6. Each small circle on the illustration represents a seed, all of which form a spiral pattern from the center. Use two different colored pencils to mark the clockwise and counterclockwise spirals. Starting with an outside circle, trace the spiral shape through the circles that define one spiral. (Note: Some circles will not be included.)
7. Count the clockwise spirals, then count the counterclockwise spirals. The numbers should be consecutive Fibonacci numbers. (For this figure the Fibonacci numbers are 21 and 34.) Explain to students that seed heads in nature arrange themselves in Fibonacci spirals.
8. Assign the classroom activity (see last page) and have students share their drawings. Then discuss how rectangles with Fibonacci dimensions are used in art and architecture. You may use an example from artist Piet Mondrian, who used three- and five-unit squares in his paintings. Also, the ancient Egyptians used Fibonacci dimensions in the Great Pyramid at Giza, and the Greeks used them in the Parthenon. Brainstorm with students to name animals that have spiral shapes, such as snail and nautilus shells. (Some scientists think the spiral protects an animal inside its shell.)

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Active participation in classroom discussions; ability to work cooperatively to complete the in-class activity.
- **2 points:** Some degree of participation in classroom discussions; ability to work somewhat cooperatively to complete the in-class activity.
- **1 point:** Small amount of participation in classroom discussions; attempt to work cooperatively to complete the in-class activity.

Vocabulary

algorithm

Definition: A step-by-step procedure for solving a problem

Context: The algorithm for obtaining the numbers in the Fibonacci sequence is to add the previous two terms together to get the next term in the sequence.

logarithmic spiral

Definition: A shape that winds around a center and recedes from the center point with exponential growth

Context: The nautilus shell is an example of a logarithmic spiral.

sequence

Definition: A set of elements ordered in a certain way

Context: The terms of the Fibonacci sequence become progressively larger.

term

Definition: An element in a series or sequence