**Technology-Enhanced Activity Plan – Week #5**

**Title:** Fibonacci Magic

**Author:** Sierra Fox and Kaden Strong

**Topic**: the Fibonacci sequence and Golden Ratio

**Connection to Core Curriculum**: Strand: FUNCTIONS - Interpreting Linear and Exponential Functions (F.IF) – Standard F.IF.3

Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.

**Overview**: The activity will introduce students to the Fibonacci sequence and allow them to create their own conjecture based on what they discovered while using the applet.

**Objectives**: Participants discover that the Golden Ratio can be found through manipulating the Fibonacci sequence with division. This relationship is discovered through the applet and TED Talk video.

**Materials Needed:**Laptop, internet access, the Fibonacci Magic Task Sheet document

**Technology:** Fibonacci Numbers and the Fibonacci Spiral applet found at <https://www.geogebra.org/m/KxDU4wsG>

YouTube video of “The magic of Fibonacci numbers” TED Talk by Arthur Benjamin found at <https://youtu.be/SjSHVDfXHQ4>

**Role of Technology:** The technology allows students to discover relationships between the Fibonacci sequence and the Golden Ratio.

**Web Reference:** See above.

**Activity Plan:**

1. Students watch video introduction of the Fibonacci sequence and the instructions for the task sheet and introduce the applet
2. Students use the applet to come up with conjectures on their task sheet
3. Students explain how they came up with their conjectures and why they think it works
4. Students watch the TED Talk YouTube video
5. Students respond to the two prompts about the TED Talk on the task sheet

**Background:**

**Extensions:** Golden Spiral

**Included documents**: Fibonacci Magic Task Sheet

**References**: See Technology section above.

**Fibonacci Magic Task Sheet**

The Fibonacci Sequence is a sequence that is defined recursively, where $F\_{n}=F\_{n-1}+F\_{n-2}$ and $F\_{1}=F\_{2}=1$. Thus, the Fibonacci Sequence for $n=1, 2, 3, …$ is 1, 1, 2, 3, 5, 8, 13, 21, 34, …

Use the following applet to visually represent the Fibonacci Sequence using squares and the Fibonacci spiral (golden spiral): <https://www.geogebra.org/m/KxDU4wsG>.

1. Come up with a conjecture about the area of the squares created by the applet.
2. Show your thinking behind your conjecture from the prompt above. This does not need to be a formal proof, just a written process of your thoughts on your conjecture.
3. Watch the following TED Talk from Arthur Benjamin and see if you came up with a conjecture that he mentioned in his video: <https://youtu.be/SjSHVDfXHQ4>.
4. What did you find the most interesting in the TED Talk?
5. How did Arthur Benjamin connect what you created in the applet to the Golden Ratio?