Reading: Shapes, Patterns, and Symmetry


Snow piling up on fir and pine trees.

Shapes are all over nature. We can see triangles in animals' ears, circles in eyes and planets, and hearts in leaves. The shape of an object in nature affects the way that object functions. The shape of a flower affects what kind of pollinator can access its nectar. Other plants have different shapes for their own reasons. Fir trees get thinner toward the top and have **flexible** branches that angle downwards. Many trees that lose their leaves in the winter may not be strong or flexible enough to hold branches loaded with snow and leaves. Sometimes late season snowstorms fall on trees that have started growing leaves, causing branches to break. Fir trees don't have this problem because of their shape and flexibility. Their branches bend easily, shedding snow when it gets too heavy. The thin top of a fir tree sends the snow downward, to the ground. If you ever walk through a snowy forest, fir trees might send their snow down on top of your head!


Evening Grosbeaks can crack a cherry seed with their massive, triangular bill.

Animals use shapes to help them as well. For example, Osprey catch fish, which they carry head-first, rather than sideways like a Bald Eagle would. This takes aerodynamic advantage of the hydrodynamic shape of a fish's body. In other words, the shape of the fish helps them swim through water efficiently, and it also can make it easier for the Osprey to fly. Animals may also use their shape to help them survive different **climates**. As you go up into higher, colder climates, animals tend to look rounder because they have shorter legs, arms, tails, and ears. This shape helps keep them warm. Animals that live in lower, warmer climates have longer arms, legs, tails, and ears that help cool them off when it gets hot out.

Birds also use the shape of their bill to help them find and eat food. Osprey, Bald Eagles, and hawks are meat eaters with large, sharp bills for tearing meat. Birds with short, thick bills, such as an Evening Grosbeak, use their bills to crush and eat fruit, seeds, and plant buds. Birds with tweezer-like bills are good at picking insects off plants. Long, curved bills can access difficult to reach seeds, or enter into tight spaces, like bark crevices or tube-shaped flowers. Long, spear-like bills are good for catching fish, frogs, or even mice.

Nature is filled with different kinds of **symmetry**. The simplest symmetry to find is reflection symmetry (sometimes it is called line, mirror, or bilateral symmetry). This is when one half of an object is the reflection of the other half. Many shapes, including squares, rectangles, circles, diamonds, and hearts have reflection symmetry. We see this kind of symmetry in nature in butterflies, many flowers, some birds' tail feathers, and many kinds of leaves. If you found a leaf with reflection symmetry and folded it in half down the middle stem, both halves would look the same. Symmetry isn't always perfect. A flower might have a hole in a petal on one side, or the wing of a butterfly might be torn on one side.

Another kind of symmetry we see is called radial symmetry or rotational symmetry. This kind of symmetry is found when you can spin an object around a center point and it still looks the same as before it was spun. Radial symmetry is everywhere in nature, such as in flower petals, the top of a jellyfish, snowflakes, starfish, and spiderwebs.

Translational symmetry is when one shape is repeated in an object to make a pattern. For example, hexagon shapes are repeated in honeycomb, and the shape of each scale on a pinecone is repeated, resulting in translational symmetry.

This West Coast Lady has reflection symmetry. Both halves look the same.

Objects can also have two or more kinds of symmetry at the same time. This dandelion (pictured left) that has gone to seed has rotational symmetry, because when it is spun it looks the same, and translational symmetry because the same shape (each seed) is repeated all over the top of the plant. An object may not look symmetrical from one point of view even if it is from another.

Sometimes objects are **asymmetrical**, meaning they are not symmetrical, usually for important reasons. While some feathers have reflection symmetry, the stiff feathers in the wings and tail are asymmetrical, because having different shaped feather halves helps the birds to fly better.

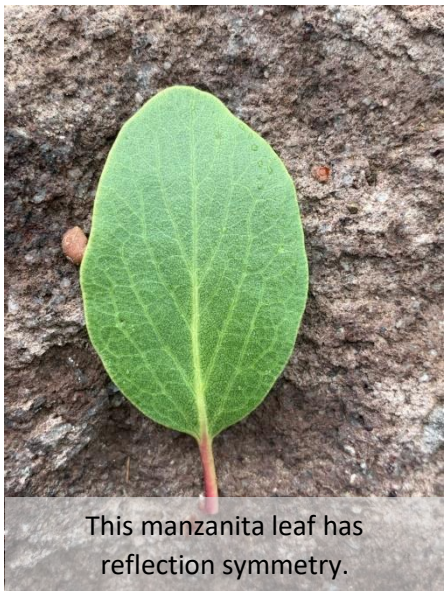
What kind of symmetry do you see in this Steer's Head flower?

Radial symmetry in lupine leaves.

Many caterpillars have translational symmetry.

This lichen is asymmetrical.

Activities for Grades 3-5


This manzanita leaf has reflection symmetry.

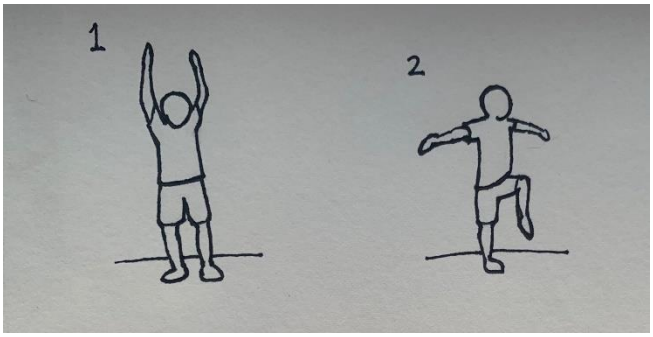
Branch Bending (Outside. 20 – 45 minutes)

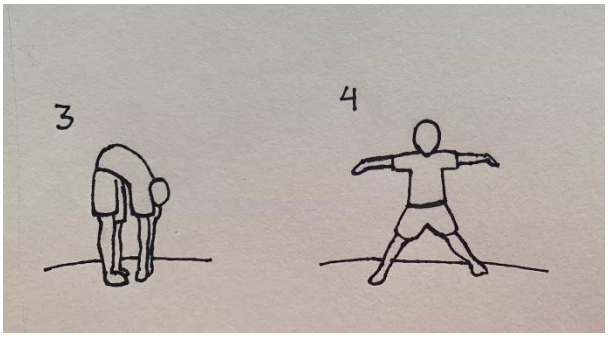
Test out the branches of different trees in your neighborhood to see how flexible they are. Find at least three different kinds of trees. At least one should be a conifer with needles, and one should be a deciduous tree with leaves. Gently and slowly pull branches down to see how flexible they are. Be careful not to pull to the point where the branch breaks or cracks. Then, discuss these questions with a family member:

1. Which branch was the most flexible? Was it a tree with leaves or needles?
2. Which branch was the least flexible? Was it a tree with leaves or needles?
3. Is a branch more or less flexible close to the tree trunk versus at the end of the branch?

Now you try bending your own body like a flexible tree with these stretches. Try to hold each stretch for 20 seconds.

1. Stand up and reach your hands up high like a tall Sugar Pine.
2. Stand, bend one knee and bring your leg up. Hold your branches (your arms) out for balance. Now do the opposite leg.
3. Stand and reach your branch arms all the way down to the ground.
4. Spread your roots and branches by spreading your feet wide and holding out your arms.





Flower Symmetry (Inside or outside. 10 minutes – 1 hour)

Invent and name you own unique flower with radial symmetry. Use what art supplies you have to paint, draw, or build this flower and its radial symmetry. **TINS wants to see your art!** Have your parent post a photo of your art project to Facebook and tag Tahoe Institute for Natural Science. You could also email the photo to us at kendal@tinsweb.org.


These Sagebrush Buttercups have radial symmetry.

Scavenger Hunt (Outside. 30 minutes – 1 hour)

Head outside with your family to find as many shapes as you can, such as:

- Reflection symmetry (look for butterflies!)
- A familiar shape in the clouds
- A cut open fruit or vegetable with symmetry
- A bird with a short bill
- Radial symmetry in a flower
- A triangle made by branches in a tree
- A bird with a curved bill
- Translational symmetry in a pinecone
- A circle on a plant
- A heart shaped leaf
- A bird with a long bill
- A building with symmetry
- A round animal with short arms, legs, and tail
- Something that is asymmetrical (does not have any kind of symmetry)

Create a Pattern (Outside. 10-30 minutes)

To create a pattern, collect things you can find on the ground such as pinecones, rocks, sticks, and leaves. Remember that a pattern exists when a design or object it repeated over and over again. With the things you collected, create your own pattern. You can make your pattern go in a straight line, in a spiral or in the form of another shape. The example of the pattern below is bark, two rocks pinecone, stick, bark, two rocks pinecone, stick.

Take a photo of your pattern. Send it to a friend or family member far away and invite them to make their own pattern.

Words to Know

Flexible: Bending easily without breaking.

Climate: The prevailing weather conditions over a long time.

Symmetry: When something is made up of exactly similar parts facing each other or around an axis.

Asymmetrical: Not symmetrical.

Palabras para conocer

Flexible: Que puede ser doblado fácilmente sin que se rompa.

Clima: Condiciones atmosféricas propias de un lugar

Simetría: Correspondencia de posición, forma y tamaño, respecto a un punto, una línea o un plano, de los elementos de un conjunto o de dos o más conjuntos de elementos entre sí.

Asimétrica: Que no tiene simetría.

Further Learning

Learn more about symmetry in this video.

Learn more about Allen's Rule in nature.

Sing a symmetry song.

Go on a shape hunt.

Watch an Osprey catch a fish and turn the fish head first.

These Jeffrey Pine cones have radial symmetry on both ends.