Discussion Prompts for the Golden Series and a Geometric Fallacy

Questions for Group Discussion

Discussion before looking at the applet:

1. Define the Golden Ratio as Φ = $\frac{1\pm \sqrt{5}}{2}$ and show where these roots come from using the Golden Section and the quadratic formula. Here we use the positive since we are talking about length.

2. Review the Fibonacci numbers and series.

3. Introduce the Golden Series: 1, Ф, 1+Ф, 1+2Ф, 2+3Ф, 3+5Ф, 5+8Ф,…

4. Show how our squares are constructed using sequential Fibonacci numbers and then Golden Series numbers.

5. Show how our rectangles will be constructed and hypothesize about whether they will have the same area.

6. Use the applet to explore the geometric shapes and their areas and determine why the area of the rectangle using Fibonacci numbers is one less unit than the square. Take care to line up the pieces carefully and zoom in to look at the shapes.

Discussion after looking at the applet:

1. If we were to try this using the next consecutive Fibonacci numbers (ie 13 and 21) would the rectangle still be smaller than the square by one unit?

2. List the first several Fibonacci numbers. Why do these rectangles oscillate between 1 unit more and one unit less than their corresponding squares?

1, 1, 2, 3, 5, 8, 13, 21, 34, 55,…

3. How is the Golden Sequence different? Why are the areas equal with consecutive numbers from the Golden Sequence? (Think about how the squares and rectangles were set up and calculate the areas of both.)

1, Ф, 1+Ф, 1+2Ф, 2+3Ф, 3+5Ф, 5+8Ф,…

Keep in mind that $Ф^{2}$=Ф+1 (from the construction of the Golden Ratio).