# Sunflowers and the Fibonacci Sequence

## Lesson Summary
In this lesson, students explore the presence of Fibonacci numbers in nature—specifically in the petals and seeds of sunflowers.



## Lesson Objectives
Students will be able to:
1. Recognize a pattern in a series of numbers
2. Identify the Fibonacci sequence and numbers
3. Discuss patterns in nature
4. Explain why seed patterns evolved into Fibonacci spirals

## Assessments
Students will:
1. Successfully count the number of petals on a sunflower
2. Identify the shape of the curve in a sunflower seed pattern
3. Explore other seed patterns in comparison to Fibonacci spirals

## Materials
1. Digital pictures of sunflowers
2. Sunflowers
3. Steak knives
4. Sewing pins

## Before You Begin
1. Check to see that the sunflowers are blooming and the seeds are visible
2. Download pictures of sunflowers and the Fibonacci spiral
3. Download the spiral application from http://demonstrations.wolfram.com/PhyllotaxisSpirals/



## Procedures
In the classroom:
1. Introduce number sequences and series.
2. Explain the Fibonacci sequence and the formula for determining the next number in the sequence.

In the garden:
1. Ask students to identify the patterns in sunflowers that they see.
2. Harvest the heads of various sunflowers; students may work solo or in pairs.


Back in the classroom, or in an outdoor work space:
1. Have students lay a sunflower head on a flat surface.
2. Students count the number of petals on the sunflower and write down their number.
3. Show the students how to identify a single spiral in one direction on a sunflower head.
4. Students should then place a pin in "Spiral 1" and begin counting spirals in one direction. They should place a pin every 10 rows of seeds in order to help keep count.
5. Have the students compare the number or spirals to the number of petals they counted. Many will have the same number.
6. Compare each student's number to the Fibonacci sequence. Students will typically have a number that is at or near a Fibonacci number.
7. Open the Phylotaxis Spiral application and project this for the students. Show them how the curve of the spirals can increase or decrease seed density.

## Resources
http://www.popmath.org.uk/rpamaths/rpampages/sunflower.html
http://en.wikipedia.org/wiki/Fibonacci_number