Name: _____ Date: _____

Counting the Spirals on a Sunflower

Circle group

Start with 1 and 1. Add them to make 2. Add 1 and 2 to make 3. Add 2 and 3 to make 5. Keep going. You get 1, 1, 2, 3, 5, 8, 13, 21, 34. Each number is the sum of the two before it. This is the Fibonacci sequence. It is named for an Italian mathematician who wrote about it about eight hundred years ago.

This pattern shows up in plants. Look at the seeds in the middle of a sunflower. They sit in curved rows. The rows spiral two ways, clockwise and counterclockwise. Count the rows each way. The two counts are often neighbors in the sequence, like 21 and 34. Pinecones and pineapples often show it too, with counts like 8 and 13.

Scientists think plants grow this way because spirals fit many seeds into a small space.

But not every plant follows the pattern. Counts can differ. The sequence is a guide, not a law. Try it yourself. Find a pinecone. Count the spirals each way.

Questions

1. What are the first two numbers in the sequence?

_____

_____

2. How is each number made?

_____

_____

3. What number comes after 21?

_____

_____

4. Where are the spirals in a sunflower?

_____

_____

5. Why do scientists think plants grow in spirals?

_____

_____

6. Why is the sequence called a guide and not a law?

_____

_____

Words to know

sequence: a list of numbers that follow a pattern
mathematician: a person who studies numbers and shapes
spiral: a curve that winds around a center point
clockwise: moving in the same direction as clock hands

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Counting the Spirals on a Sunflower

Triangle group

Start with 1 and 1. Add them to make 2. Add 1 and 2 to make 3, then 2 and 3 to make 5. Keep going and you get 1, 1, 2, 3, 5, 8, 13, 21, 34. Every number is the sum of the two numbers before it. This pattern is called the Fibonacci sequence, after an Italian mathematician who wrote about it about eight hundred years ago.

What makes the sequence famous is that it turns up in plants. Look closely at the seeds in the middle of a sunflower. They are packed into curved rows that spiral in two directions, one clockwise and one counterclockwise. If you count the rows going each way, the two counts are often neighbors in the sequence, such as 21 and 34. Pinecones and pineapples often show the same thing, with counts like 8 and 13.

Scientists think plants grow this way because spiral packing lets a great many seeds or scales fit into a small space with very little wasted room.

Still, not every plant follows the pattern exactly, and counts can vary from one flower to the next. The sequence is a helpful guide, not a strict law of nature. To test the idea yourself, find a pinecone and count the spirals going each way. Then see whether your two numbers are neighbors in the sequence.

Questions

1. What are the first two numbers of the Fibonacci sequence?

_____

_____

2. How is each number in the sequence made?

_____

_____

3. What number comes after 21 in the sequence?

_____

_____

4. Where in a sunflower do the spirals appear?

_____

_____

5. Why do scientists think plants grow in spirals?

_____

_____

6. Why does the passage call the sequence a guide and not a strict law?

_____

_____

Words to know

sequence: a list of numbers that follow a pattern
mathematician: a person who studies numbers and shapes
spiral: a curve that winds around a center point
clockwise: moving in the same direction as clock hands
scales: the small overlapping parts that cover a pinecone

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Counting the Spirals on a Sunflower

Square group

Begin with the numbers 1 and 1. Add them together to make 2. Add 1 and 2 to make 3, and then add 2 and 3 to make 5. If you continue in this way, you generate the list 1, 1, 2, 3, 5, 8, 13, 21, 34. Every number in the list is the sum of the two numbers that precede it. This pattern is called the Fibonacci sequence, after an Italian mathematician who described it roughly eight hundred years ago.

What has made the sequence so famous is its tendency to appear in plants. Examine the seeds at the center of a sunflower closely, and you will notice that they are packed into curved rows that spiral in two directions, one clockwise and the other counterclockwise. When you count the rows running each way, the two totals are frequently neighbors in the sequence, such as 21 and 34. Pinecones and pineapples often display the same feature, with totals like 8 and 13.

Scientists believe that plants grow in this manner because spiral packing allows an enormous number of seeds or scales to fit into a small space with very little room wasted.

Nevertheless, not every plant follows the pattern precisely, and the counts may vary from one flower to the next. The sequence is a useful guide rather than a strict law of nature. To test the idea for yourself, find a pinecone and count the spirals running in each direction, then check whether your two numbers are neighbors in the sequence.

Questions

1. What are the first two numbers of the Fibonacci sequence?

_____

_____

2. How is each number in the sequence produced?

_____

_____

3. What number follows 21 in the list?

_____

_____

4. Where do the spiral rows appear in a sunflower?

_____

_____

5. Why do scientists believe plants grow in spirals?

_____

_____

6. Why does the passage describe the sequence as a guide rather than a strict law?

_____

_____

Words to know

sequence: a list of numbers that follow a pattern
mathematician: a person who studies numbers and shapes
spiral: a curve that winds around a center point
clockwise: moving in the same direction as clock hands
scales: the small overlapping parts that cover a pinecone

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Counting the Spirals on a Sunflower

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Counting the Spirals on a Sunflower

Easier · 150 words · Flesch-Kincaid grade 2.5

1. 1 and 1.
2. It is the sum of the two numbers before it.
3. 34.
4. In the rows of seeds in the middle.
5. Spirals fit many seeds into a small space.
6. Not every plant follows it, and counts can differ.

Triangle: Counting the Spirals on a Sunflower

This passage · 204 words · Flesch-Kincaid grade 5.5

1. 1 and 1.
2. It is the sum of the two numbers before it.
3. 34 comes after 21 in the list.
4. In the rows of seeds in the middle of the flower.
5. Spirals let many seeds fit into a small space with little wasted room.
6. Not every plant follows the pattern exactly, and counts can vary.

Square: Counting the Spirals on a Sunflower

Harder · 232 words · Flesch-Kincaid grade 8.2

1. 1 and 1.
2. It is the sum of the two numbers that come before it.
3. 34.
4. Among the seeds at the center of the flower.
5. Spiral packing fits many seeds into a small space with little wasted room.
6. Not every plant follows it exactly, and the counts can vary.