Investigating the Ratios of a Golden Rectangle

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November 12, 2014

Topic: Finding the Golden Ratio using Euclid's construction of the Golden Rectangle.

Connection to Core Curriculum:

High School Geometry-

• CCSS.MATH.CONTENT.HSG.SRT.B.5: Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Overview: Students will use the applet to see how the Golden Rectangle is constructed and find the Golden Ratio. Students will see how many ways they can find the ratio in the Golden Rectangle. Students can then make a conjecture on what happens if a square is repeatedly removed from the smaller rectangle.

Objectives:

Students will:

- 1. Use the applet to learn how to construct a golden rectangle.
- 2. Apply what they have learned from the applet as well as using what they have learned about congruence, similarity, circles and right triangles to find the ratio between the length and width of the Golden Rectangle. This is the Golden Ratio. Students will experiment with other ratios in the Golden Rectangle to find which ones are the Golden Ratio.
- 3. Students will be guided to think about what happens when a square is removed from the smaller rectangle and compute the ratio of length to width in the resulting leftover rectangle.
- 4. Students will make a conjecture about what will occur if the process is done repeatedly and explain their reasoning.

Materials Needed: Computer for each participant.

Technology: Golden Rectangle applet from MULTICHOICE MATHEMATICS ON THE WEB: A mathematics teacher development programme for the Dinaledi Maths and Science Initiative.

Role of Technology: The technology gives the student the visuals necessary to find the Golden Ratio. It also allows them to work at their own pace and revisit the construction as often as necessary.

Web Reference: http://academic.sun.ac.za/mathed/shoma/assets/MATUNIT24_07c.htm and http://academic.sun.ac.za/mathed/shoma/MATUNIT24_09.htm#"

Activity Plan: Each student will pull up the applet and be directed to carefully go through the 5 steps a few times until they feel confident that they understand the construction of the Golden Rectangle. They will then be directed to use the constructed rectangle to find the Golden Ratio which is the ratio of length to width in the Golden Rectangle. They will need to apply their knowledge of squares, circles and right triangles to find the ratio. If time permits, students could further explore the Golden Rectangle and look for more relationships using ratios, similarity etc.

Background: Students should have some experience working with ratios and with constructing geometric proofs using congruence, similarity and properties of right triangles and circles.

Extensions: Students could further explore the Golden Ratio. They could learn about it's history, use it in other applications or explore it's mathematical implications.

Included documents: Task Sheet: 'The Golden Rectangle'