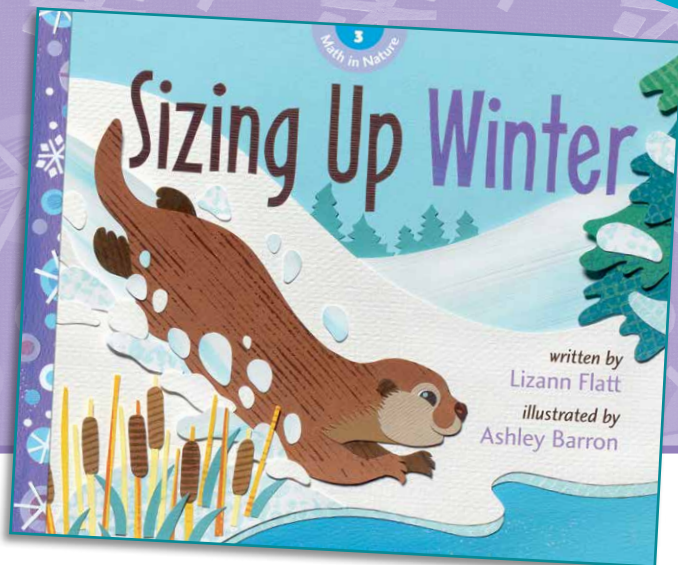




Teacher Resource Guide

for K–2 classrooms

Math in Nature: an engaging and delightful introduction to cross-curricular concepts for the primary grades.

This series invites children to journey into the natural world — a world they love to discover and could explore endlessly — to find not only math, but science, language arts, and visual arts, too! Written by Lizann Flatt, a former *chickaDEE Magazine* editor and author of several children's books, and using illustrated cut-paper collage art by Ashley Barron, the Math in Nature series is a veritable cross-curricular goldmine.

This educator's companion to *Sizing Up Winter*, the third book in the series, contains unintimidating and fun ways to introduce key concepts to the students in your K–2 classrooms. They will laugh, use their imaginations, and learn through these activities, which are all inspired by the book.



MEASURING AND COMPARING ACTIVITIES

Measuring Matters!



What you need:

- A variety of measurement tools (clock, ruler, measuring tape, scale, calendar, thermometer)

What to do:

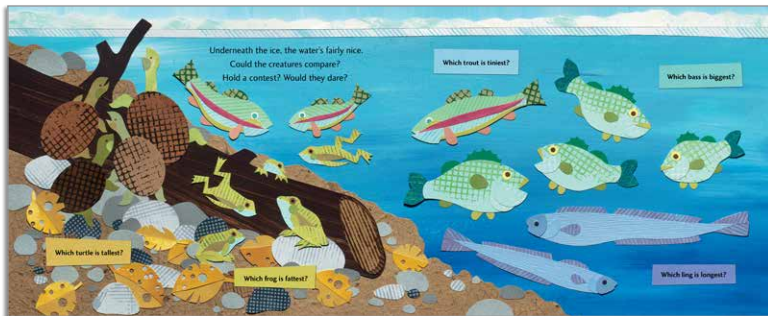
1. Have students describe ways they could compare the sizes of the snowflakes on these pages. Ask for descriptors that relate to size (e.g., tiny, small, medium, large).
2. Ask students what tools they could use to measure the exact size of the snowflakes. Bring out a measuring tool one at a time, asking, "Can you measure a snowflake with a [clock]?" As they respond yes or no to your questions, discuss what each tool can measure.

Curriculum: Mathematics

Learning Outcomes: Comparing, Measuring, Sequencing

Grouping: Whole Class

Makeshift Measures



What you need:

- String or ribbon
- Popsicle sticks
- Cube-shaped counters
- Coins or counters

What to do:

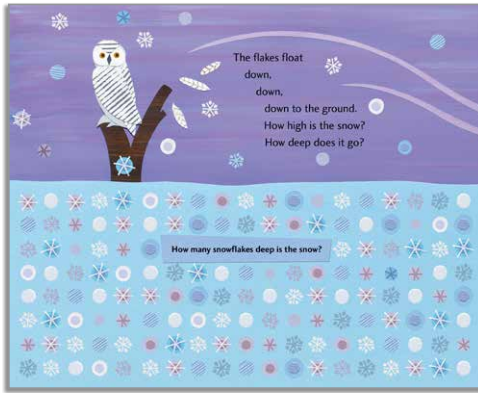
1. Have students choose any of the tools provided to answer the questions on these pages.
2. Have students share their findings with the class. Which tool did they choose to measure the animal, and why? Encourage students to think of different ways of measuring. For example, a popsicle stick or string could be used to measure the length or width of an animal; the coins or counters could be used to measure the area of a turtle's shell or a bass's body; and the string could be used to measure circumference.

Curriculum: Mathematics

Learning Outcomes: Comparing, Measuring, Sequencing

Grouping: Whole Class

Up and Down



What you need:

- A clear glass or plastic container filled with sugar or salt
- A ruler

Curriculum: Mathematics

Learning Outcomes:

Comparing, Measuring, Extending Understanding, Spatial Sense

Grouping: Whole Class

What to do:

1. As a class, read the text on page 4. Have students imagine they are standing on the ground near a tree. Like the picture in the book, an owl is at the top of the tree and snow is falling. Ask the students what they would see above them. What does the owl see below?
2. Explain that if you want to measure what is above or below you, up or down (i.e., on the vertical plane) you measure height or depth. For example, you would measure the height of a tree to see how high the owl is (or how far it is above you). To measure the depth of the snow, you would measure from the surface of the snow to the ground.
3. Some students may be confused by the stanza, “How high is the snow? How deep does it go?” To measure the snow’s height, you would measure the snow from the ground up. To measure its depth, you would measure from the surface of the snow down. The snow’s height and depth are the same. Demonstrate this concept using the container of salt or sugar (pretending it is snow) and the ruler. Also, have the students count how many snowflakes deep the snow is on pages 4–5.

How Much Longer?



What you need:

- Measuring tape, yardsticks, or meter sticks

Curriculum: Mathematics

Learning Outcomes:

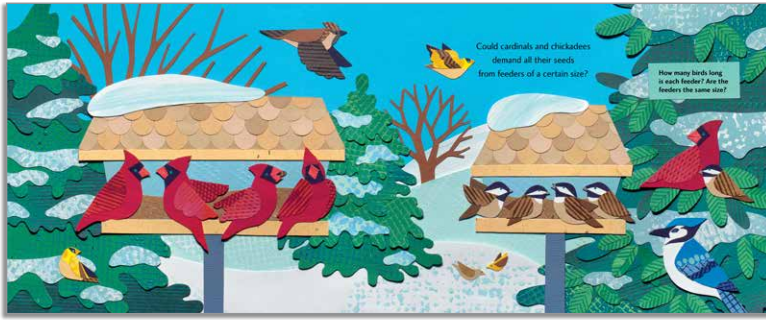
Comparing, Measuring, Extending Understanding, Spatial Sense

Grouping: Whole Class, Individual

What to do:

1. Ask students how they would measure the length of a classroom or hallway. What tool would they use? In small groups or as a class demonstration, have students use a measuring tape or meter or yardstick to measure the length or distance across the room.
2. Brainstorm ways to measure long distances. (As a homework assignment, have students ask their parents to show them the odometer in their vehicle.)
3. Explain that people used to measure lengths using body parts. This is why we sometimes use a unit of measure called a “foot.” Have students measure various items using body parts. For example, how many index fingers wide is their desk or how many footsteps long is the classroom? Have each student see how many footsteps it takes to get from one wall to another. Record the distances in “feet” on the board.
4. Ask students why using body parts to measure things could lead to problems. Since peoples’ feet are different sizes, historically this method of measure led to confusion and inconsistent measurements. Finally, King Edward I of England decreed that the measure of one foot would always equal 12 inches!

Measuring Our Feathered Friends



What you need:

- 20 same-sized counters (e.g., cubes) for each student
- Mixed birdseed (ensure there are large seeds, such as sunflower seeds)
- Paper and pencil

What to do:

1. Have students compare the size of the cardinals (the red birds) and the chickadees (small brownish birds) using their counters. Measure the birds from the tip of the beak to the end of the tail. (Tip: Help students choose the appropriate bird to measure. For instance, the red cardinal at the left-hand end of the feeder will be the easiest to measure and so will the chickadee on the right-hand side of the feeder.)
2. Have the students use their counters to measure the width of the feeders.
3. Discuss the question posed on page 7. If each feeder has four birds, are the feeders the same size?
4. Divide students into small groups, and give each group a small sample of mixed birdseed. Have them order the seeds from largest to smallest. Which seeds would the birds on these pages prefer? (Hint: Look at the beak size.)

Curriculum: Mathematics, Biology

Learning Outcomes: Comparing, Measuring, Sequencing, Making Connections, Understanding Scale, Drawing, Describing

Grouping: Whole Class, Small Groups, Individual

Hop to it!



What to do:

1. Have students examine the tracks of both animals on this page. Over the same distance, how many hops does the hare take? How many does the mouse take? This ratio can be written at 4:8. Or, for every 4 steps the hare takes, the mouse takes 8.
2. Pair a taller student with a shorter student (or an adult with a student). In pairs, have them walk the same distance down a hallway or across the schoolyard. Compare the number of steps it took to cover the same distance. Write the comparison as a ratio.
3. Have students use the words more and fewer in a sentence. For example, John took 5 more steps than Susan to walk the hall. (Note to teachers: Sometimes the word *less* is used when the word should be *fewer*. The author correctly uses *fewer* on page 8. Although the distinction can be subtle for young students, it never hurts to start using the correct word! If you can count an item, use *fewer*. If you can't count it, use the word *less*. For example, "I should eat fewer cookies and less junk food." Or, you have less money and fewer coins, or less fruit and fewer blueberries.)

Curriculum: Mathematics, Language Arts

Learning Outcomes: Comparing, Measuring, Ratios, Extending Understanding

Grouping: Whole Class, Pairs

Fill It Up!



What you need:

- Different sizes of plastic drinking glasses and containers
- 20 cotton balls per student
- Paper and pencil

What to do:

1. Read pages 12–13 with the students. Have them suggest what the word “capacity” means.
2. Give each student two containers of different sizes. Try to make them quite different (e.g., a tall, narrow glass and a short, squat glass). Have students predict which glass has a larger capacity (or, will hold more).
3. Have the students test their predictions by filling the containers with cotton balls. Which container had the larger capacity?
4. Have students record their results using pictures and numbers.
5. Have students look again at pages 12–13. They can see that the lakes have different areas on the surface, but what other measurement might be different? How would differing depths change a lake’s capacity?

Curriculum: Mathematics, Language Arts

Learning Outcomes: Comparing, Measuring, Comparing Quantities, Recording Data

Grouping: Whole Class, Individuals

Mass Appeal!



What you need:

- An empty box
- A brick or large book
- Balance scales
- A variety of items, such as fruit, to measure

What to do:

1. Explain that the word *mass* refers to the amount of “stuff” in an object. A student’s mass will change if his or her size changes. As the student grows, his or her mass increases. Take a bite from an apple and the apple’s mass decreases.
2. Show students the empty box and the brick or large book. Ask them which has a larger size? Which has a larger mass? Larger objects do not always have more mass.
3. As a class, examine the different fruits. Have students predict their mass and order them from lightest to heaviest.
4. In small groups, show students how to use the balance scales to measure each fruit’s mass. Discuss the units used to measure mass (mg, g, kg or oz, lbs). Help the students measure the fruit. Re-order the fruit based on the accurate measurements.

Curriculum: Mathematics

Learning Outcomes: Comparing, Measuring, Predicting, Ordering

Grouping: Whole Class, Small Groups

Balancing Act



What you need:

- 8 paper clips
- 2 small paper or plastic drinking cups
- 1 clothes hanger
- Sticky tape
- Variety of items to weigh (e.g., coins, pasta, buttons, dried beans, etc.)

What to do:

1. Have students work individually or in pairs. Link four paper clips together in a chain.
2. Hook the end of the chain through the top of the paper cup.
3. Hook the other end of the chain to one end of the hanger. Secure it with a piece of tape.
4. Repeat steps 1 to 3, attaching this chain to the other end of the hanger.
5. Experiment with the balance scale to see if larger objects are always heavier than smaller objects.

Curriculum: Mathematics

Learning Outcomes: Comparing, Measuring, Following Instructions, Building

Grouping: Individual, Partners

Musk-ox Clock



What you need:

- Analog clock
- Digital clock
- Paper plates
- Metal paper fasteners
- Set of cardboard “clock hands” for each student

If your students have already learned to read analog clocks, these pages can be used to test their knowledge. If telling time is a new skill, use this page to introduce the analog clock.

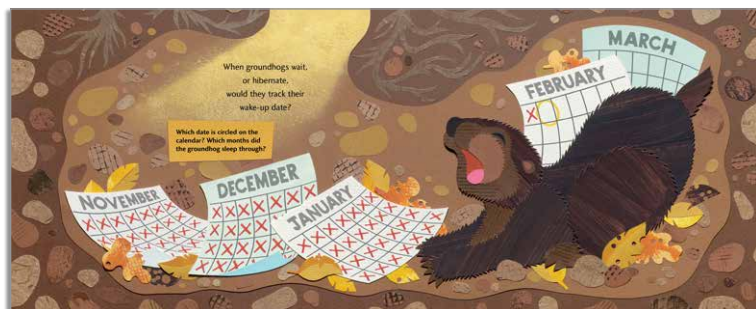
What to do:

1. As a class, compare an analog clock to a digital clock. What is the same? What is different?
2. Review the difference between a second, a minute, and an hour. As a class, watch an analog clock and have the students clap out each second. A second is about the time it takes to say “one Mississippi” or “one 1000.” Have students create their own word or phrase that is about one second long.
3. Brainstorm a list of typical activities and compare how long they take. For example, how long is a school day, recess, a television show, or the bus ride to school? List the activities on the blackboard, and throughout the day reinforce the length of time it takes to perform an activity and whether you’d measure it in seconds, minutes, or hours.
4. Have students assemble their own “clocks,” each using a paper plate and the cardboard hands. First, have them put the numbers on the clock. They can follow your model on the blackboard. After they attach the hands, describe which hand measures the hour and which hand measures the minutes. Have them practice with time on the hour and the half hour. (For example, “Set the hands to 5:00.”)

Curriculum: Mathematics

Learning Outcomes: Measuring, Comparing, Discussing Ideas

Grouping: Individual, Whole Class



What you need:

- A calendar
- Paper
- Colored pencils or felt pens

What to do:

1. Ask students how they measure their ages. Tracking our birthdays is one way.
2. Review the calendar in your classroom and explain how one year is divided into 12 months. A month is the length of time it takes for the Moon to do one complete revolution around the Earth. This takes about 30 days. A year is measured as the length of time it takes for Earth to travel once around the Sun. This takes about 365 days.
3. Have students use a calendar to calculate how many months, weeks, and days it is until their birthdays.
4. Historically, many cultures did not have calendars. Instead, time was recorded by the activities that happened throughout the year. For example, on the west coast of Canada, the singing of a bird called a Swainson's Thrush meant it was the time of year to harvest wild salmonberries. Or, fall was the time of the salmon harvest since this was when they swam upstream. As a class, brainstorm some different ways to name the months of the year based on the weather or other natural phenomena or human activity (e.g., September could be "Back to School Time").
5. Have students fold the paper so there are four squares. Label each square for the seasons: spring, summer, fall, winter. Have students use words and pictures to describe the activities that happen during that season. They could include holidays (e.g., Halloween happens in the fall) or activities they observe or take part in (e.g., I swim in the lake during the summer).

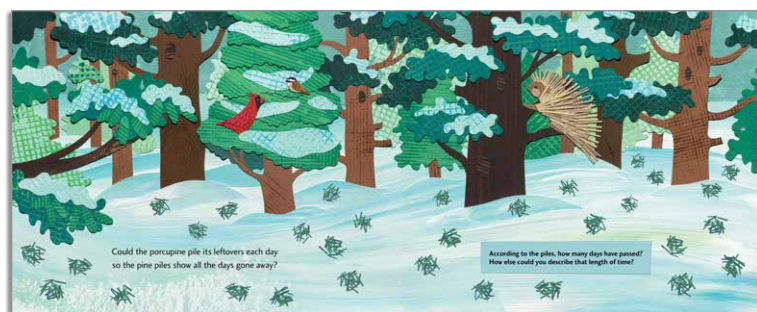
Curriculum: Mathematics, Social Studies, Language Arts

Learning Outcomes: Comparing, Measuring, Extending Understanding, Creativity

Grouping: Whole Class, Individual

DESCRIBING AND OBSERVING ACTIVITIES

Day after Day



What you need:

- A calendar
- A watch
- A clock
- A small flowerpot
- A paper plate
- A chopstick or pencil
- Modeling clay
- A felt pen



What to do:

1. In pairs, have students read the text on pages 16–17. For how many days has the porcupine been leaving its pine piles? Use the calendar to mark off and count the number of days. What is another way to describe 31 days? (A month.)
2. Have students discuss other ways to measure one day. How did people measure the length of a day before we had watches, clocks, and calendars?
3. Discuss watches, clocks, and calendars. What units are used to measure time? (Seconds, minutes, days, weeks, months.)
4. As a class or in small groups, make a sundial. Put the flowerpot upside down on the paper plate.
5. Stick the chopstick through the hole in the pot, and secure it with modeling clay so the chopstick won't wobble.
6. At the beginning of the day, place the "clock" in a place where it will be in the sun all day.
7. At each hour of the day, make a mark on the paper plate where the shadow from the chopstick falls. By the end of the day, you will have a clock set by the Sun.
8. As a class, discuss the fact that a "day" is the time it takes the Earth to rotate once. As the Earth rotates, the shadow cast by the chopstick falls in a different place. A month is the length of time it takes the Moon to do one complete revolution around Earth.

Curriculum: Mathematics, Science

Learning Outcomes: Discussing Ideas, Making Connections, Measuring

Grouping: Whole class, Small Groups, Partners



What you need:

- A globe
- A lamp

What to do:

1. As a class, read pages 26–27 and answer the questions.
2. Depending where they live, winter will mean different things to different students. For many, winter will be “frozen.” But for others, in coastal climates or in southern states, winter may just be “wet” or “cooler than summer.”
3. Set up the light and the globe so that the “Sun” shines on the Earth. As you spin the globe slowly, have the students observe which parts of the Earth get the most Sun and which get less. (Note to teachers: It is a common misconception that summer occurs when “we” [where we live] are closer to the Sun. This is not true. In fact, during summer in the northern hemisphere, Earth is actually at its farthest point from the Sun. The change of seasons is because of the tilt of the Earth, which is replicated in the globe. During summer in the northern hemisphere, Earth is tilted towards the Sun. Days are longer and the Sun warms the Earth.)
4. To understand the seasons better, put a large sticky dot on your town. Slowly spin the globe, noting when your town has its most exposure to the Sun (summer) and when it has the least (winter). The seasons in between are transitional, with the days gradually lengthening and warming during the spring, and shortening and cooling during the fall.
5. Have the students observe what is happening in the southern hemisphere on the globe. Summer in the northern hemisphere is winter in the southern hemisphere!

Curriculum: Mathematics, Science

Learning Outcomes: Observing, Comparing, Making Connections

Grouping: Whole class

ESTIMATING AND COUNTING ACTIVITIES

From Columns and Rows, Area Grows



What you need:

- A calendar, quilt, bingo card, newspaper, or other items with columns and rows
- Black-line master of page 11
- 3 colored pencils/pair of students

What to do:

1. Have students guess and record the number of fleas on page 11.
2. Discuss the difference between columns and rows and identify the columns and rows on page 11. Have students think of other things they've seen with columns and rows. With a partner, have them examine a calendar, a newspaper, or your other chosen item to identify the columns and the rows. Are the desks in their class in columns and rows?
3. As a group, brainstorm the different ways they could count the fleas on page 11. How can they use grouping to make the counting easier?
4. Give each pair of students one black-line master of page 11. How many ways can they group the fleas to make counting easier? Have them use the colored pencils to group the fleas in 2s, 5s, and 10s. How did their counts compare to their estimates in question 1?
5. As a class, count the fleas by 2s, 5s, and 10s out loud. As well, explain the mathematical equations that result: 50 groups of 2 = 100; 20 groups of 5 = 100; 10 groups of 10 = 100.

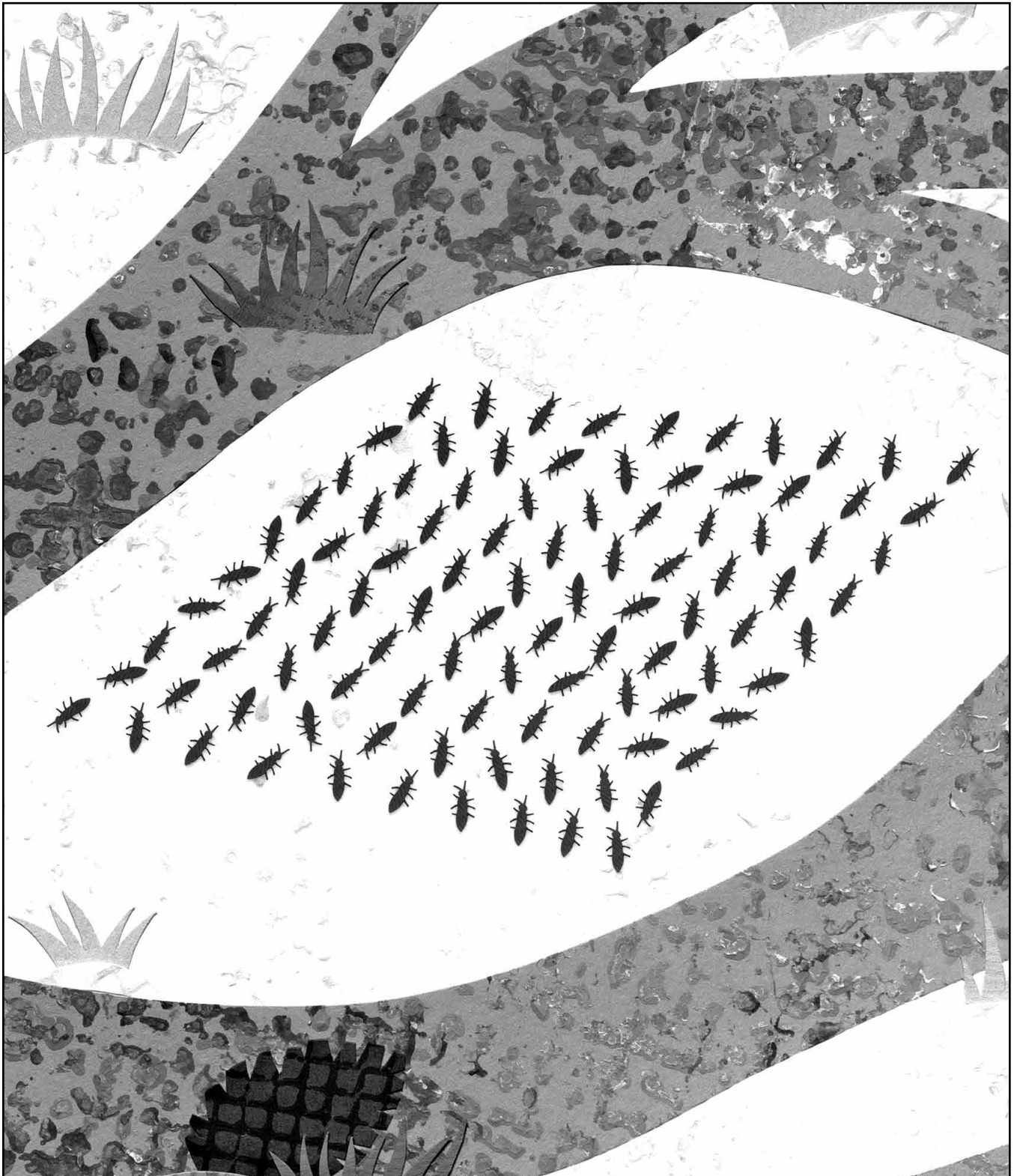
Curriculum: Mathematics

Learning Outcomes: Making Connections, Grouping, Counting, Comparing

Grouping: Whole Class, Partners

From Columns and Rows, Area Grows

Black and white master.



COMPOSING AND CREATING ACTIVITIES

The illustrations in this book are deceptive. At first glance, they may seem simple, yet upon closer inspection the layers, textures, and colors used make stunning collages. To create each of the illustrations in *Sizing Up Winter*, artist Ashley Barron scoured drawers and drawers of paper scraps, searching and unearthing until she found the perfect colors to bring the animals and landscapes to life.

Collage Creations

What you need:

- Blank paper
- Powdered paint and water
- Paintbrushes
- Tools to add textures and patterns (combs, doilies, straws)
- Scissors
- Pinking shears or other scissors that cut interesting edges
- Glue

What to do:

1. As a class, review several pages in *Sizing Up Winter*, but focus on the art instead of the text. Note the different patterns, colors, and shapes that the artist used.
2. With the paint, have students use the paint brushes, tools, and their fingers to create pages with color and texture. Allow the pages to dry completely. (As an option, you could also use papers that already have different patterns and textures.)
3. Have students cut simple shapes from their paper to make their own collages. The shapes can then be assembled and glued to a fresh sheet of paper.

Note: Depending on the age of your students, you may want to create shape templates that the students can trace before cutting. You may also want the entire class to participate in recreating one of the illustrations from the book. The owls on pages 4–5 or the bears on pages 14–15 are good ones to try, since they are less detailed.

Curriculum: Visual Arts

Learning Outcomes: Art Composition, Cutting, Painting

Grouping: Individual, Whole Class

Storytelling

What to do:

Ask students to create a short story using their own words and observations based on pages 20–21 of *Sizing Up Winter*. What are the animals in each group doing or thinking about? How are they interacting?

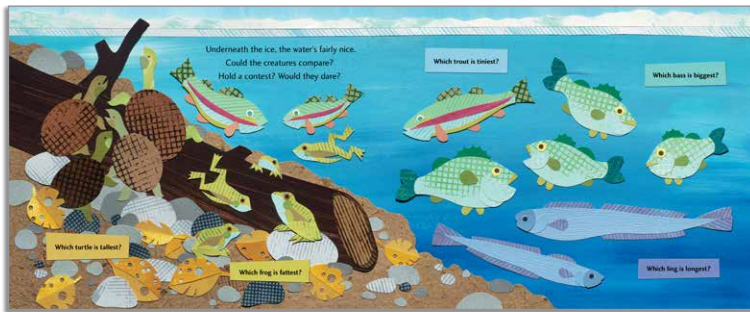
Curriculum: Language Arts

Learning Outcomes: Observing, Describing, Writing

Grouping: Individual

PATTERNING AND SEQUENCING ACTIVITIES

Animal Alliteration



What to do:

1. Read the five questions on these pages out loud. Ask students if they notice a pattern in the way you are speaking. If they don't notice, emphasize the second and fourth word. Do they hear the pattern and the use of the same sounds? This is alliteration.
2. Ask students to create their own short sentences that use alliteration. You may have to give them prompts such as, "Which bird is...?" or, "Which salmon is...?"

Curriculum: Language Arts

Learning Outcomes: Listening, Describing Patterns

Grouping: Whole Class

Order, Please!



What you need:

- Black-line master of pages 22–23
- Scissors
- Blank sheet of paper
- Glue
- Crayons or felt pens

What to do:

1. As a class, review the images on these pages. What clues can the students use to understand the time of year? How is the weasel changing over time?
2. Have students cut the images into squares and, using the book for reference, color the brown parts of the weasel.
3. Rearrange the order of the images, starting from the image of the weasel standing up with snow falling.
4. Glue the pictures onto the blank page, leaving space below each image.
5. Depending on the students' ages and abilities, have them briefly write what is happening in each panel. (Or, an adult can help with the writing.)
6. As a class, discuss whether this sequence could have happened in seven days (one week)? What clues are they using to answer the question? The spread actually shows how a weasel's fur will change over a year.

Curriculum: Mathematics, Science

Learning Outcomes: Sequencing, Observing, Making Connections

Grouping: Individual, Whole class

Order, Please!

Black and white master.



Do You Hear What I Hear?

What to do:

In partners, have students choose any page from *Sizing Up Winter* that contains animals. Ask them to create dialogue for the animals on the page. What are they saying? Depending on your students' writing skills, they can write their dialogue on paper in speech balloons or share their ideas orally.

Curriculum: Language Arts

Learning Outcomes: Creativity, Dialogue

Grouping: Pairs

Word Patterns

What to do:

1. Read *Sizing Up Winter* aloud and ask students to listen for repeating or rhyming sounds.
2. As you read, have students clap out the syllables. Help students identify where the number of syllables in two lines of text is the same, even though the number of words in each line is different.

Curriculum: Language Arts

Learning Outcomes: Identifying Patterns, Listening

Grouping: Whole Class

