

TEACHING GUIDE

Golden Spiral



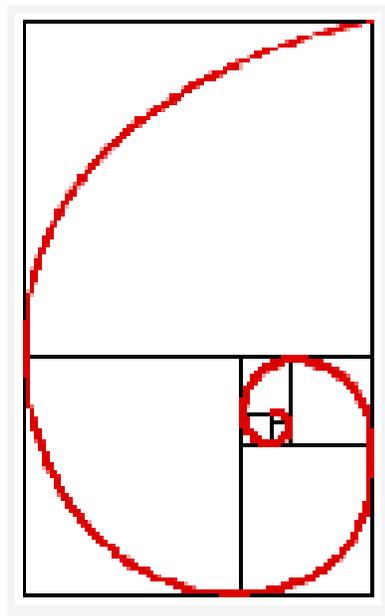
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Teaching the “Golden Spiral”

The Golden Spiral, like many spirals, does not change in shape as it grows in size. It is distinct from other spirals, however, because its structure exhibits the proportion of the Golden Ratio. The Golden Spiral manifests itself in such familiar forms of nature as sunflowers, pinecones, and shells, but it may also appear in the structure of such large-scale phenomena like hurricanes and spiral galaxies.

A Golden Spiral can be derived from a Golden Rectangle, a specific type of rectangle whose ratio of the long side to the short side is approximately 1.618034 to 1. To create this special type of spiral, simply partition off a square from the Golden Rectangle in such a way that its sides are equal to the short side of the rectangle. This will leave you with your square and another Golden Rectangle. You can repeat this process indefinitely, as the resulting Golden Rectangle can always be partitioned into smaller and smaller units. You can then draw a spiral connecting the points where the Golden Rectangle has been divided into squares, as can be seen in the animation below.



As noted earlier, spirals can be found in pinecones and the seed heads of sunflowers. In sunflowers, the seeds are arranged in a tightly-packed pattern with two interlocking spirals, one that moves clockwise and another that moves counterclockwise. The spiral pattern created by the way in which the seeds grow out from the centre of the seed head approximates the Golden Spiral.

This arrangement preserves the most space for an optimal number of seeds. The number of clockwise spirals is often 34 and the number of counterclockwise spirals is often 55. Amazingly enough, these numbers are both found in the Fibonacci sequence, a series of numbers in which each number is the sum of the two preceding it: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89... If you divide the rows of seeds by one another, the product is very close to the Golden Ratio. The Golden Spiral, which occurs in phenomena both small and large, helps us to discover the mathematical patterns that often occur in nature.

Source:



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