



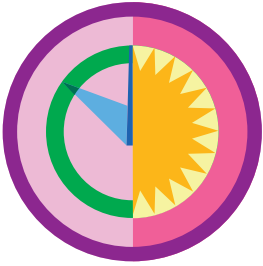
Junior Shapes in Nature

Juniors explore patterns found in nature and use math to create their own.

Steps

1. Identify symmetry in nature
2. Explore bilateral symmetry in nature
3. Create nature-inspired art with circular symmetry
4. Find fractals in nature
5. Search for the Fibonacci sequence

Purpose: When Juniors have earned this badge, they'll know about symmetry, fractals, and the Fibonacci sequence. They'll have identified patterns and shapes in nature.



Junior Numbers in Nature

Juniors explore how math can be used to tell us all kinds of information about nature, from how tall or old a tree is to the weather, season, or time.

Steps

1. Tell time with nature
2. Track the weather
3. Explore the circumference of trees
4. Search for shadows
5. Find the area and perimeter of plants

Purpose: When Juniors have earned this badge, they'll know how to use math to tell time, predict the weather, and learn about trees. They'll know how to measure shadows, perimeter, and area.



Junior Design with Nature

Juniors use math to plan and organize an outdoor adventure. They'll decide where to go, how long they'll be gone for, and what to bring.

Steps

1. Find your hiking pace
2. Choose a hiking trail
3. Find changes in elevation on a map
4. Decide how much food to bring
5. Pack for your adventure

Purpose: When Juniors have earned this badge, they'll know about different types of maps. They'll know how to calculate distance, pace, elevation changes, and area.



Junior Shapes in Nature 1

Activity 1—Arrival and Opening Ceremony: Juniors explore creating symmetrical images using mirrors and the letters of the alphabet.

Activity 2—Step 1: Identify symmetry in nature (choose one)

Choice 1: Draw Symmetry You Find in Nature

Juniors identify lines of symmetry in natural objects. Then, they find and draw examples of symmetry from nature such as hearts, snowflakes, and butterflies and identify lines of symmetry in each. From there, they can create a symmetry journal.

Choice 2: Create a Paper Snowflake with Symmetry

Juniors identify lines of symmetry in natural objects. Then, they create paper snowflakes and identify the six lines of symmetry.

Choice 3: Strike a Pose With Symmetry

Juniors identify lines of symmetry in natural objects. Then, they create symmetrical poses using their bodies and with a partner.

Activity 3—Step 2: Explore bilateral symmetry in nature (choose one)

Choice 1: Draw or Sculpt Leaf Symmetry

Juniors explore bilateral symmetry in natural objects. Then, they explore bilateral symmetry of a leaf by folding a leaf in half, making an impression using clay or creating a rubbing, and then drawing the other half to complete the leaf image.

Choice 2: Create Butterfly Symmetry

Juniors explore bilateral symmetry in natural objects. Then, they use two wire hangers to create the shape of a symmetrical butterfly. From there, Juniors create symmetrical patterns on the butterfly wings using tissue paper and other craft supplies.

Choice 3: Make Art With Human Symmetry

Juniors explore bilateral symmetry in natural objects. Then, they will explore human symmetry by tracing each other's right or left side from head to toe, and then draw and fill in the other half. Juniors share which features are and are not symmetrical.

Activity 4—Step 3: Create nature-inspired art with circular symmetry (choose one)

Choice 1: Create Radial Art With Birdseed

Juniors create nature-inspired art with circular symmetry. Using a circle's diameter, radius and quadrants as a guide, Juniors use a variety of bird seed to design and create symmetrical bird feeders.

Choice 2: Make Circular Art With Natural Objects

Juniors create nature-inspired art with circular symmetry. Using a circle's diameter, radius and quadrants as a guide, Juniors use natural objects such as sticks, rocks, leaves, flower petals, etc. to design and create radial art.

Choice 3: Make Art With Concentric Circles

Juniors create nature-inspired art with circular symmetry. First, they explore a circle's lines of symmetry (diameter, radius, and quadrants) and concentric circles. Then, they create art using concentric circles inspired by nature.



Activity 5—Closing Ceremony: Juniors review their favorite part of the meeting and what they learned.

Junior Shapes in Nature 2

Activity 1—Arrival and Opening Ceremony: Juniors explore tetrahedron features and patterns.

Activity 2—Step 4: Find fractals in nature (choose one)

Choice 1: Search for Fractals

Juniors explore natural fractals and search for them in the world around them. After collecting several examples, Juniors look for similarities and patterns or shapes in the different objects.

Choice 2: Sculpt Tree Fractals

Juniors explore natural fractal patterns. Then, they use a twig, clay and plastic knife to sculpt tree branches leading to the twig as well as those extending outward from the twig.

Choice 3: Make a Fractal Bouquet

Juniors explore natural fractals and the patterns that occur in flowers and plants. Then, they create a fractal bouquet using pipe cleaners and beads to share with the troop.

Activity 3—Step 5: Search for the Fibonacci sequence (choose one)

Choice 1: Find the Fibonacci Sequence in Food

Juniors explore the Fibonacci sequence, the Golden Rectangle and the spiral it forms. Then, they find the Fibonacci spiral and numbers in foods such as pineapples, artichokes, strawberries, apples, bananas, etc.

Choice 2: Find the Fibonacci Sequence in Animals

Juniors explore the Fibonacci sequence, the Golden Rectangle, the spiral it forms, and the ratios that result from consecutive numbers. Then, they research animals and look for examples of Fibonacci spirals, numbers and ratios.

Choice 3: Find the Fibonacci Sequence in Flowers

Juniors explore the Fibonacci sequence, the Golden Rectangle, and the spiral it forms. Then, Juniors find Fibonacci spirals and numbers in seeds, petals and leaves of flowers and plants. In the end, they draw or paint and share their favorite Fibonacci example.

Activity 4—Closing Ceremony: Juniors earn their Shapes in Nature badge.

Junior Numbers in Nature 1

Activity 1—Arrival and Opening Ceremony: Juniors explore what a clock, thermometer, and tape measure are used for and what they have in common.

Activity 2—Step 1: Tell time with nature (choose one)

Choice 1: Make a Sundial

Juniors explore different kinds of clocks and sundials. Then, they make their own sundial using paper plates, markers and straws or chopsticks.

Choice 2: Make a Life-sized Sundial



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Juniors explore different kinds of clocks and sundials. Then, they make a life-sized sundial using their shadows and ribbon and rocks to mark the time.

Choice 3: Use the Sun and Your Hands to Tell Time

Juniors explore different kinds of clocks and sundials. Then, they explore other signs of telling time using the position of the sun with respect to the horizon. Juniors learn to estimate time using their hands and the horizon.

Activity 3—Step 2: Track the weather (choose one)

Choice 1: Make Your Own Weather Station

Juniors learn about and create the following instruments for their weather station: rain gauge, windsock, and anemometer.

Choice 2: Build a Barometer

Juniors learn about how a barometer works and what it tells us about the weather. Then, Juniors create their own barometer using a jar, balloon, rubber band, straw, and cardstock.

Choice 3: Track Nature's Clues

Juniors research natural changes that indicate change in the weather or season. Then, Juniors explore the outdoors and look for evidence of weather changes. From there, Juniors create a natural calendar documenting the different clues by season or month.

Activity 4—Closing Ceremony: Juniors review their favorite part of the meeting and what they learned.

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Junior Numbers in Nature 2

Activity 1—Arrival and Opening Ceremony: Juniors discuss how accurate their weather observations and their instruments were. Then, Juniors learn about the importance of trees ahead of the meeting's tree-related activities.

Activity 2—Step 3: Explore the circumference of trees (choose one)

Choice 1: Measure Circumference to Find the Age of a Tree

Juniors learn how to measure circumference. Then, they learn how to estimate a tree's age by measuring its circumference and calculate the year it was planted or sprouted. Juniors also learn to estimate tree circumference using their wingspan.

Choice 2: Measure Circumference to Understand Tree Health

Juniors learn how to measure circumference. Then, they learn how to measure a tree's health by measuring its circumference and tree pit, which is the area around the tree needed for root growth. Juniors also learn to estimate tree circumference using their wingspan.

Choice 3: Measure Circumference to Find the Amount of Carbon Stored by a Tree

Juniors learn how to measure circumference. Then, they learn how to estimate how much carbon a tree has stored by measuring its circumference in centimeters and using the Dry Weight Conversion Table. Juniors also learn to estimate tree circumference using their wingspan.

Activity 3—Step 4: Search for shadows (choose one)

Choice 1: Find a Tree's Height Using Shadows



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Juniors learn about proportions. Then, they measure the length of their shadow, a tree's shadow and calculate its height using a proportion equation.

Choice 2: Go On a Shadow Adventure

Juniors learn about proportions. Then, they measure and compare the length of different objects and their shadows using a flashlight.

Choice 3: Measure the Power of Shadows

Juniors learn about proportions. Then, they make shadow puppets to explore the relationship between light and the size of the shadow cast.

Activity 4—Step 5: Find the area and perimeter of plants (choose one)

Choice 1: Find the Perimeter and Area of Leaves

Juniors learn about perimeter and area and how to measure each. Then, they find the perimeter of a leaf using string, and the area of the leaf by tracing it on graph paper and counting the squares.

Choice 2: Find the Perimeter and Area to Plan a Garden

Juniors learn about perimeter and area and how to measure each. Then, they use graph paper and information on seed packets to plan out a fenced in garden plot. They will determine the length of fence they will need to enclose it and which plants they can grow based on the area they have.

Choice 3: Find the Perimeter and Area of a Natural Landscape

Juniors learn about perimeter and area and how to measure each. Then, they find the perimeter and area of an irregular shape (like their hand) for practice, then do the same for a natural landscape.

Activity 5—Closing Ceremony: Juniors earn their Numbers in Nature badge.

Junior Design with Nature 1

Activity 1—Arrival and Opening Ceremony: Juniors think about where in the world they would like to go on an adventure, how they would get there, and what they might need to bring.

Activity 2—Step 1: Find your hiking pace (choose one)

Choice 1: Calculate Your Pace

Juniors learn about walking pace and how to calculate it. They walk for a quarter mile, time themselves, and work through the calculation to figure out their walking pace. Then, they can find out how many miles they can travel in 1 hour and in 3 hours.

Choice 2: Compare Human and Animal Paces

Juniors learn about walking pace and how to calculate it. They use the average human's walking pace to determine how many miles the average human can walk in 1 hour and in 3 hours. Then, they choose different animals, research their speeds and find their pace for different distances and compare them to human paces.

Choice 3: Calculate and Compare Different Paces

Juniors learn about walking pace and how to calculate it. They walk for a quarter mile, time themselves, and work through the calculations to figure out their walking pace. Then, Juniors run or skip the quarter mile, and calculate their new pace.



Activity 3—Step 2: Choose a hiking trail (choose one)

Choice 1: Choose a Trail on a Sample Map

Juniors review map features such as symbols, legend or key, scale, etc. They learn how to determine the length of the trail using a string and the map scale. Then, Juniors use the sample Trail Map to plan out a 3-hour hike, considering landmarks and looped trails to maximize their hike.

Choice 2: Choose a Trail on a Map of Your Local Area

Juniors review map features such as symbols, legend or key, scale, etc. They learn how to determine the length of the trail using a string and the map scale. Then, Juniors use a map to plan out a local 3-hour hike, considering landmarks and looped trails to maximize their hike.

Choice 3: Choose a Trail on Any Map

Juniors review map features such as symbols, legend or key, scale, etc. They learn how to determine the length of the trail using a string and the map scale. Then, Juniors use a map from any desired location to plan out a local 3-hour hike, considering landmarks and looped trails to maximize their hike.

Activity 4—Step 3: Find changes in elevation on a map (choose one)

Choice 1: Calculate Elevation Changes on a Sample Topographic Map

Juniors learn about elevation and sea level and how to read a topographic map using contour lines and index lines. They use the sample Topographic Map to calculate and graph elevation changes between different points.

Choice 2: Calculate Elevation Changes on Topographic Map of Your Area

Juniors learn about elevation and sea level and how to read a topographic map using contour lines and index lines. They use a topographic map of a local area to calculate and graph elevation changes between different points.

Choice 3: Calculate Elevation Changes on Any Topographic Map

Juniors learn about elevation and sea level and how to read a topographic map using contour lines and index lines. They use any topographic map to calculate and graph elevation changes between different points.

Activity 5—Closing Ceremony: Juniors review their favorite part of the meeting and what they learned.

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Junior Design with Nature 2

Activity 1—Arrival and Opening Ceremony: Juniors choose an Outdoor Adventure Card and brainstorm packing lists for the different kinds of trips.

Activity 2—Step 4: Decide how much food to bring (choose one)

Choice 1: Make a Snack for Your Hike

Juniors learn about measuring liquid volume and the meniscus line it forms in a measuring cup. Then, they use conversion equations to calculate how much water they will need per person for their 3-hour hike. Next, they will calculate the amount of ingredients they will need to make their snack for the hike.

Choice 2: Pack a Lunch

Juniors learn about measuring liquid volume and the meniscus line it forms in a measuring cup. Then, they use conversion equations to calculate how much water they will need per person for their 3-hour hike. Next, they will calculate the number of ingredients they will need to make sandwiches for the hike.



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Choice 3: Enjoy Your Trip With a Treat

Juniors learn about measuring liquid volume and the meniscus line it forms in a measuring cup. Then, they use conversion equations to calculate how much water they will need per person for their 3-hour hike. Next, they will calculate the number of ingredients they will need to make a sweet treat for the hike.

Activity 3—Step 5: Pack for your adventure (choose one)

Choice 1: Pack Your Equipment

Juniors learn about area and volume and how to calculate each. Then, they choose the supplies they will need for their hike and use math to make sure there is enough room in a backpack or box for all the supplies.

Choice 2: Load Your Vehicle

Juniors learn about area and volume and how to calculate each. Then, they calculate the cargo or trunk space for a vehicle and the volume of the different supplies to make sure there's enough room for all the supplies to fit in the vehicle.

Choice 3: Plan Your Campsite

Juniors learn about area and volume and how to calculate each. They determine how many tents and sleeping bags they will need by calculating the area for each. Then, using graph paper, Juniors will plan their campsite to ensure everything fits.

Activity 4—Closing Ceremony: Juniors earn their Design with Nature badge.