Reader's Guide

SUGGESTIONS FOR READING ALOUD
Swirl by Swirl is a book about a shape (the spiral) that is found over and over in nature. As you are reading, encourage students to find the spirals on each page, and identify the creatures to which they belong.

Questions to Ask Before Reading:
1. What is a spiral? Can you trace one in the air with your finger?
2. What spirals can you find on the front cover of this book? On the back?
3. What creatures can you see, both front and back?
4. Have you ever seen any of these spirals in nature yourself?
5. Can you think of any others?

After Reading:
1. What words did the author use to describe spirals? Can you think of any other words that describe them?
2. The endpapers (inside the front and back covers) are chockfull of creatures and spirals. Take a moment to look at them and talk about them.
3. Think of all the ways animals make spirals with their bodies (tails, trunks, horns, etc.). Can you make any spirals with your body?
4. After reading the endnotes, look back over each page and think about why each spiral shape occurs.
5. Can you find other spirals—at home, in the classroom, outdoors?

I SPY SPIRALS
Find these shapes and objects in the cover (front & back):

20 spirals
1 snail
1 swallowtail butterfly
5 flowers:
  • 1 sunflower
  • 1 rose
  • 1 chrysanthemum
  • 1 calla lily
  • 1 hibiscus blossom
1 sweet pea bud
4 thorns
6 fern fronds
4 clouds
1 bee

SPIRAL PARTY!
Host a spiral party in your classroom. Set up different stations using the different
activities on this poster, plus a few more:

- Spiral Mobile (described below)
- Party Blower Butterflies: party blowers and construction paper can be used to create butterflies with curling tongues
- Fibonacci Spiral sheet (described here)
- Slinky Play: slinkies form helixes, a kind of spiral
- Shell Table: set out various spiral shells along with paper and crayons, so that students can draw pictures of them and locate their spirals.
- Show and Tell: have students bring in any object with a spiral in it, to show the class. Those students that have forgotten can just make a fist—instant spiral!

SHELL STUDY: Science, Art, and Writing

1. Where do shells come from?
   - Show students a large shell (a conch works well), and identify the spiral within it. Look closely at the shell and note its other characteristics—bumpy outside, smooth inside, colors, etc.
   - Ask students if they know where shells come from. Then talk about mollusks: show pictures of their anatomy, and describe how the shell is extruded by the mollusk’s body and how it protects the growing mollusk.

2. How are shells different?
   - Bring in a box of small spiral shells; pass one out to each student. Have each student observe his or her shell closely and identify the spiral. Then ask students to draw a picture of their shell, and write down one interesting thing they noticed about it.
   - Have each student show his/her drawing and share observations.
   - Advanced: Students can use shell guide books to identify each shell.

3. Write a poem to a shell
   - Using the large shell as a model, brainstorm metaphors: what it looks like, feels like, etc. Write a group “letter poem” on the board, in which you are addressing the shell (“Dear Shell . . .”). Include at least one compliment (“Your inside looks like a beautiful sunset”), one question (“What is it like to feel the sand against your skin every day?”) and one wish (“I wish I could shrink and climb inside you”).
   - Advanced: Ask each student to write an individual poem about his or her shell.
   - Poems and drawings can be collected into a class Shell Book.

SCIENCE PROJECT

Tornado in a Bottle
This experiment shows how water forms spirals.

You Will Need:
- Two empty 2-liter plastic bottles with caps
- Water
- Food coloring (optional)
- Foil confetti or glitter (optional)
• Drill
• Silicone caulking
• Duct tape

1. Remove the labels from the bottles, take the caps off, and rinse bottles thoroughly.
2. (To skip this step, find a company online that sells bottle connectors.) Drill a ½ inch hole in the center of each cap. Place the caps together on their flat ends, and put a thin bead of caulk around the hole to seal it. Let dry. Wrap duct tape tightly around the outside of the caps to stick them together.
3. Screw the “doubled” cap on to one of the 2-liter bottles. Fill the other bottle about 3/4 full with water. Add food coloring and glitter if you wish; these help show the “tornado”.
4. Screw the empty bottle tightly to the top of the bottle filled with water.
5. With one hand holding the bottles by the connector area and the other supporting the full bottle, drain one bottle into the other, swishing in a circular motion. Students should see a spiraling "tornado" as the water drains.

MATH PROJECT

More About Fibonacci Numbers
Fibonacci numbers—which are named after a 13th century Italian mathematician—are a specific sequence of numbers that show up over and over in the structure of many naturally occurring objects. This sequence \{1, 1, 2, 3, 5, 13, 18, \ldots\} is created by adding the previous two numbers of the sequence. Fibonacci numbers occur in the way plant leaves are arranged on a stem, or the way petals or seeds are arranged in a flower head. They can also be used to predict a logarithmic spiral, which widens at a fixed rate.

Color and Trace a Fibonacci Spiral
Use the attached Fibonacci template to demonstrate how Fibonacci numbers lead to a spiral similar to that in a nautilus shell. These blocks represent the squared area of each successive number in the Fibonacci sequence. When you arrange them around each other and draw a curved line connecting their diagonal corners, voila! A spiral!
• Copy this template for each student
• Have students color in the separate blocks, then trace the spiral with marker

ART PROJECT

Spiral-Mobile

You Will Need:
• Spiral template (attached)
• Scissors for each student
• Crayons or markers
• String for hanging
• Glue or stapler
• Glitter (optional)

1. Copy the spiral template onto card stock.
2. Color the spiral on both sides of the paper. Staying within the lines does not matter. You can use glitter with glue sticks for extra sparkle.
3. Cut the whole shape from the paper, and then carefully cut along the spiral line, to make one long piece.
4. Glue or staple a piece of string to the very center of the spiral.
5. Hang from the ceiling!
FIBONACCI SPIRAL from Swirl by Swirl: Spirals in Nature by Joyce Sidman
To Make Spiral Mobiles:

1. Copy this template on cardstock (if you want more than two mobiles).
2. Use crayons or markers to color spiral on both sides.
3. Cut shape from paper. Then carefully cut along spiral line. Don't worry about staying between the lines.
4. Glue or staple a length of string or ribbon to the very center of the spiral to make one long piece.
5. Hang from the ceiling!