show Mirror* is clicked on, another 15 lines are added with “peaks” now “valleys” at lines 18, 21, 24, 27, and 30. **These points are on the vertex 0 radius, but they are on the negative part of that radius.** The end of the 30th line is OPPOSITE vertex 0, midway between vertices 1 and 2 but equidistance from the center. This image is symmetric on the horizontal line through the center. The web mirror image is symmetric about the line through the center, midway between the start of the first line and the end of the last line.

Line endpoint:	3	6	9	12	15	with mirror	18	21	24	27	30
Coordinate:	(0, 0.8)	(0, 0.6)	(0, 0.4)	(0, 0.2)	(0, 0)	on	(0, -0.2)	(0, -0.4)	(0, -0.6)	(0, -0.8)	(0, -1)

