Objectives:
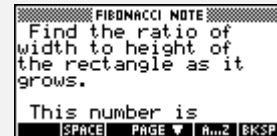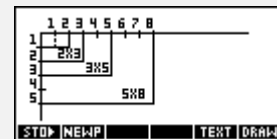
Using the **FIBONACCI** aplet the student will determine an approximation for the golden mean using the ratio of width to length of the sides of the golden rectangles.
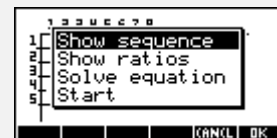
Functionality:

When the student selects **START**, the **FIBONACCI NOTE** will be displayed.

The student should then view the **SKETCH** to see how the golden rectangles are constructed.

To select the sequence of numbers or the ratios formed by the width to length of the rectangles, the student should press **VIEWS**.

After seeing a partial listing of the sequence and ratio values using the prompts from **VIEWS**, the student will be taken to the **NUMERIC** view. Here the student can access more values by using the up and down arrows.
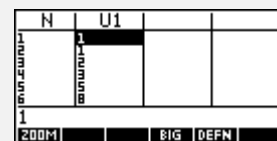
Once the exploration has been completed for the sequence and ratio values, the student can solve the equation by choosing **Solve equation** from the **VIEWS** menu. This will automatically load the **Solve** aplet and put the equations in the **SYMBOLIC** view.
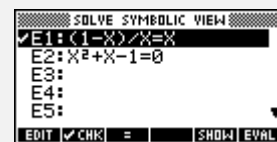
The student should press **NUM** to enter a seed number in order to find the solutions.
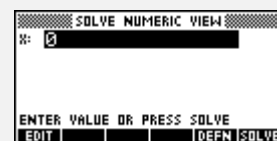
Note: Students should **Reset** the **Solve** aplet before and after using the **FIBONNACCI** aplet.

Note: The negative solution to the equation in the solve is not the golden ratio. While the equation has two solutions, the negative solution would be extraneous since length is never negative.
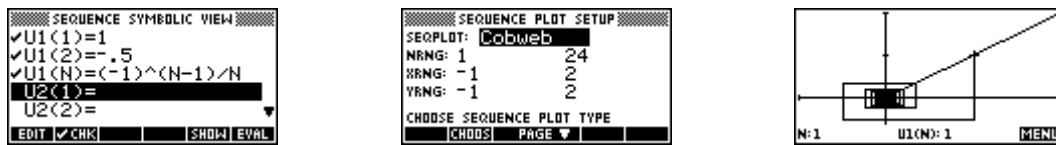
Additional Exploration:

Graphically investigate the sequence of positive odd numbers using the Sequence aplet.
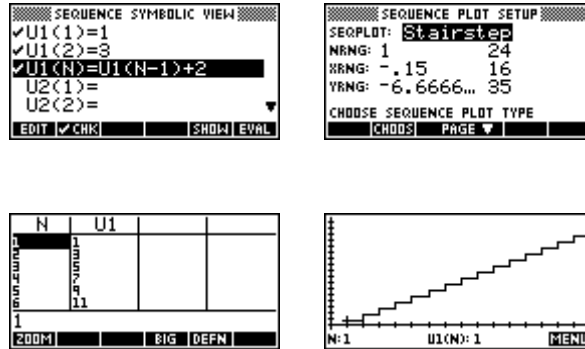
Using the Sequence aplet, examine the behavior of a sequence. An example would be:

Given the sequence defined by $a_n = \dfrac{(-1)^{n-1}}{n}$, investigate what value(s), if any, the sequence approaches.

Programs associated with this aplet:
    .F.L, .F.F, .F.E, .F.SV

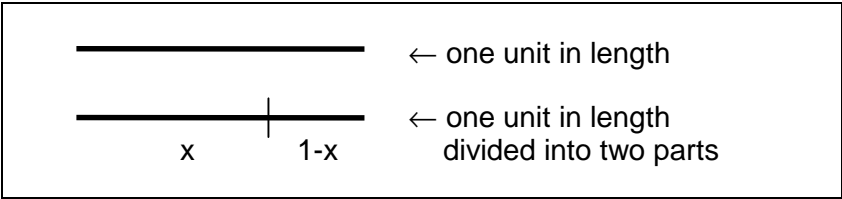| A Golden Opportunity	Name: _____
Fibonacci and the Golden Mean	Date: _____

Directions: To begin go to the library by pressing **LIB** . Reset the **Solve** aplet. Choose
FIBONACCI aplet from the aplet choices by highlighting it. Then press
START . Once you have read the note and have seen the sketch, press
VIEWS to make your next choice.

1. List the first ten terms of the sequence. Choose **Show sequence** from the **VIEWS** .

2. Complete the table with the information. Refer to the sketch and choose
   Show ratios from the **VIEWS** .

Width	Length	Ratio (W/L)	Decimal form

2. The ratio approaches the number, 0.618033..., which is known as the golden mean or
   golden ratio. How many terms of the ratio sequence did you have to use to get a good
   approximation of the golden mean? _____

3. In the 15th century, a mathematician named Luca Pacioli derived the divine proportion.
   Take a line segment and divide it into two parts so that the smaller part is to the larger
   part as the larger part is to the whole segment. Set up the ratio and solve the equation.
   Choose **Solve equation** from **VIEWS** . What do you notice about the positive
   solution to this equation?

← one unit in length

← one unit in length
x   1-x   divided into two parts

_____

_____

_____