**Golden Rectangles**



1. The rectangle ABCD shown at the right is called a “Golden Rectangle.” Notice that it is divided into two parts, square ABFE and rectangle FCDE. The smaller rectangle is similar to the large one. This means that their sides have the same ratio, that is $\frac{AD}{DC}=\frac{DC}{ED}$.
2. Each side of square ABFE is one unit long. The shorter side of rectangle FCDE is *x* units long. What is the length of AD?
3. Explain why $\frac{x+1}{1}=\frac{1}{x}$.
4. Multiply by *x* on both sides of the equation in (b). You now have a quadratic equation.
5. Rearrange the terms of your quadratic equation so that 0 is on one side.
6. Use the quadratic formula to find solutions to the equation in (d).
7. One of the solutions to your equation does not apply to the Golden Rectangle. Explain why.
8. Find a decimal approximation (to the nearest .001) for *x.*
9. In a Golden Rectangle the ratio of the longer side to the shorter side is called the Golden Ratio. Use your value of *x* to find the Golden Ratio to the nearest .001.



1. Here is another, larger, Golden Rectangle. This time the smaller side of the small rectangle is one unit as shown. Because the large rectangle GHJK is similar to the small rectangle MJKL, we again have a proportion: $\frac{GK}{KJ}=\frac{KJ}{KL}$.
2. Use the proportion to write an equation with the variable *z*.
3. Multiply by *z* on both sides of the equation so that you have a quadratic equation.
4. Rearrange the quadratic equation so that 0 is on one side.
5. Use the quadratic formula to find solutions to the equation in (c).
6. Find a decimal approximation (to the nearest .001) to the solution that applies to the rectangle.
7. Use your value of *z* to find the Golden Ratio. Compare your result with your answer to 1h.
8. The Golden Ratio is related to the Fibonacci sequence. Here is how the sequence works:

First term = 1

Second term = 1

Recursive rule: Add the two previous terms to get a new term.

Here is how the sequence starts: 1, 1, 2, 3, 5, 8, 13, ...

1. Explain why the seventh term of the sequence is 13.
2. Find the next five terms in the sequence.

The ratios of the terms in the Fibonacci sequence form an interesting pattern. Here are the first four ratios.

$$\frac{1}{1}=1$$

$$\frac{2}{1}=2$$

$$\frac{3}{2}=1.5$$

$$\frac{5}{3}=1.666…$$

1. Find the next six ratios.
2. What do you notice? How are the Fibonacci ratios related to the Golden ratio?
3. Learn more about the Golden ratio and its relationship to nature and art by searching on the Internet.