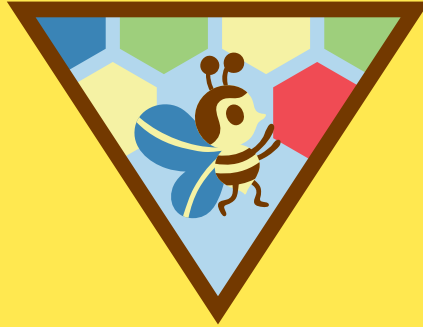




Brownie Design with Nature

Plants, bees, and birds are fascinating! They're all part of nature. This badge is all about using math to do things in nature.

Math can help you design a garden, build a bird feeder, and explore the world of bees.

Steps

1. Calculate the age of a natural object
2. Explore the shape of beehives
3. Measure and build a bird feeder
4. Use ratios to make bird food
5. Graph data about birds

Purpose

When I've earned this badge, I'll know about natural objects. I'll know how to measure, use scale and ratios, and make a graph.



Words To Know

Annual ring: A ring of wood showing one year of a tree's growth.

Bar graph: A chart that uses rectangles to show the number of things.

Concentric circles: Two or more circles with the same center point.

Cross section: The surface or shape made when you cut through something.

Data: Information gathered by observation, questioning, or measuring.

Eye level: As tall as a person's eyes.

Herb: A plant used to season foods, like parsley, basil, and thyme.

Hexagon: A six-sided shape with six angles.

Hive: Where bees live, either made by bees or people.

Honeycomb: A container made by bees out of wax to keep their honey.

Nectar: Sweet liquid produced by plants or made from a solution of water and sugar.

Ornithologist: A scientist who studies birds.

Pollination: The spread of pollen from one plant to another, enabling the flowers to grow seeds and fruit.

Ratio: How much you have of one thing compared to another.

Scale: An idea used in math to make drawings of objects smaller or bigger. It's the ratio of the length of something in a drawing to the length of the real object.

Solution: A mixture where something is dissolved in water or another substance.

Tessellation: An arrangement of shapes that fit together in a pattern without any gaps or overlapping.

Tree cookie: A cross section of a tree trunk.

Volume: The amount of space something takes up.

Step 1: Calculate the age of a natural object

Many animals age faster than people. That's why dogs and cats don't usually live as long as people. Other animals age slowly. They can live a long time. Some trees can also live for hundreds of years.

Scientists can measure the age of different natural objects in many ways. Sometimes they use fancy machines. Sometimes they measure with a ruler. Other times they just use observation.

Choices—do one:

Calculate the age of a tree. A **tree cookie** is a cross section of a tree trunk. A **cross section** is the surface or shape made when you cut through something. The rings are **concentric circles**. That means they all have the same center point. Light rings show fast growth in the spring. Dark rings show slow growth in the summer. Each pair of light and dark rings is an **annual ring**. It shows one year of growth. The wider rings show that the tree grew a lot that year. The thinner ones are when the tree grew less. Use a tree stump or tree cookie to calculate the age of a tree.

Calculate a pet's age in pet years. Some people think the average dog ages 7 years for every human year. That means if a dog is 3 years old in human years, it is $7 + 7 + 7$ dog years old. That's 21 in dog years. How old are you in dog years? What about cat years? Big dogs age faster than medium-sized dogs. Small dogs age faster, too. Look up the life spans of different kinds of dogs and cats.

► **For more fun:** Calculate the age of other pets, like fish, birds, or hamsters.



Calculate the age of a snake. Different kinds of snakes grow at different speeds. The longest snake in the world is the reticulated python. It can be over 20 feet or 240 inches long! The shortest is the Barbados threadsnake. It can be only 4 inches long. You can predict how old a snake is by its length (how long it is) and weight (how heavy it is). Look up how long and heavy each kind of snake below is when first hatched and as an adult. Then compare them to the measurements below: How old are the snakes? Compare with what you found.

**Green tree python =
72 inches, 3 pounds**

I'm _____
years old!

I'm _____
years old!

Milk snake = 8.5 inches, 0.2 oz

I'm _____
years old!

Rosy boa = 36 inches, 1 pound

Step 2: Explore the shape of beehives

Nectar is a sweet liquid produced by plants. Bees drink nectar and turn it into honey. Once bees collect nectar, they bring it back to their nest, called a **hive**. Bees store honey so they have food. This helps during colder months when they can't find nectar. They put it into the holes of a honeycomb. A **honeycomb** is a wax container made by bees.

Honeycombs are made with hexagons. A **hexagon** is a six-sided shape with six angles. The hexagons are arranged in a tessellation. A **tessellation** is when shapes fit together. The pattern repeats without any gaps. It never overlaps. Think of a pineapple or turtle shell.

Some scientists think that bees use hexagons because it uses the least amount of wax. It stores the greatest amount of honey, too.

Choices—do one:

Create a beehive to fit you. Make a diagram of a honeycomb. Your scale will be one inch representing one foot. This will make a beehive 12 times as big as your diagram! Then build your honeycomb on the ground with sticks or balsa wood. When you're done, you can enjoy a bee-inspired snack (like honey in tea or on apples!).

Build a bee hotel. Some bees lay eggs in hollow plant stems or holes in wood. They may also need somewhere to stay safe during the winter. You can help by building a bee hotel! Other pollinators, like butterflies or beetles, might visit, too. Measure empty tubes, like bamboo, paper straws, or rolled paper. Then draw a diagram of your hotel. Make sure to include a scale. How big will your diagram be compared to your final hotel? Which shape works best? Can you create a tessellation? Experiment with different materials and shapes to build your hotel.

Calculate how much honey a beehive might hold.

Sometimes, beekeepers make beehives out of wooden boxes. Then, when the honeycomb is full, they spin the frame to get the honey out. After harvesting, they jar the honey to use or sell. How many jars of honey can you get from one beehive? Figure it out with your own jar! Make a diagram of the hive. An average beehive has 3 honey boxes. Honey boxes have about 10 frames in them. Each frame holds about 5 pounds of honey. So, how big is your jar? How many jars could you fill with honey?

Scale is when you make a model that's smaller or bigger than the real thing. Scale is the ratio of the size of an object to the size of its drawing or model. A **ratio** is how much you have of one thing compared to another. You can use ratios to easily change the scale, size, or amount of what you're making.

Did you know?

Bees also spread pollen from plant to plant. Flowers that have had pollen brought to them can then grow seeds and fruit. This is called **pollination**. Without bees, we wouldn't have many fruits and vegetables.



For more fun:

Learn more about bees and honey from a beekeeper. Or, explore pollinator plants that grow in your area and plant a pollinator garden (with permission!).



Step 3: Measure and build a bird feeder

Some birds eat seeds, fruit, and nuts. Other birds eat surprising foods, like apples, cereal, or even butter. Some birds drink nectar, like bees! Hummingbirds are some of these birds. They're very small birds. They can find nectar in flowers or feeders made by people. They even fly while they're eating! Butterflies like nectar, too.

Volume is the amount of space something takes up. You can measure the volume of liquids, like water or nectar. You can measure the volume of solids, like bird seed, too. You can use volume and measurement to make a feeder with nectar, seeds, or another kind of food that's safe for birds.

Choices—do one:

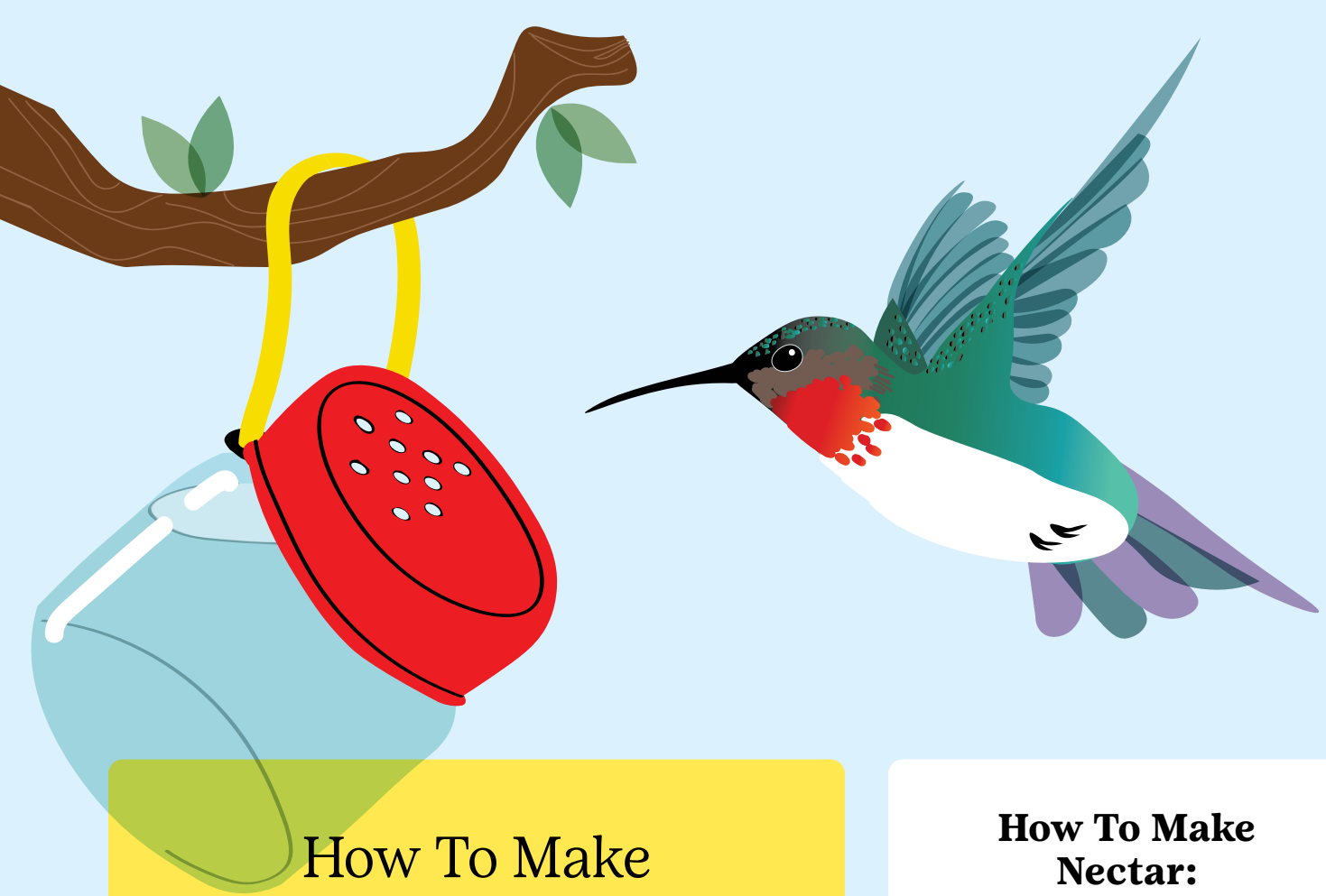
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Build a seed feeder. You can make a feeder for seeds out of a milk or juice carton. Choose a container and find its volume. Measure squares or rectangles to cut out openings for the seeds. Add perches the birds can stand on while they eat. Then glue your feeder together. You might also measure string to hang your feeder.
.....

Build a nectar feeder. Make a nectar feeder to attract hummingbirds and butterflies. Find the volume of an empty jar. Decorate it with red to attract hummingbirds. Then measure string to hang your feeder.
.....

.....
Build a feeder for unusual food. Learn about birds in your area that eat unusual foods. How can you build a feeder to hold it? What shape will the feeder be? Maybe you can use pipe cleaners or a juice carton. You can also use something unexpected, like a pine cone or an ice cream cone. Find the volume of your feeder. Then measure space for food and string to hang your feeder.

**Check out
the feeder
instructions on
page 8.**





How To Make a Nectar Feeder

What you'll need:

- A clean, empty spice jar or jar with lid
- Scissors
- String
- Red paint and/or red foam
- Hot glue (for an adult to help you)
- Nectar

How to make it:

1. Make holes in the lid of your jar.
2. Paint your jar or cut out shapes to make red foam flowers that you can attach to your jar.
3. Measure, cut, and attach string around the lip of the jar for it to hang.
4. Fill the jar with nectar.
5. Hang the jar by the string on a tree branch, porch, or other outdoor place.

How To Make Nectar:

What you'll need:

- 1 cup water
- $\frac{1}{4}$ cup extra-fine or superfine white granulated sugar
- Mixing bowl
- Whisk or mixing spoon
- Funnel

How to make it:

Mix $\frac{1}{4}$ cup of sugar in 1 cup of water until the sugar dissolves. Use the funnel to pour your nectar into the feeder. You can keep extra nectar in the fridge for 7-10 days.

Step 4: Use ratios to make bird food

Now that you have a feeder, what kinds of birds do you want at your feeder? Depending on your feeder and the kind of bird you want to attract, you can fill it with seeds, nectar, or another bird-friendly food. Birdseed is a mix of seeds, grains, and other ingredients. Nectar is a **solution**. It's a mixture of sugar and water.

You can use a ratio to make nectar, birdseed, or any kind of recipe. As long as you use the same ratio, you can easily change the size, scale, or amount of what you're making.

Choices—do one:

Follow a nectar recipe. The ratio for nectar is 1 part sugar to 4 parts water. Why this ratio? Too much sugar isn't healthy for hummingbirds. Too little sugar doesn't provide enough calories. Mix and make nectar for your feeder.

Create your own birdseed recipe. Find out what local birds like to eat and make your own bird food or birdseed recipe. Use ratios to choose amounts of different seeds or foods. Then fill your feeder.

Multiply the recipe. Did you make your feeder with other Girl Scouts? If so, go big with ratios! Figure out how to fill your feeders all at once. Use ratios to scale the amount of nectar, food, or birdseed you need to fill all your feeders.



How To Make Birdseed:

What you'll need:

- Spoon and measuring cups
- Mixing bowl
- 2–4 kinds of birdseed for local birds, such as sunflower, millet, flax, cracked corn, and safflower seeds
- Seed butter and other foods that are safe and nontoxic for local birds (optional)

How to make it:

1. Find out what local birds in your area like to eat.
2. Decide what seeds and ratio to use for your recipe, like 1 spoonful of flaxseed for every 4 of cracked corn.
3. Draw or list each seed on a sheet of paper.
4. Tally your spoonfuls as you measure and mix your birdseed.
5. Fill the feeder with your seed.

Step 5: Graph data about birds

Bird scientists are called **ornithologists**. They gather all kinds of **data** or information about birds. They write down the kinds of birds they see. They write down what the birds eat. Bird-watchers keep lists of birds, too.

People can use a graph to show their data. A **bar graph** is a chart that uses rectangles to show and compare the number of things. It shows two kinds of data along a horizontal axis (x-axis) and a vertical axis (y-axis).

For Step 5, collect and graph data about birds. The data might be how much food was eaten. It might be the birds you see, too.

Choices—do one:

.....
Graph data from your bird feeder. By measuring volume, you can find out how much food from your feeder has been eaten over time. Put your feeder outside and check it daily for 6 days. How much nectar or food disappears each day? Write down your measurement every day. Then use your data to make a bar graph with the day on the x-axis and amount of food left on the y-axis. Add rectangles to show how much food the birds ate each day.

Tip:

If your feeder runs out of food, refill it so you can continue to collect data!

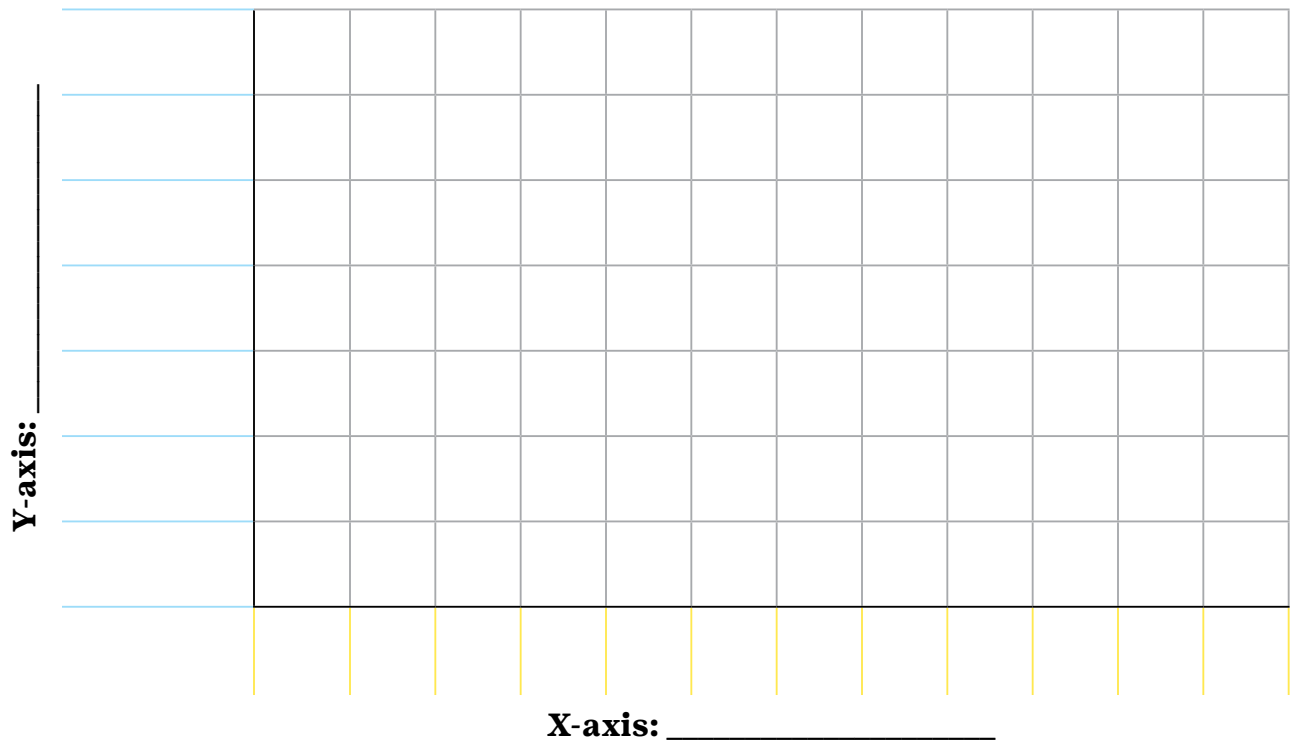
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Go bird-watching and graph birds you see. Find somewhere to watch birds and place your feeder out for birds to eat (if possible). Take notes and tally the kinds of birds you see. What did they eat? Where did you see them? How many were there? After, use your data to make a bar graph with the kinds of birds on the x-axis and the number of birds you saw on the y-axis. Add rectangles to show the number of each kind of bird you saw. Color in bars for birds that ate in one color and bird that didn't eat in another color.

.....
Find the best place for your feeder. Place your feeder outside and move it around 2 or more times over 6 days. Check it each day and note how much nectar or food has disappeared. Write down your location and measurement each day. After 6 days, use your data to make a bar graph with the day and location on the x-axis and amount of food left on the y-axis. Add rectangles to show how much food the birds ate each day. Which location got the most action?

Make sure to return any leaves, rocks, or other natural objects to the place you found them.

My Bird Data

 What is your first set of data? (kinds of birds or days of week)	 What are your measurements? (amount of birds or food)
This data goes on the x-axis (side to side).	This data goes on the y-axis (up and down).





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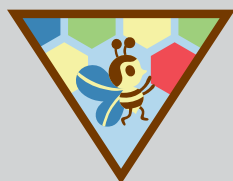
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Volunteer's Guide to Brownie Design with Nature*

Tips and ideas to help guide your troop through this badge. *This is the third badge in the Math in Nature badge series. The order of the Math in Nature badges is: 1) Shapes in Nature, 2) Numbers in Nature, and 3) Design with Nature.*

STEP 1: Calculate the age of a natural object • 15–25 minutes

Ask: How old are you? What would this be in cat years? What about tortoise years?

Share: Animals age at different rates than people. Scientists measure the age of different natural objects in many ways. They can use fancy equipment, measure with a tool, like a ruler, or just observe.

Choices—do one:

- **Calculate the age of a tree.** Point to the circles on the tree cross section, and ask, “What do you notice about the rings?” Explain that the circles are **concentric**, all having the same center. Ask, “Why are some rings wide and others thin? Why are some dark and others light?” Explain, “Each pair of light and dark rings is an **annual ring** showing one year. Light rings show fast growth in the spring. Dark rings show slow growth in the summer. Tree rings’ thickness and color change depending on rain, sunshine, temperature, how healthy the soil is, and big events (like volcanic eruptions and fire). Wider rings represent years when the tree grew a lot. Thinner rings are years when the tree grew less.” Have Brownies: 1) count the annual rings from the center to determine the tree’s age and 2) subtract the tree’s age from the current year to find when it was planted. **For more fun:** Help Brownies compare the rings from different trees, including their ages, the rings’ thickness and color, and any differences in the trees’ growth histories.

Materials: Tree cross section with rings: tree trunk OR tree cookie (slices of tree trunks) OR photo in the Brownie Booklet; paper; pencils

- **Calculate a pet’s age in pet years.** Ask, “Have you ever heard of ‘dog years’? How are they different from human years?” Share that some people think the average dog ages 7 years for every human year. Show Brownies the equation that a dog 3 years old in human years is $7 + 7 + 7 = 21$ dog years old. Ask, “How old are you in dog years? What about cat years?” Have them research the life spans

of different kinds of dogs and cats. **For more fun:** Help Brownies research and calculate the age of other pets, like fish, birds, or hamsters.

Materials: Field guides, books, or online research about cats and dogs; paper; pencils

- **Calculate the age of a snake.** Have Brownies research the length and weight of the green tree python, milk snake, and rosy boa when first hatched and as an adult. Have them use their research to decide how old each snake is in Step 1 of the Brownie Booklet. Show the strings, and ask, “If each string is a snake, which snake is each string?” Have Brownies measure and match the strings with the snakes in Step 1 (8.5 inches = milk snake, 36 inches = rosy boa, 6 feet = green tree python). **For more fun:** Organize a field trip or another way for Brownies to safely look at a real snake and estimate its age.

Materials: Field guides, books, or online research about the green tree python, milk snake, and rosy boa; paper; pencils; 3 pieces of string (8.5, 36, and 72 inches long); scissors

STEP 2: Explore the shape of beehives • 30–40 minutes

Ask: What do you know about bees? How do they make honey? Why do they make honey?

Share: Bees make honey from **nectar**, a sweet liquid produced by plants. They collect and bring it back to their hive. They store the honey in a **honeycomb**, which is made out of wax in the shape of six-sided **hexagons** that are arranged in a **tessellation**, fitting closely together without any gaps or overlapping. This helps during colder months when they can’t find nectar. Bees also spread pollen from plant to plant. Flowers that have had pollen brought to them can then grow seeds and fruit. This is called **pollination**. Without bees, we wouldn’t have many fruits and vegetables.

Do: Draw a hexagon with sides that are one inch long. Keep adding hexagons to make a tessellation. Then have Brownies sketch their own. Explain, “We can change the

*Detailed choice activities, meeting tools, and additional resources and materials can be found within the Volunteer Toolkit on my.girlscouts.org.

scale from 1 inch to any size. **Scale** makes an object smaller or bigger. It's the **ratio** of your sketch to the real object or how much you have of one thing compared to another. You can use ratios to easily change the scale, size, or amount of what you're making."

Materials: *Rulers; paper; pencils; honey, honeycomb, and/or beeswax (optional)*

Choices—do one:

- **Create a beehive to fit you.** Ask, "How can we scale up a honeycomb to fit us?" Help Brownies to increase the scale of their sketch from 1 inch to 1 foot to build a hive 12 times as big with balsa wood (or other material) on the floor or open space. Have Brownies compare their first sketch with the larger scaled version. If you want, serve fruit, sitting in a friendship circle or around the tessellation, and remind Brownies how important bees are for pollination.

Materials: *75 x 1-foot lengths of small balsa wood, dowels, sticks, or strips of paper; fruit snack (optional)*

- **Build a bee hotel.** Ask, "Where do bees go if there isn't a hive?" Share that some bees lay eggs in plant stems or holes in wood. Help Brownies choose materials, measure their widths, and sketch a new tessellation for their bee hotel. Encourage them to scale their design up or down and try different materials, shapes, and configurations.

Materials: *Bamboo, paper straws, or rolled paper; glue; packing tape; boxes, paper towel rolls, and other materials for the hotel frame*

- **Calculate how much honey a beehive might hold.** Show the photo of honey boxes on page 6 of the Brownie Booklet and any other pictures of honey boxes used by beekeepers. Help Brownies: 1) sketch a rectangular hive, 2) divide it into three honey boxes, 3) divide each box into ten frames, 4) calculate the number of frames in the hive (count or multiply 3 boxes x 10 frames = 30 frames), and 5) figure out how many jars 5 pounds of honey could fill. Count or multiply (30 frames x 5 pounds = 150 pounds), then calculate the number of jars (150 pounds / volume of jar = number of jars).

Materials: *Paper; pencils; calculators (optional)*

For more fun: Have a beekeeper meet with Brownies or help Brownies to get permission to create a pollinator garden.

STEP 3: Measure and build a bird feeder • 25–35 minutes

Ask: What do birds eat?

Share: Birds eat seeds, fruit, and nuts. Some birds, like hummingbirds, and butterflies drink nectar, like bees! Hummingbirds are very small birds that find nectar in flowers or feeders made by people.

Do: Show Brownies how to measure volume, and explain,

"**Volume** is how much space something takes up." To measure liquid volume, pour water into a glass and show how to look at the **meniscus line**, the bottom of the curve, at eye level (looking straight at the line, not above or below it). To measure solid volume, pour birdseed into a measuring cup, showing how it should fill and be level with the top of the container.

Materials: *Water; liquid measuring cup; dry measuring cup; birdseed or another dry good*

Choices—do one:

- **Build a seed feeder.** Show Brownies the materials, like a milk or juice carton, to choose from. Help them: 1) find the volume of their carton (height x length x width or on the label), 2) draw their idea, 3) build it by measuring and creating square openings around the feeder for birds to reach the seeds inside, 4) add dowels or other materials as perches, and 5) glue them together. Then help them to measure, cut, and attach string to hang their feeders.

Materials: *Clean and empty paper milk or juice cartons; dowels; ruler or tape measure; paper; pencils; twine or yarn; packing tape; scissors; hot glue gun (for you)*

- **Build a nectar feeder.** Before the activity, make holes in the jar lids—remove the outer lid to expose the layer with holes or create holes with scissors or a screwdriver. At the meeting, go over "How To Make a Nectar Feeder" in the Brownie Booklet with Brownies. Then have them: 1) find the volume of their jar (on the label or by measuring amount of water it can hold), 2) draw and cut out shapes to make red foam flowers (or paint them red), and 3) attach their flowers. Then help them to measure, cut, and attach string around the lip of the jar for it to hang.

Materials: *Clean and empty spice or other jars; water; measuring cups; red foam OR foam and red paint; markers; scissors; twine or yarn; hot glue gun (for you); screwdriver (optional to create holes in lids)*

- **Build a feeder for unusual food.** Ask, "What do you want to feed the birds?" Have Brownies choose bird food (make sure it's safe and nontoxic) and materials, draw their idea, and build their feeders by doing anything from measuring and creating openings, adding perches, or sculpting pipe cleaners into a specific shape. Then help them find or estimate the volume of their feeder (height x length x width, on the label, or by measuring the amount of water/food it can hold). Help Brownies glue their feeders together and measure, cut, and attach string to hang their feeders.

Materials: *DIY feeder materials, like pipe cleaners, ice cream cones, citrus rinds, cans, paper plates, cartons, etc.; other materials to build and decorate feeders; paper; pencils; twine or yarn; packing tape; scissors; hot glue gun (for you)*

STEP 4: Use ratios to make bird food • 15–25 minutes

Ask: Now that you’ve built a feeder, what will you fill it with?

Share: Birdseed is made from seeds, grains, and other ingredients. Nectar is a **solution** of sugar and water. You can use a **ratio**, or how much you have of one thing compared to another, to make nectar or birdseed. With a ratio, you can easily change size, amount, and scale.

Choices—do one:

- **Follow a nectar recipe.** Go over “How To Make Nectar” in the Brownie Booklet. Explain, “The ratio for nectar is 1 part sugar to 4 parts of water, such as 1 tablespoon of sugar for 4 tablespoons of water or $\frac{1}{4}$ cup of sugar (4 tablespoons) for 1 cup of water (16 tablespoons).” Help Brownies measure and dissolve $\frac{1}{4}$ cup of sugar in 1 cup of water (heating if you’d like). Put the nectar into a pitcher and help Brownies each funnel 1 cup of nectar into their feeder. Do not dye the nectar as this can be toxic for birds. You can keep extra nectar in the fridge for 7–10 days.
- Materials:** *Nectar feeders from Step 3; glass cup of water; extra-fine or superfine white granulated sugar; water; tablespoons; 1-cup measuring cups; mixing bowls; pitcher; funnel; pot and stove, microwave, or hot plate (optional)*
- **Create your own birdseed recipe.** Before the activity, research local birds and what they eat to gather a variety of seeds. Then go over “How To Make Birdseed” in the Brownie Booklet and ask Brownies, “What kinds of birds do you want at your feeder?” Help Brownies choose local birds and seeds before using a ratio to create their recipe. For example, add 1 teaspoon of sunflower seeds for every 4 teaspoons of cracked corn. Have Brownies write down their recipe so they can remake it later. Then help Brownies funnel the seeds into their feeders or stick them on with seed butter.

Materials: *Birdseed feeders from Step 3; spoons and measuring cups; mixing bowls; funnel; paper; pencils; birdseed, seed butter, and other foods that are safe and nontoxic for local birds*

- **Multiply the recipe.** Ask, “How can we make one big amount of food for all our feeders?” Explain that scale and ratio can make a larger amount of bird food. Share the ratio for nectar (1 part sugar for 4 parts water) or the birdseed recipe and demonstrate how to make one serving (follow the recipe or instructions in “How To Make Nectar” and “How To Make Birdseed” in the Brownie Booklet). Then ask, “How many feeders do we need to fill? How much food will we need?” Help Brownies multiply each ingredient by the number of feeders and funnel the food into their feeders. You can keep extra nectar in the fridge for 7–10 days.

Materials: *Feeders from Step 3; tablespoons; 1-cup measuring cups; mixing bowls; pitcher; funnel; For nectar:*

extra-fine or superfine white granulated sugar, water, and pot and stove, microwave, or hot plate (optional); For birdseed: birdseed recipe for local birds, variety of seeds, seed butter, and other foods that are safe and nontoxic for local birds

STEP 5: Graph data about birds • 30–40 minutes (May take multiple days)

Ask: How can you track how many birds you see or how much food the birds eat?

Share: **Ornithologists** are scientists who study birds including what birds they see and what the birds eat. Bird-watchers keep lists, too. A **data set** is a collection of information on a topic, like birds, bugs, or butterflies. You can use a **bar graph** to show data, like how much food was eaten and the number of different kinds of birds you see, with rectangles.

Do: Show Brownies “My Bird Data” on page 11 of the Brownie Booklet. Point to the x-axis and y-axis on both the data table and the coordinate plane and explain that they are just names for the two types of data, like the day of the week and amount of food or the kinds of birds you see and how many.

Choices—do one:

- **Graph data from your bird feeder.** Show Brownies how to add measurement markings to their feeders. Have them put their feeder outside for six days, check its volume daily, and note how much food is left. After, help Brownies: 1) label the y-axis (amount of food) and x-axis (days of week) on “My Bird Data,” 2) add their data as rectangles above each day, and 3) compare graphs. Ask questions like, “How much food was left after six days? What day did birds eat the most and the least? How do you know?”

Materials: *Feeders from Step 3; pencils; rulers (optional)*

- **Go bird-watching and graph birds you see.** Show Brownies the research about the birds they might see, including their name, shape, color, and song or call. Then go bird-watching. Have Brownies: 1) place their feeders outside (if possible), 2) tally when they see a bird, 3) keep a second tally if they see that bird eat, and 4) identify the birds using a field guide. After, help Brownies: 1) total each category of birds they saw and if any ate, 2) label the x-axis (bird categories) and y-axis (how many birds) on “My Bird Data,” 3) add each category’s data as a bar (one color bar for birds they saw eat and another color for birds they didn’t see eat), and 4) compare graphs. Ask questions like, “Which bird did you see most and least often? How much did they eat?”

Materials: *Feeders from Step 3; field guides or research on birds; access to outdoor area or video player; pencils; colored pencils; rulers (optional)*

- **Find the best place for your feeder.** Show Brownies how to add measurement markings to their feeder. Have them put their feeder outside for six days, check its volume daily,

move it every two days (three different locations total), and note both the location and how much food is left. After, help Brownies: 1) label the y-axis (amount of food) and x-axis (location and day of week) on “My Bird Data,” 2) add their data as rectangles above each day, and 3) compare graphs. Ask questions like, “How much food was left after six days? What day did birds eat the most and the least? Where’s the best spot for the feeder?”

Materials: *Feeders from Step 3; pencils; rulers (optional)*