SYMMETRY

DEFINITION OF SYMMETRY

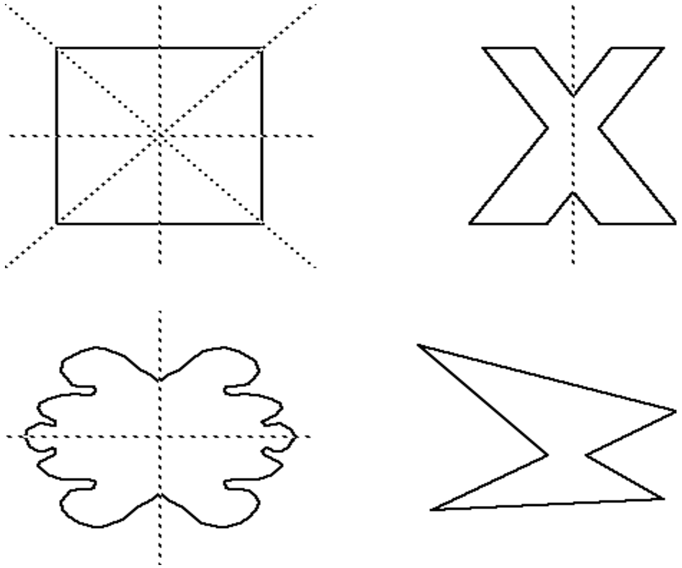
A geometric shape or object is symmetric if it can be divided into **two or more** identical pieces that are arranged in an organized fashion.

An object is symmetric if there is a transformation that moves individual pieces of the object but doesn't change the overall shape.

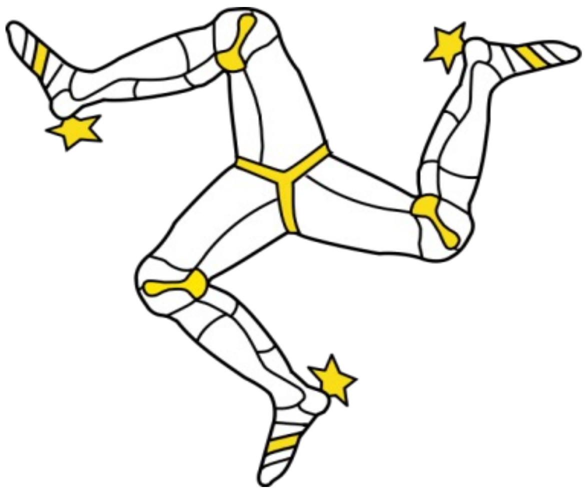
The type of symmetry is determined by the way the pieces are organized, or by the type of transformation:

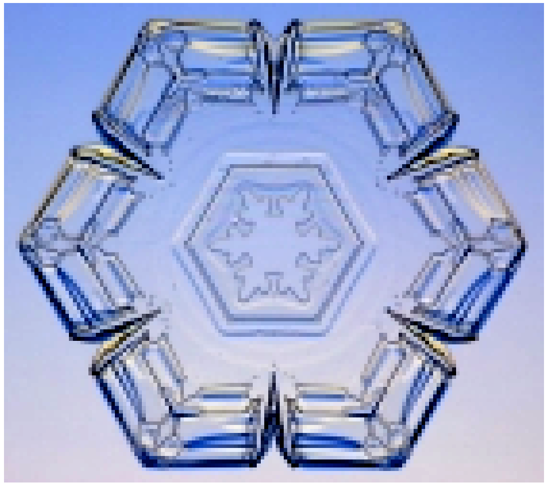
DIFFERENT TYPES OF SYMMETRY

- **An object has reflectional symmetry (line or mirror symmetry) if there is a line going through it which divides it into two pieces which are mirror images of each o**

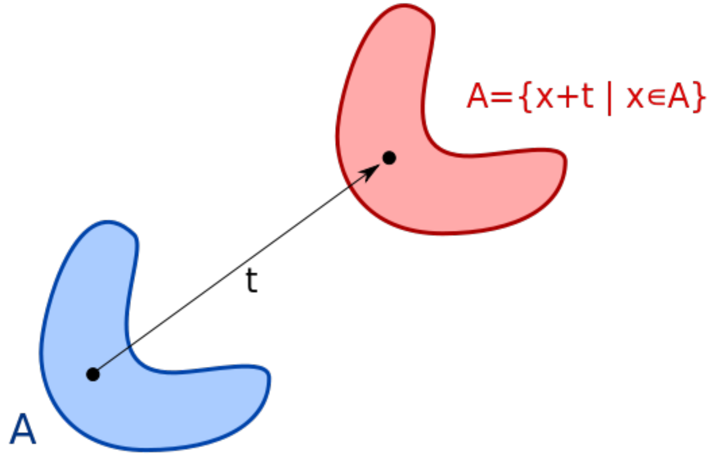


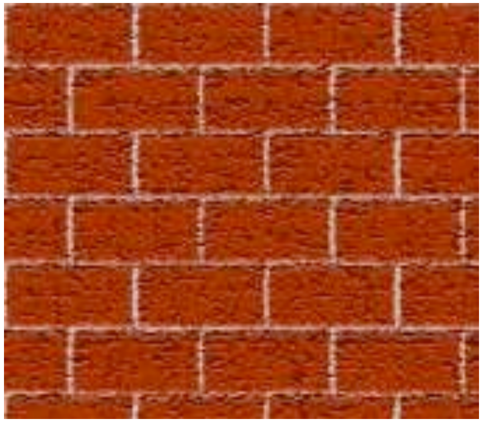
- An object has rotational Symmetry if the object can be rotated about a fixed point without changing the overall shape.





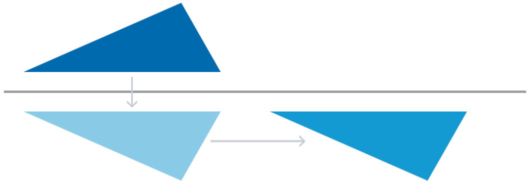
- **An object has translational symmetry if it can be translated without changing its overall shape.**





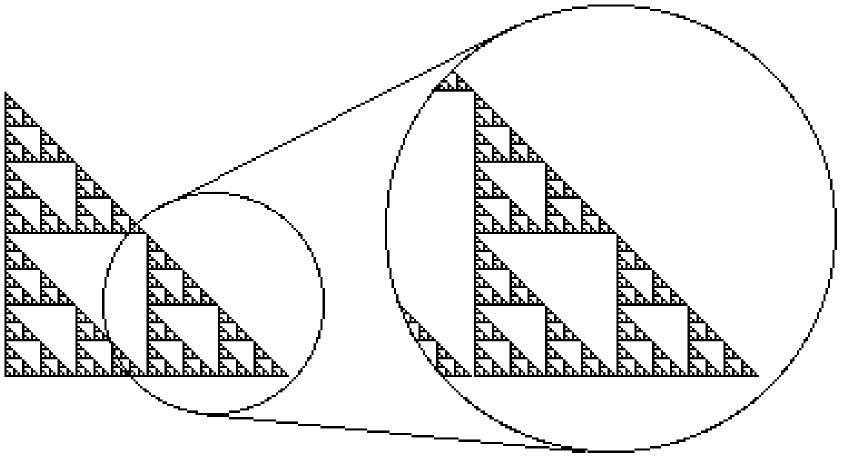
MANY TYPES OF SYMMETRY

- **Other symmetries include glide reflection symmetry and rotoreflection symmetry.**

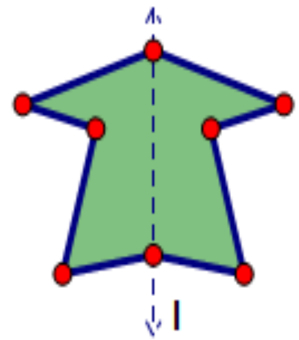


SPECIAL KIND OF SYMMETRY

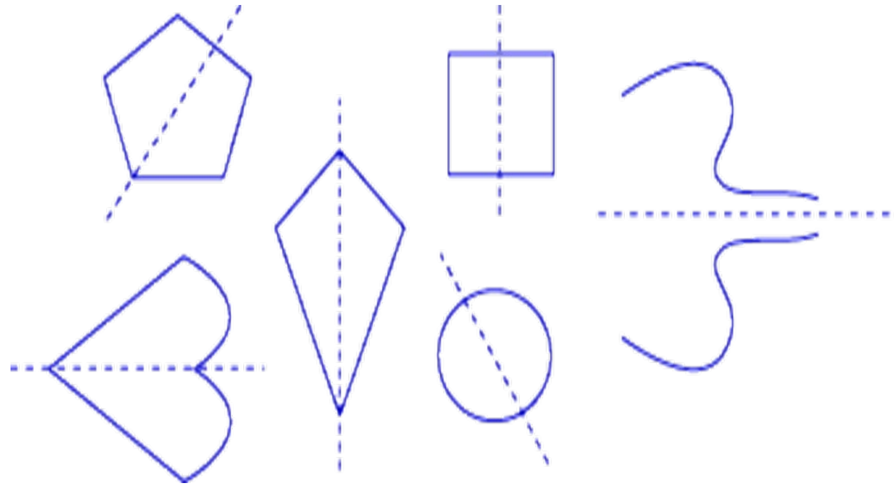
- **An object has scale symmetry if it does not change shape when it is expanded or contracted. Fractals exhibit a form of scale symmetry, where small portions of the fractal are similar in shape to large portions.**[]

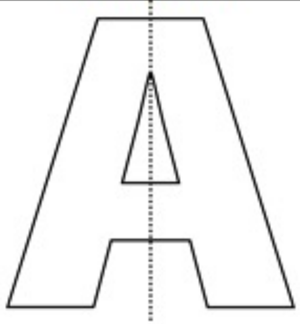
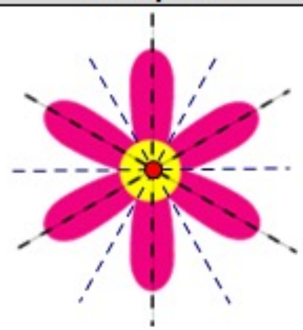
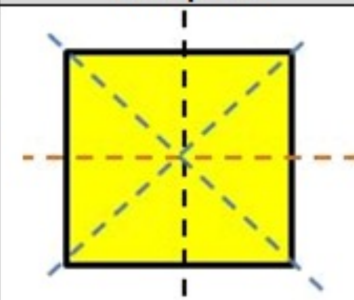


LINE OF SYMMETRY (REFLECTIONAL SYMMETRY)

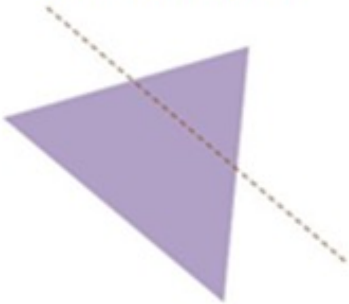
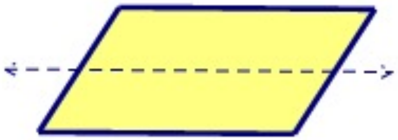
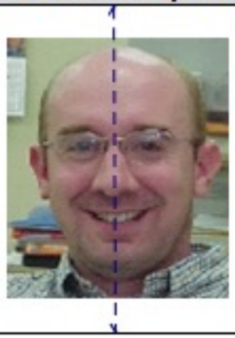
Definition #1	Definition #2
Line symmetry occurs when two halves of a figure mirrors each other across a line. The line of symmetry is the line that divides the figure into two mirror images. A simple test to determine if a figure has line symmetry is to fold the figure along the supposed line of symmetry and see if the two halves of the figure coincide.	A set of points has **line symmetry** if and only if there is a line, l, such that the reflection through l of each point of the set is also a point of the set. 
Definition #3	**Definition #4**
If half the figure is a mirror image of the other half.	A figure in the plane has a line of symmetry if the figure can be mapped onto itself by a reflection in the line.

EXAMPLES:

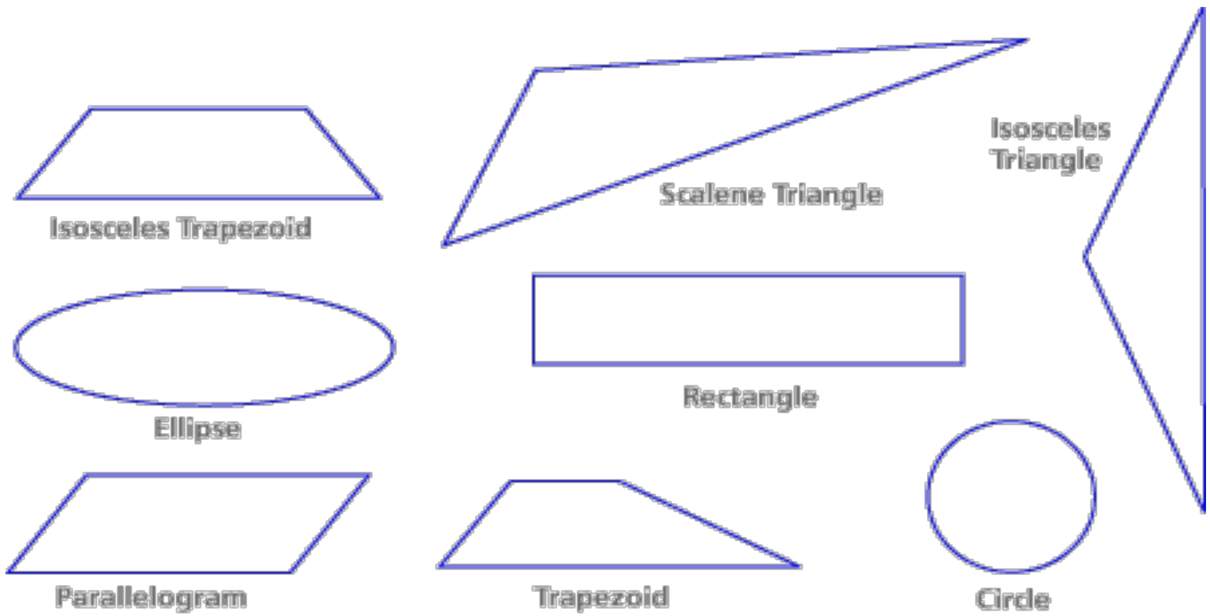


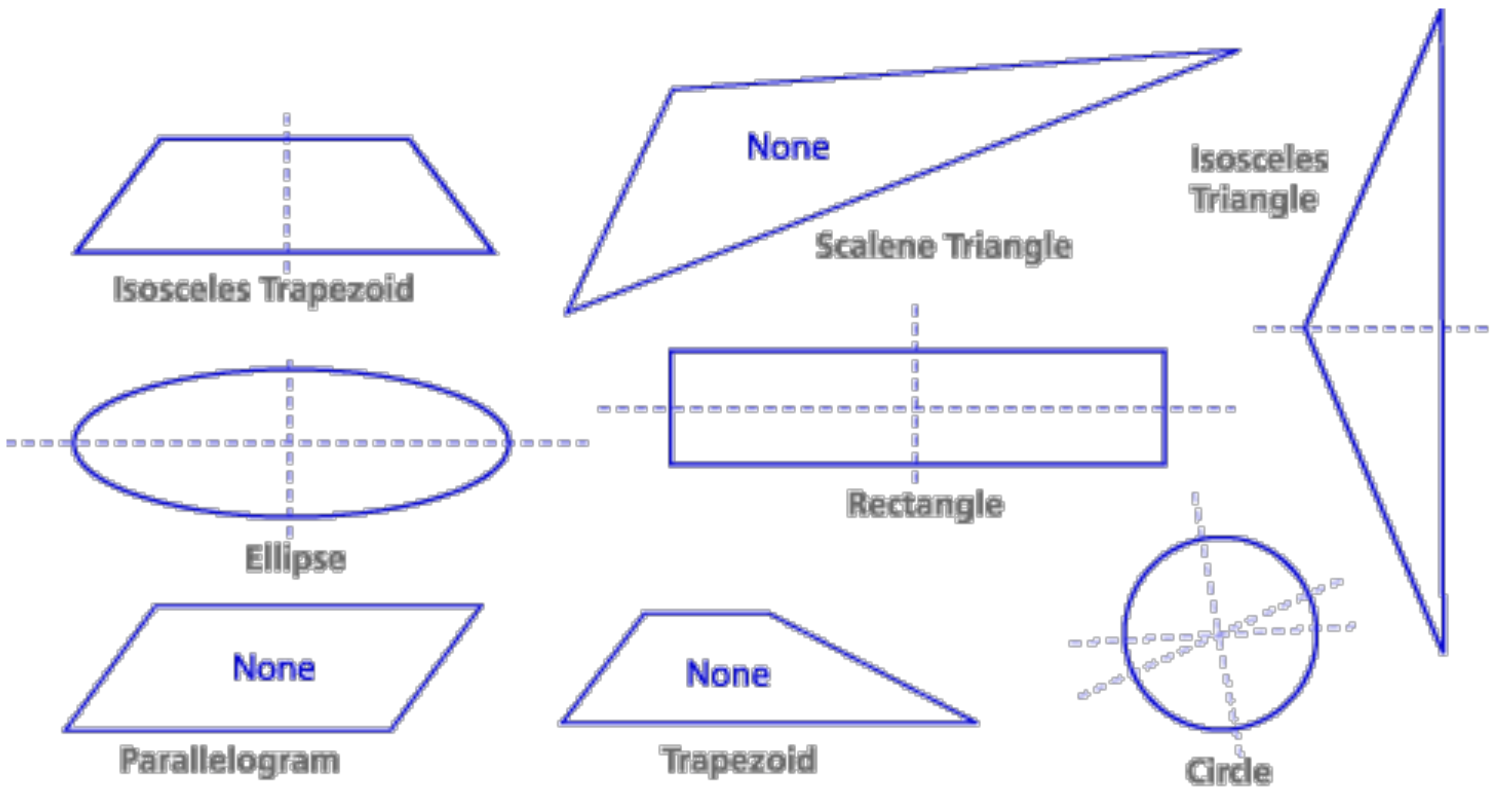
Example #1	Example #2	Example #3	Example #4
			

NON-EXAMPLES

NON - Example #1	NON - Example #2	NON - Example #3	NON - Example #4
			

FIND ALL THE LINES OF SYMETRY:





None
Isosceles Triangle
Scalene Triangle
Isosceles Trapezoid
Ellipse
Rectangle
None
None
Parallelogram
Trapezoid
Circle

FOLD & CUT THEOREM – CUT ANY SHAPE FROM ONLY ONE CUT

The fold-and-cut theorem states that any shape with straight sides can be cut from a single sheet of paper by folding it flat and making a single straight complete cut

The first published reference to folding and cutting of which we are aware is a Japanese book, *Wakoku Chiyekurabe* (Mathematical Contests), by Kan Chu Sen, published in 1721

https://www.youtube.com/watch?v=ZREp1mAPKTM
https://www.youtube.com/watch?v=G8SoJ530JAs

https://www.youtube.com/watch?v=GKzl0_6NKJ8

References:

Wikipedia: Symettry

http://www.brotherstechnology.com/docs/fractals.pdf

http://www.geometrycommoncore.com/content/unit1/gco3/teachernotes1.html