10. Glossary of Commonly Used Terms: Spirals
(Reference to where the term was introduced)

Almost polygon: An image may look like common polygon, but it is not because the image is not closed. (10.2)

Clockwise spirals (and counterclockwise spirals): As is true throughout **PwP**, vertices are counted clockwise starting at the top. If the first segment leans to the right the image appears clockwise but if the first line leans to the left the image appears counterclockwise. Mathematically, we have clockwise spirals if MOD(***J***, ***n***) < ***n***/2 and counterclockwise if the inequality reverses. (10.1c)

Closed: A set of connected segments is closed if it all vertices are the starting point and ending point for another line. Polygons are closed. Spirals are not closed because the starting point of the first segment (the top of the circle) and the ending point of the final segment (the center of the circle) do not coincide. (10.4)

J: ***J*** is the number of jumps between vertices in the parent polygon. In the present context, it tells us which on which vertex ray the endpoint of the line segment lies. This is the analog of jumps used to create stars in **PART I** of **PwP**. (10.1)

Parent polygon: Spirals are created using the polygon's vertices, but the final image includes only the top vertex. Since the polygon's vertices are used but not shown, we call it the parent polygon. (10.1b)

n-***J*** mirror: There are no lines of symmetry for a spiral (with the trivial exception of the vertical line attained when ***n*** = ***a*·*k*** for whole number values of ***a***). But any image ***n***, ***k***, ***r*** image has a mirror image by replacing ***k*** by ***n*-*k*.** If you click the Mirror image toggle in the Excel file this is what you see. If Image and Mirror image are both clicked on, the resulting image will exhibit vertical symmetry. (10.4a)

2***r*** mirror: The web version of the spirals file creates a mirror image in a different way from the **n**-***J*** mirror. If Toggle mirror is clicked on in the web version, lines continue PAST the rth line which takes you to the center. The amount 1/***r*** continues to be subtracted for the next ***r*** line segments maintaining the same jump pattern as the first ***r*** segments. The last segment, 2***r*** will be at THE OPPOSITE SIDE of the circle from the vertex. For example, if n = 3 then the final vertex will be in one of three locations: at "vertex 0.5" (which is opposite vertex 2), "vertex 1.5" (which is opposite vertex 0), and "vertex 2.5" (which is opposite vertex 1). It is worth noting that these are just the 1st, 3rd, and 5th vertices of a hexagon. (10.4b)

r: The radius is reduced by 1/***r*** each time a line segment is drawn. The image has ***r*** segments with the end of the ***r***th segment at the center of the circle. (10.1)

Swirls: Swirl describe the overall rotational aspect of the image as your eyes move towards the center of the image. Swirls are most easily seen when ***n*** is *just below* or *just above* a multiple of ***J***. A just below ***n*** results in a clockwise swirl,  , and when ***n*** is just above, counterclockwise,  . (10.3)

Vertex ray: The line from the center of the circle to the parent polygon vertex is the vertex ray. Each endpoint of connected segments in the spiral is on a vertex ray. These rays are most readily seen using the Possible dots toggle for small ***n*** and ***r***, (***n*** ≤ 12 and ***r*** ≤ 10). (10.1b)