Maths – Symmetry in Nature Stage 2 - Stage 3

Learning Intention	Maths Stage 2 & 3
What is symmetry and is there symmetry in nature?	**Geometry** MA2-15MG: Manipulates, identifies and sketches two-dimensional shapes, including special quadrilaterals, and describes their features Working mathematically MA2-2WM selects and uses appropriate mental or written strategies, or technology, to solve problems MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations.

Symmetry in Nature

Symmetry is fun to learn about because it is all around us in nature. It is an important aspect in the study of Geometry, as an integral component connecting Mathematics to the real world.

Content: Symmetry is when an object looks the exact same on one side as the other. To see if an object is symmetrical, you draw a line of symmetry- a line dividing an object to show a perfect match on each side. It's like making a mirror image. The line down the middle of a symmetrical shape is called the line of symmetry or a mirror line

There are other types of symmetry we will learn about during these activities. Complete the activities to get a deeper understanding of rotational, reflection or non-symmetrical items from nature.

Extend your learning with optional Fibonacci sequence explorations and mandala making with found objects from outside.

Online Resources (optional) Look up the word symmetry on google and on Youtube

https://www.youtube.com/watch?v=YFzktJNmnPU

https://www.mathsisfun.com/numbers/fibonacci-sequence.html

https://www.mathsisfun.com/numbers/nature-golden-ratio-fibonacci.html

Activities

1A –Complete the worksheet.

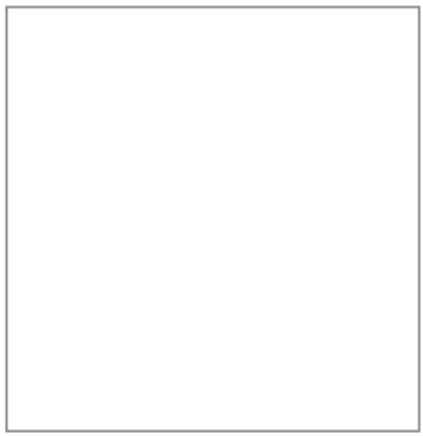
1B – Complete the table

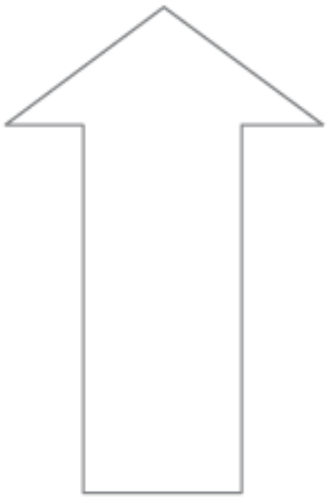
1C-Complete worksheet with drawings of rotational, reflection or non-symmetrical items from nature.

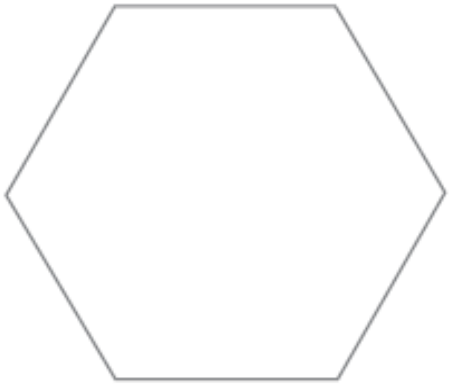
1C – Use a mirror or a phone camera to find the line of symmetry or draw second half of leaf.

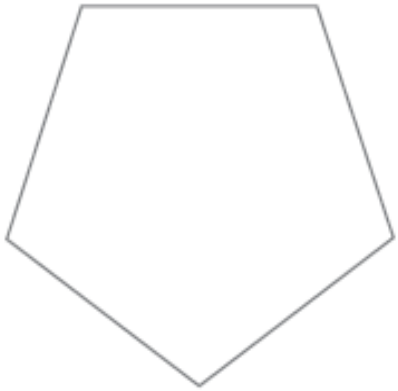
1D-(Optional Extension activity) Can you find something in nature with the Fibonacci Sequence and Create a rotationally symmetric design with nature?

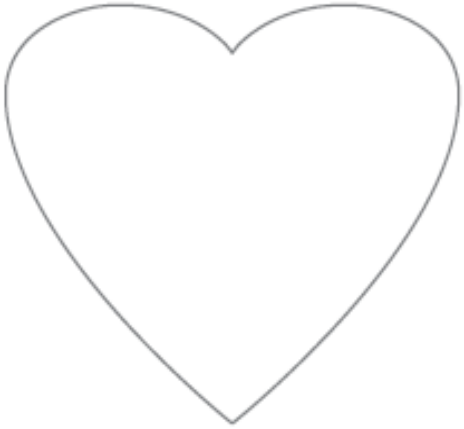
Cut out each shape and fold it exactly in half as many ways as you can.

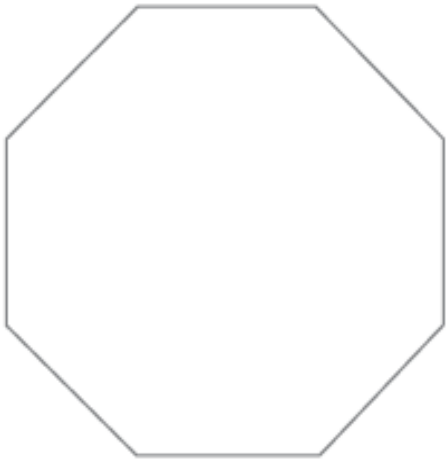


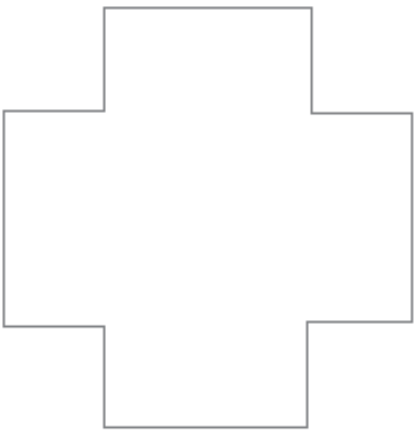


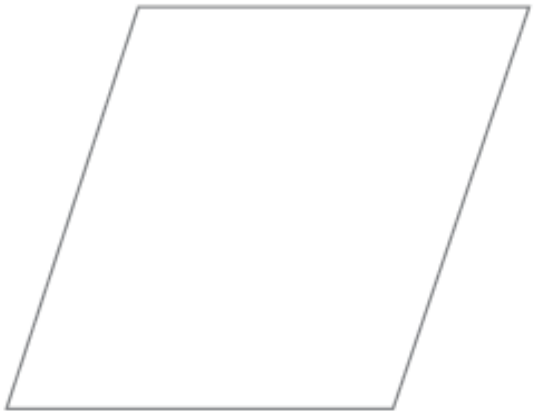












1A. Use the worksheet with a variety of 2D shapes to find how many times each shape can be folded in half. Cut out each shape and fold it exactly in half in as many ways as you can.

Discuss:

Which shapes can be folded in half only once?

_____

_____

Which shapes can be folded in half in more than one way?

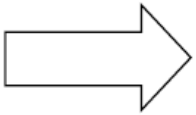
_____

_____

When two halves exactly overlap, what is the line along the fold called? A Line of _____

On each of the cut outs, draw the line of symmetry along each fold line.

1B - Complete the table to record whether each of the shapes is symmetrical and indicate how many lines of symmetry each shape has.

Shape	Does it Have Symmetry? Yes or No	How Many Lines of Symmetry?
1. 		
2. 		
3. 		
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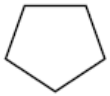
5. 		
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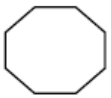
7. 		
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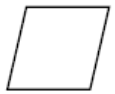
9. 		

Do all four-sided shapes have the same number of lines of symmetry?

_____

Do all five-sided shapes have the same number of lines of symmetry?

_____

Trace around a circular container and cut out the circle. Then

- fold the circle in half once
- fold it in half twice
- then fold it again and again and again.

How many times can you fold a circle exactly in half?

_____

Write about how many lines of symmetry you think a circle has.

_____

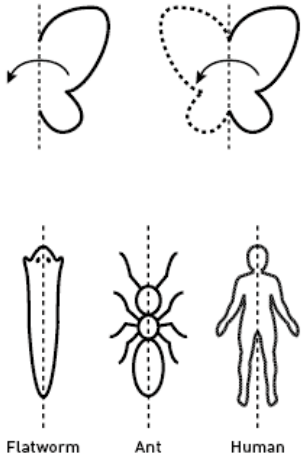
_____

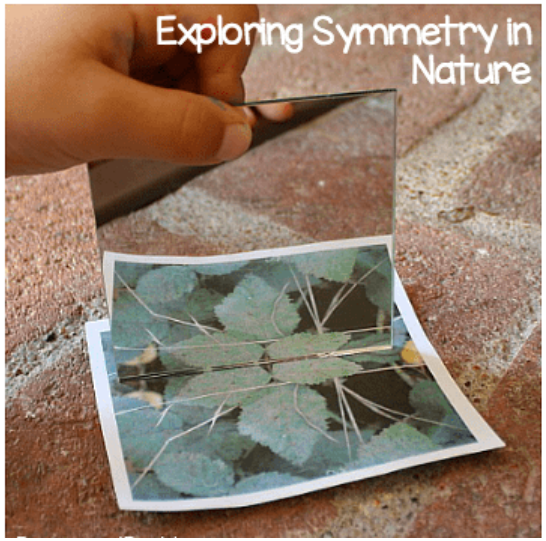
Now explain it to somebody else. You can use your circle to demonstrate.

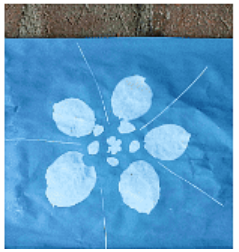
Symmetry in Nature

Reflective Symmetry: Something is symmetrical when both sides of it are the same when cut in half.

The line down the middle of a symmetrical shape is called the line of symmetry or a mirror line







1C- Can you draw the other half of a leaf shape using reflectional symmetry? Use a mirror or a phone camera to check your work!

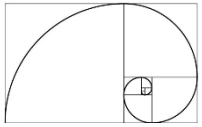
Find a leaf and cut it in half. Stick it here and draw the other half.

1D-Extension activity

Can you find something in nature with the Fibonacci sequence?

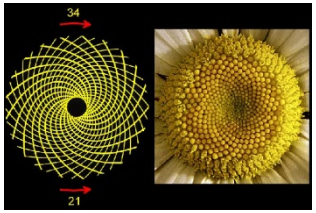
Fibonacci: The Fibonacci sequence starts like this: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55 and so on forever. Each number is the sum of the two numbers that precede it. It's a simple pattern, but it appears to be a kind of built-in numbering system to the cosmos. Here are some astounding examples of phi in nature.

Golden Ratio: The Fibonacci sequence is very close to the golden ratio a special number approximately equal to 1.618 or phi. It appears many times in geometry, art, architecture and in nature.



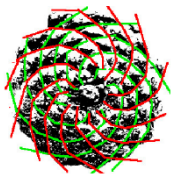
Shells - This shape displays the Golden Rectangle, a rectangle in which is drawn using the Golden Ratio phi. Phi is like another irrational number Pi, a real number that cannot be expressed by a fraction, a number that after the decimal point carries on forever without repeating a pattern. This takes on the form of a spiral. It's called the logarithmic spiral, and it abounds in nature.

Flower petals-The number of petals in a flower consistently follows the Fibonacci sequence, each petal is placed at 0.618034 per turn (out of a 360° circle) allowing for the best possible exposure to sunlight and other factors.

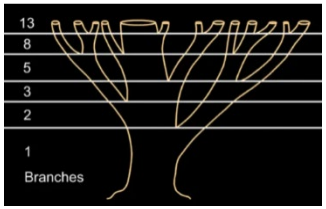


Seed heads-The head of a flower is also subject to Fibonaccian processes. Typically, seeds are produced at the centre, and then migrate towards the outside to fill all the space. Sunflowers provide a great example of these spiralling patterns.

Pinecones-Similarly, the seed pods on a pinecone are arranged in a spiral pattern. Each cone consists of a pair of spirals, each one spiralling upwards in opposing directions. The number of steps will almost always match a pair of consecutive Fibonacci numbers. For example, a 3-5 cone



is a cone which meets at the back after three steps along the left spiral, and five steps along the right. Pineapple and cauliflowers also have this pattern.



Tree Branches-The Fibonacci sequence can also be seen in the way tree branches form or split. A main trunk will grow until it produces a branch, which creates two growth points. Then, one of the new stems branches into two, while the other one lies dormant. This pattern of branching is repeated for each of the new stems. Root systems and even algae exhibit this pattern

Draw something from nature with a repeated pattern in this box

Create a rotationally symmetric design with nature?

Make a mandala with found natural objects demonstrating one type of symmetry from today's lesson Collections might be of leaves, sticks, stones, pebbles or flowers. Share finished art work in exhibition. Could this be arranged symmetrically?