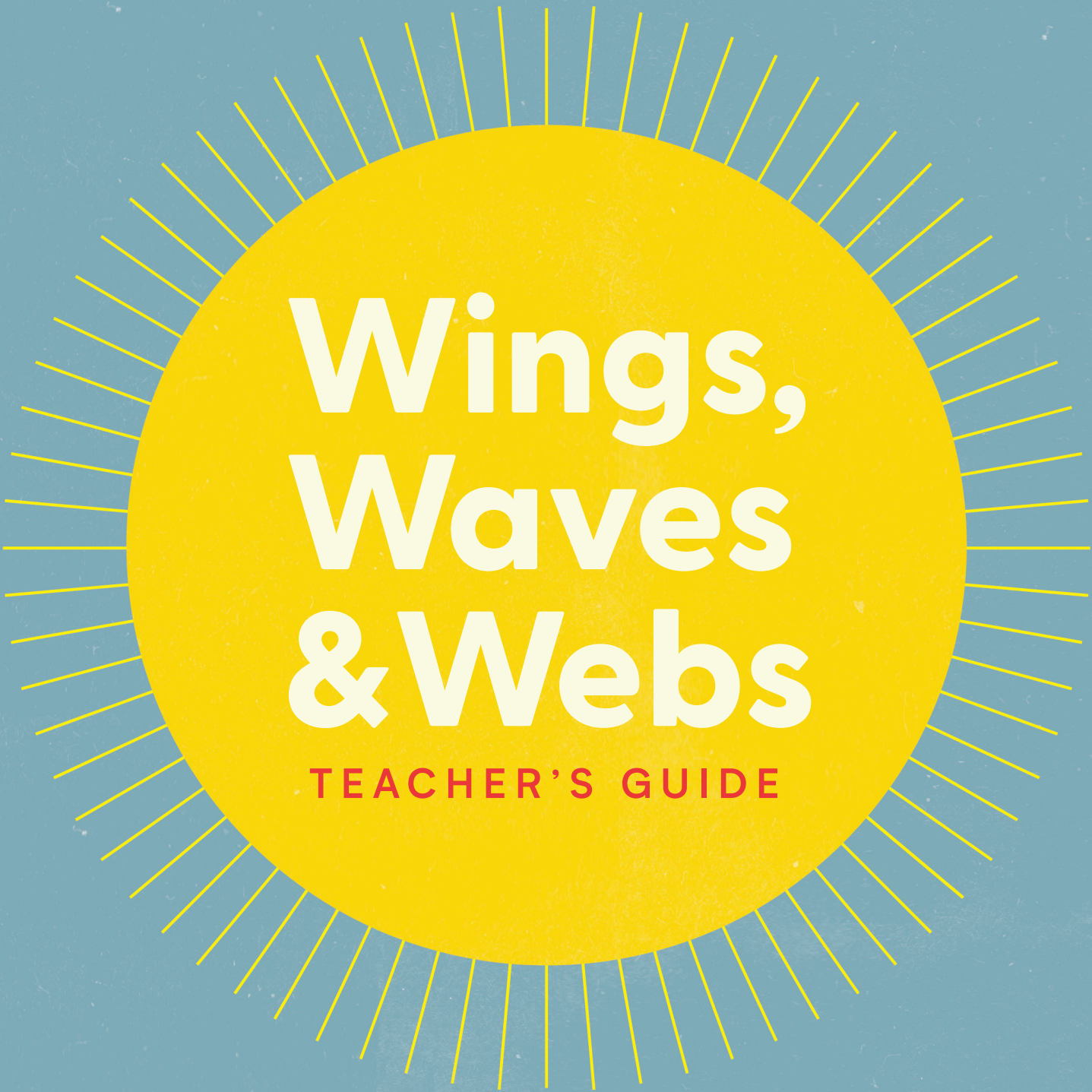




Wings, Waves & Webs

TEACHER'S GUIDE

Title: *Wings, Waves & Webs: Patterns in Nature*

Author and Illustrator: Robin Mitchell Cranfield

Genre: Juvenile nonfiction

Themes: Patterns, nature, observation, plants, animals, beauty

Suitable for: Grades K—3

Lexile Level: 830L

Common Core Standards:

English Language Arts

College and Career Readiness Anchor Standards for
Reading, Writing, Speaking and Listening, and Language;
Reading Standards for Informational Text

R.CCR. 1, 2, 3, 4, 7

W.CCR. 2, 7, 8

SL.CCR. 1, 4, 6

L.CCR. 1, 2, 4

Skills and Competencies:

asking questions

making connections

identifying types of patterns

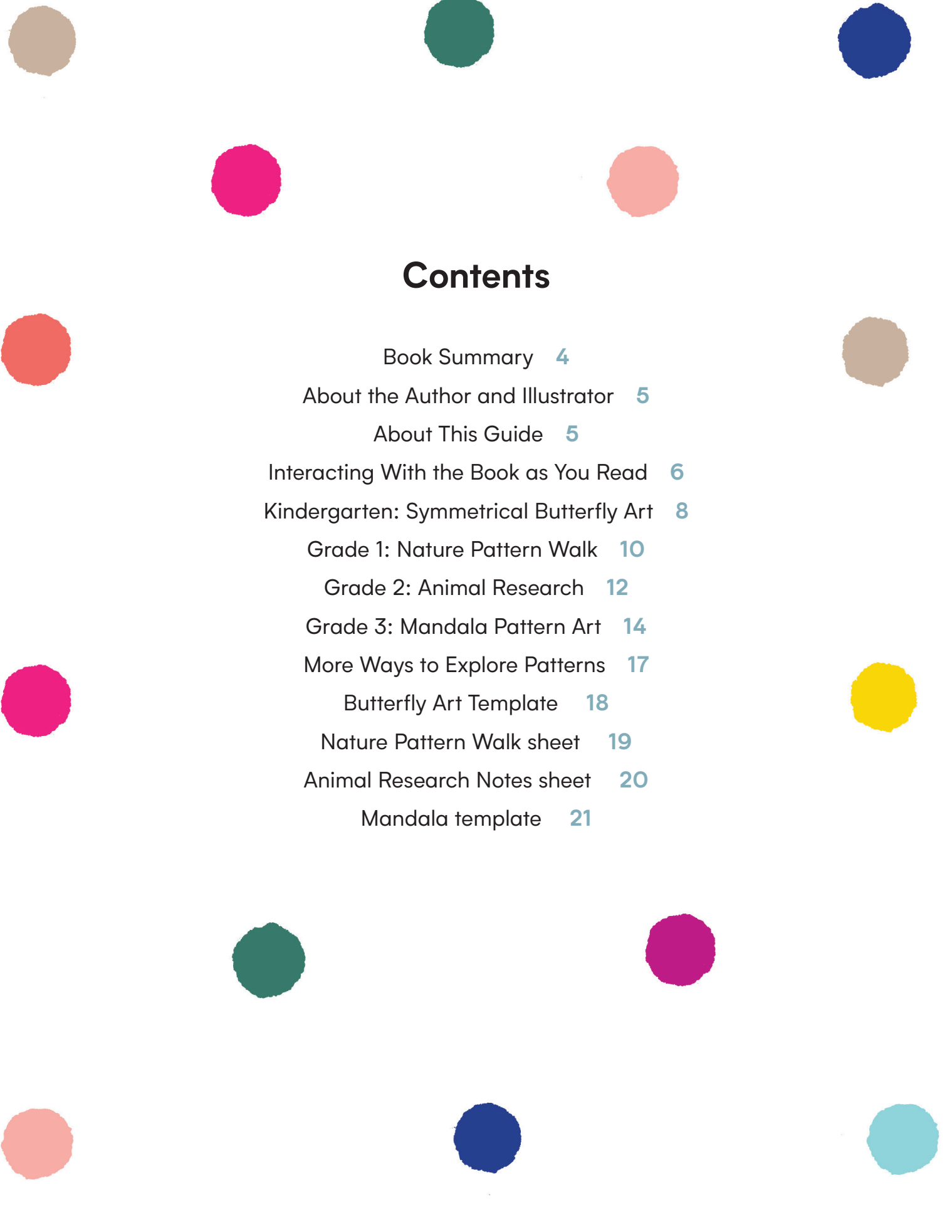
painting

observing patterns

recording information in a table

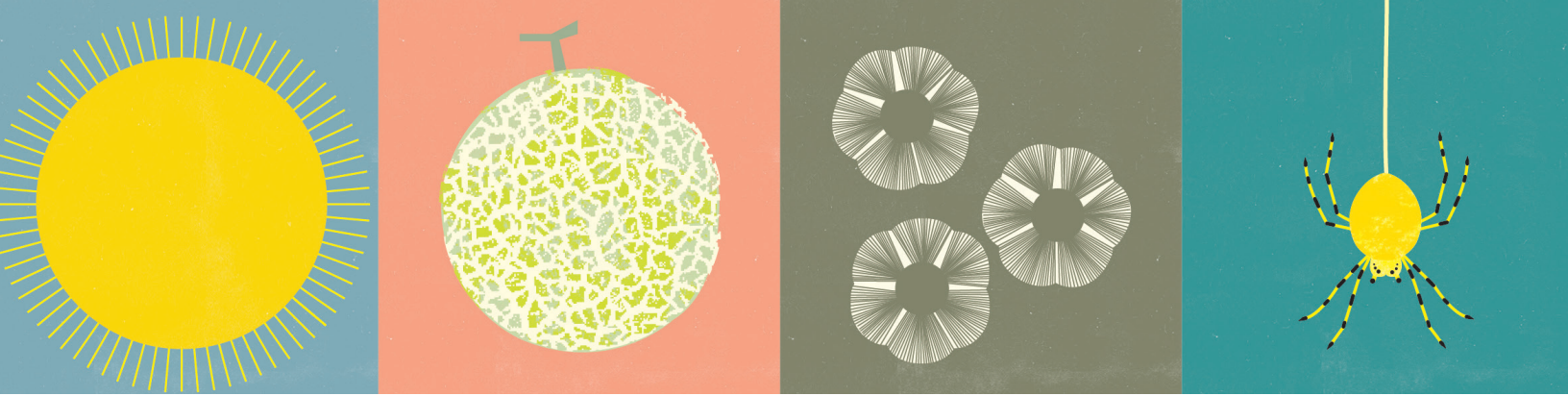
researching a topic

creating symmetrical artwork

The page is decorated with twelve hand-drawn colored circles of various sizes and colors, including shades of brown, green, blue, pink, red, orange, yellow, and teal, scattered around the central text.

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Book Summary

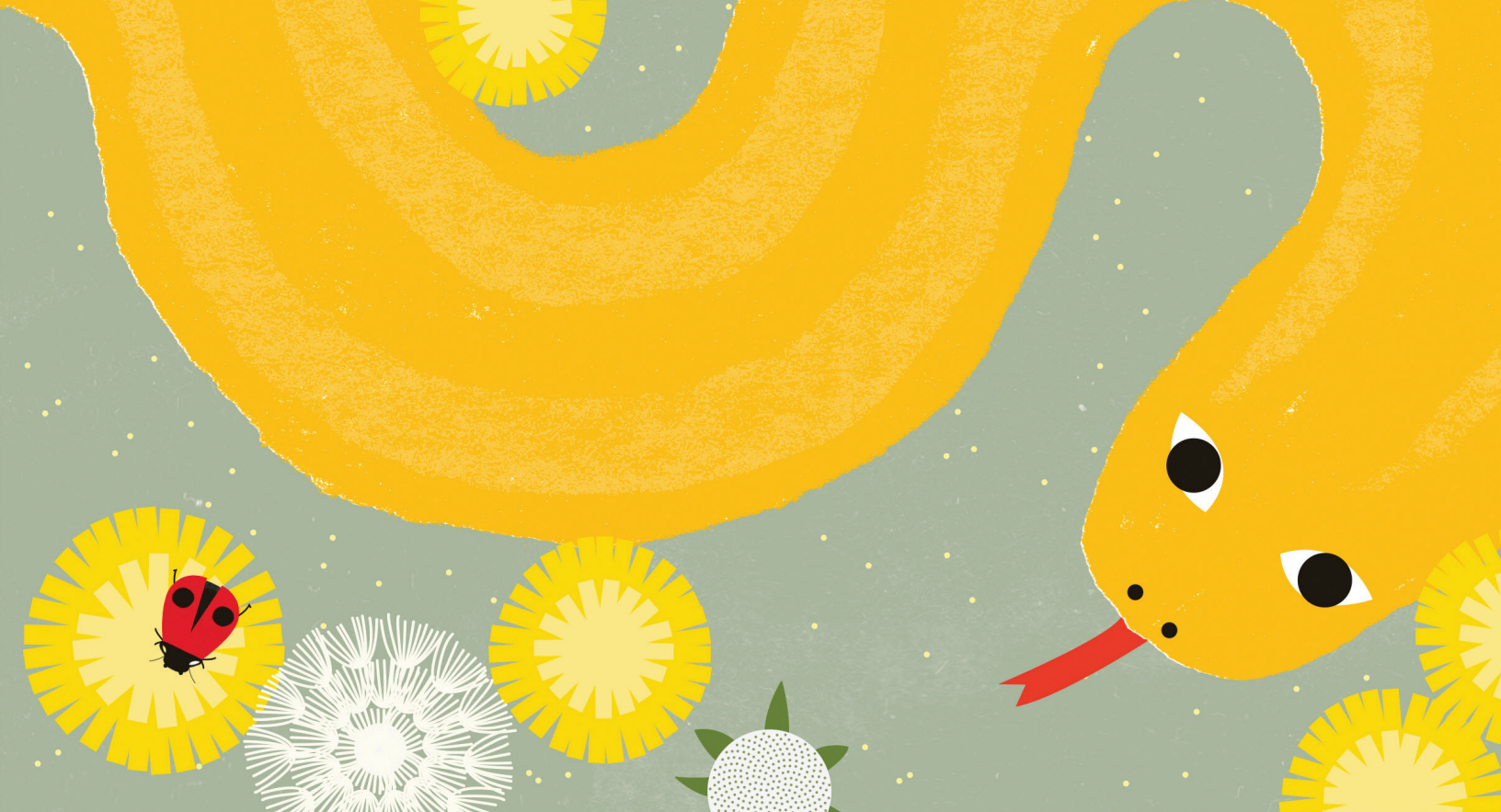
A visually stunning introduction to patterns found in nature. Perfect for early STEM learning in elementary school.

From the dots on a ladybug to the spiral on a snail, patterns in nature can be found everywhere. This simple and playful concept book introduces young readers to both math and nature while engaging their creative potential. By the end, kids will be able to identify:

- spots and stripes
- spirals and symmetry
- waves and honeycombs
- and more

After learning about key patterns, kids will be inspired on the book's final page—a striking sunflower—to find patterns for themselves. Vibrant and immersive, *Wings, Waves & Webs* invites young children to discover the beauty of the world around them.





About the Author and Illustrator

Robin Mitchell Cranfield is an illustrator, teacher, and graphic designer. She is the cocreator of the Windy book series, and has been honored by the Kidscreen Awards, iTunes Editor's Choice selections, the Parents' Choice Awards, and the BolognaRagazzi Award for her work. *Wings, Waves & Webs* is her fifth children's book.

About This Guide

This teacher's guide was created by Becky Noelle, an experienced elementary teacher with a bachelor of science degree. Use this guide to help your students fully engage with the book and have fun looking for patterns in nature!

Although this book was written for the littlest of readers, it can be used to inspire students as old as grade 3 to look for patterns in nature and delve deeper into the different types you can find. Each of the activities in this guide is listed with the target grade, but any of them can be adapted to suit your students' ages, interests, and needs.

Interacting With the Book as You Read

Make Connections

As you read the book, use the following questions as a guide (when relevant to the page's contents) to help students interact and make connections with the illustrations and concepts.

- What animals do you see on this page?
- Have you ever seen an animal like this?
- What would you call this pattern?
- Where else have you seen a pattern like this?
- How many {e.g., spots, stripes, legs} can you count?

Get Moving

For younger readers, have students move their bodies as you read to engage with the descriptions. Use the ideas below or create your own as you go!



SPIRALS:

- Have students use their finger to draw a spiral, starting in the middle and getting bigger and bigger.
- Have students draw a spiral with their nose by moving their head in a circle, “drawing” a bigger and bigger circle as they go. (Bonus: They’ll get a nice neck stretch in the process!)
- Have students make their body as small as possible, crouching down and wrapping their arms around their legs. Then have them slowly stand up, getting “bigger and bigger,” stretch their arms out to the sides to show “wider” then reach as high as they can to show “taller.”



MIRROR SYMMETRY:

Have students balance on one foot. Explain how their legs are symmetrical and help them stand, so it's harder to balance when you only use one!



RADIAL SYMMETRY:

Have students stretch their arms and legs out wide like a starfish. (This works with students standing up or lying on the ground.)



WAVES:

Have students squat, then stand, and repeat, moving up and down like a wave. Say, “Up, down, up, down” together as a class, as the students move up and down. Explain that this is a repeating pattern. Other examples of this repeating pattern are ABAB and red-yellow-red-yellow.



HONEYCOMB:

Have students buzz around like bees and walk slowly on their hands and feet like a tortoise.



MEANDERS:

Have students lay on the ground and wiggle their body like a snake meandering.



COLLECTIVE MOTION:

Have all the students hold hands together in a circle and move as one. For example, everyone could move in close together, then move out to make a bigger circle. Or they could move around in the circle, dancing together as they go.

Find the Hidden Patterns

Reread the book and have students take a closer look at the additional patterns that show up on some pages. For example:

- the stripes on the bees on the honeycomb page
- the spots of snow on the snowflake page
- the flowers with radial symmetry on the snake page



Kindergarten: Symmetrical Butterfly Art

MATERIALS

- one copy of page 18 of this guide for each student in your class
- a selection of paint colors (acrylic or tempera will work)
- paint dishes to hold the paints
- paint brushes
- paper towels for cleanup

DISCUSSION

After reading the book, show students the Mirror Symmetry page again. Explain that mirror symmetry means the image is the same on both sides. Point out how the wings, body, and antennae are the same shape on both sides of the butterfly and the spots match.

Show students the harlequin ladybird page and the leopard tortoise page. Explain that these animals also have mirror symmetry. Then have students look at each other to notice that humans also have mirror symmetry.

Have students practice saying “symmetrical.”

STEPS

1. Explain to students that they will get to make their own symmetrical butterfly art.
2. Show students the page that they will be painting on (page 18 of this guide).
3. Point to where it says “1. Paint” and explain that they will only paint on this half of the butterfly. They can use whatever colors and shapes they would like to paint the butterfly wing.
4. Tell students they need to be quick! They will have to fold the paper in half (along the “2. Fold” line) while the paint is still wet.
5. Once they’ve folded the paper in half, have students gently press all over the paper, to transfer the paint to the other side.
6. When students open their paper again, they will have a beautiful symmetrical butterfly!

TIPS

- Students may need help folding the paper along the dotted line. To help with this step, you could pre-fold the papers before students start painting. Then, when the paint is wet, they can easily fold the paper in half along the pre-folded line.
- Depending on your students’ experience with painting, you may want to have them complete this activity in smaller groups while other students are occupied with another activity. This will allow you to provide any support needed during the project. Additional adult or older student support in the room during this activity would also help.



Grade 1: Nature Pattern Walk

MATERIALS

- one copy of page 19 of this guide on a clipboard for each student in your class (or student notebooks)
- pencils and erasers
- seat pads (optional—for sitting and observing nature even if it's wet or bumpy on the ground!)
- pencil crayons

DISCUSSION

After reading the book as a class, discuss with students what patterns they have noticed in nature. Start a list as a class of the objects and type of patterns they've seen in nature, either ones included in the book or others they can think of.

Discuss the difference between natural objects and humanmade objects.



STEPS

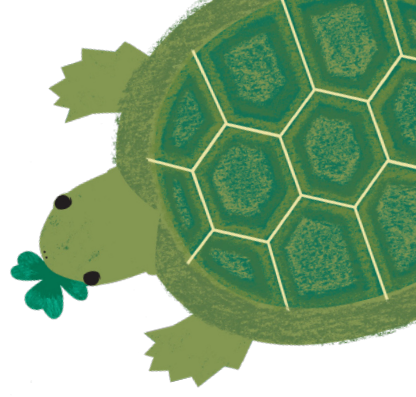
1. Tell the class that they will now have a chance to walk in nature and see what patterns they observe.
2. Show students a copy of page 19 of this guide and explain that they will need to look closely at the natural world around them to find objects with patterns like those in the book.
3. Point out the three columns that students will need to fill in: Object, with the name of the thing they are looking at; Drawing, with a quick sketch of the object; and the Type of Pattern (e.g., spots, cracks, mirror symmetry).
4. Take students on a walk through a natural area near your school. Walk slowly or take time to sit in at least one spot so students have time to look around and find patterns.
5. Give students enough time to find at least four different examples of patterns in nature.
6. When you return to the classroom, students can add color to their drawings. (Note that this step may be important if the patterns they observed were created with colors, rather than lines and textures.)
7. Have students share with the class some of the patterns they noticed. Add any new objects to the class list started during the Discussion before the walk. If humanmade objects come up, start a second list with those items. Discuss how there are many patterns in the humanmade world as well. Use the opportunity to help students distinguish between humanmade and natural objects.

TIPS

- Ideally you will have time for the class to sit in at least one spot so students can take the time to look around and consider what patterns might be there. Seat pads can be helpful in this situation to ensure students are comfortable and able to focus on the task.
- Depending on how your students usually record their thinking, it may work better for your class to use notebooks or visual journals to record the patterns they find. They can draw their own table like the one on page 19 or use a different thinking organizer to record their observations.



Grade 2: Animal Research



MATERIALS

- one copy of page 20 of this guide for each student in your class
- an internet-connected device for each student in the class
- a collection of nonfiction books about animals that include those mentioned in *Wings, Waves & Webs*
- pencils

DISCUSSION

After reading the book as a class, revisit the pages that show specific types of animals. Reread the text describing the pattern each animal forms. Take note of the explanations of why a certain type of pattern is present (e.g., a butterfly has symmetrical wings to help it balance and fly). For those pages that do not specifically explain the reason for a pattern (e.g., the guinea fowl's spotted feathers), ask students how they think that pattern might help the animal survive.

STEPS

1. Tell students they will now have the chance to learn more about one of the animals in the book.
2. Show students a copy of page 20 of this guide and explain that they will use books and reliable sources on the internet to find out more about their chosen animal. (Note: If you haven't discussed reliable sources with your students, this is a great opportunity to do so!)
3. Give students each a copy of page 20 of this guide.
4. Have students choose an animal from the book and write it at the top of their Animal Research Notes page.
5. Give students time to research their animals, finding at least three facts about their animal and the reason for their pattern.

TIPS

- Depending on the level of your students, you may wish to have them take research notes without the support of the template. Use whatever note-taking method works best for your students and classroom culture.
- Students could also be given the opportunity to choose an animal to research that is not mentioned in the book. The animal should exhibit some sort of pattern, so students can still explore the purpose of the pattern.
- You can take this activity further by having students create a presentation about their animal, including illustrations and/or pictures showing the animal's pattern and how it helps with survival.





Grade 3: Mandala Pattern Art

MATERIALS

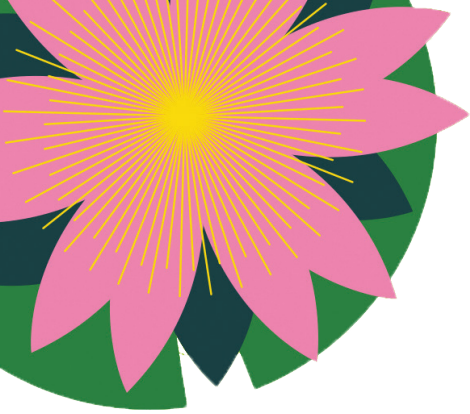
- one copy of page 21 of this guide for each student in your class
- sample pictures of mandalas
- a collection of radially symmetrical flower pictures (either printed or on a computer to project). For example: sunflower, daisy, petunia, buttercup, wild rose, trillium, and dahlia pictures.
- pencils
- fine-tipped black markers or pens
- pencil crayons or fine-tip markers

DISCUSSION

After reading the book, show students the Radial Symmetry page again. Explain that radial symmetry means the object has a center with petals or arms sticking out evenly around it. If something is radially symmetrical, you can draw a line any direction through the center, and it will cut the object into two matching halves. Have students brainstorm things they've seen that are radially symmetrical. These could be from nature, or they could be humanmade objects.

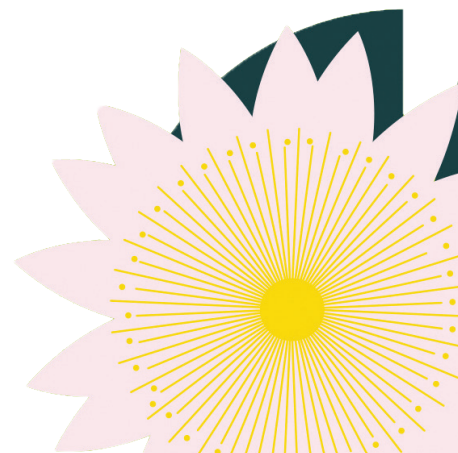
Possible examples to discuss:

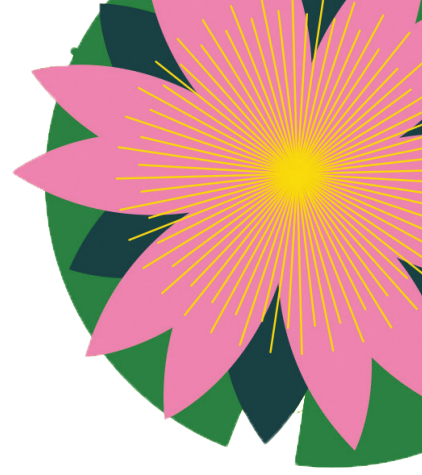
- | | |
|-------------------------|--------------------|
| • wheel | • sea urchin |
| • iris of the human eye | • sand dollar |
| • jellyfish | • snowflake |
| • sea anemone | • four-leaf clover |



STEPS

1. Tell students that they will be creating radially symmetrical art.
2. Ask students if they have ever heard of or created a mandala.
3. Show students some sample pictures of mandalas. Point out how each “layer” of the mandala is the same all the way around the circle and that it grows outward.
4. Show students pictures of radially symmetrical flowers and discuss how some of the shapes and colors are like those in a mandala. Encourage students to try using different petal shapes like the flowers as they create their mandalas.
5. Demonstrate for students how to create a basic mandala using the template on page 21:
 - a. Starting in the middle of the paper, choose a shape to draw six times, repeating around the circle. Draw the shape as wide and tall as the template lines.
 - b. Add the next layer with a new shape. These shapes can also be in between the lines (and on top of the previous shape) or overlapping the lines, so they go from the middle of one previous shape to the middle of the next (so the template line cuts the new shape in half).
 - c. Once the shapes are all drawn, return to the middle and start to add embellishments like dots or other shapes inside the shapes already there, always drawing the same thing in all the shapes on that level around the circle.





6. Give students each a copy of the mandala template (page 21).
7. Have students start with pencils to create their mandalas.
8. Once students have filled the template with shapes and embellishments, have them outline everything with a fine-tipped black marker or pen and add color, continuing the radial symmetry with the colors.
9. Display students' artwork somewhere in the classroom or hallway with a title such as "Radial Symmetry."

TIPS

- It may help your students to brainstorm possible shapes and embellishments before they begin their mandalas. You can use sample mandalas to get ideas and draw them on a whiteboard or chart paper, so students can refer to them as they create their mandalas.
- Depending on the comfort level of your students, they could skip using a pencil and go straight to drawing the mandala with a pen. This can be difficult if they have never drawn a mandala before, but it can also save time and bring more pleasure to the activity, since tracing over the pencil with pen can be monotonous for some.



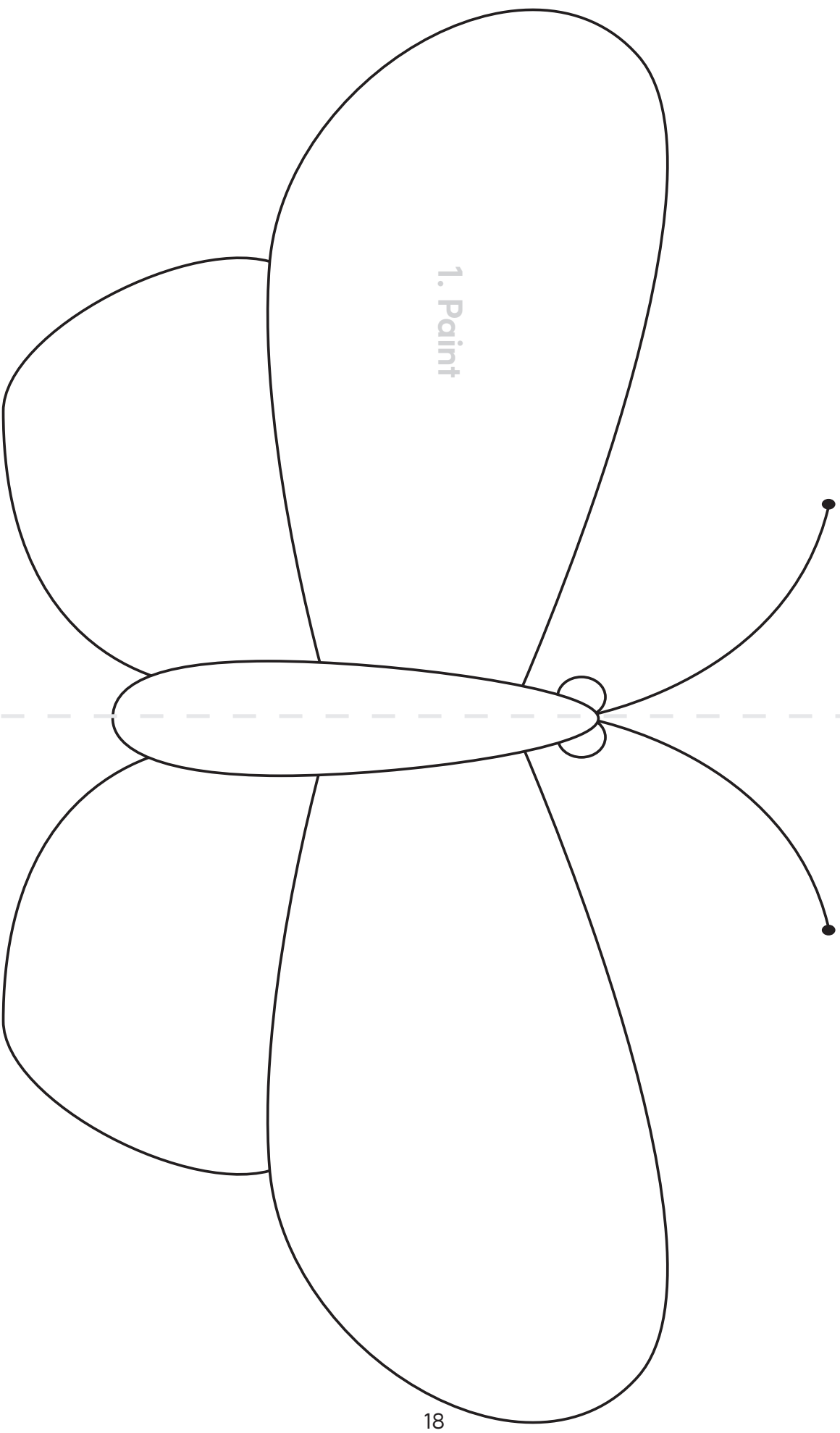


More Ways to Explore Patterns

- Research the animals from the book online and find pictures and videos of them to see what they look like and how they move in real life. For example, it's worth looking up videos of murmurations of starlings for students to see this amazing pattern in action!
- Explore the wonders of spiral symmetry in nature by searching the following online: *Aloe polyphylla*, Romanesco broccoli, and nautilus shell. Delve even deeper into spiral patterns in nature and connect to math outcomes by reading about the Fibonacci sequence and its connection to nature.
- Create cracked-paint artwork to discover this “wild pattern full of surprises”!
- Cut out snowflakes to further explore mirror and radial symmetry. (Note that how you fold the paper will determine if the snowflake has mirror symmetry or radial symmetry—or something else altogether!)
- Find other examples of the patterns in the book by searching online or in various nonfiction books with photographs of nature.

Butterfly Art

Name: _____
Date: _____



Name: _____

Date: _____

Nature Pattern Walk

OBJECT	DRAWING	TYPE OF PATTERN

Name: _____

Date: _____

Animal Research Notes

MY ANIMAL:

PATTERN TYPE:

THREE FACTS ABOUT MY ANIMAL:

1.

2.

3.

HOW MY ANIMAL'S PATTERN HELPS IT SURVIVE:

Name: _____

Date: _____

