

## Exploration 4

### The ABCs of Balance

**Balance** is the consideration of visual weight and importance. Balance can be symmetrical and evenly balanced or asymmetrical and unevenly balanced.

Much of what we see in nature appears to be symmetrical. If we look in the mirror, our own faces appear to be mostly symmetrical. Butterflies and moths have 2 equal sides and their wings appear to be symmetrical or mirror images of each other. Throughout history and in every corner of the world, builders and architects have used symmetry to create balance in the built world.

#### *Materials:*

- Copy of the alphabet in capital letters
- Copy of Capital Letter Symmetry Venn Diagram
- Copy of Patterns Everywhere Worksheet

#### *Objective:*

Using classroom objects and the letters of the alphabet, students will use visual analysis to identify examples of symmetry and balance.

#### *Standards:*

- Arts: NA-VA 2
- English: NL-ENG: 4, 6, 12
- Mathematics: NM-PROB.COMM: 1, 2, 3; NM-GEO: 1, 2, 3, 4; NM-PROB.CONN: 1, 3
- Science: NS: 3, 4, 7
- Social Studies: NSS-G 1

#### *Procedures:*

- Begin by discussing balance and symmetry. Look around the classroom. Find examples of objects with symmetry, meaning that if the object were divided in two exactly in the middle, one side would "mirror" the other.
- Explain that the opposite of symmetrical is "asymmetrical". Here, the letter "a" means "not", as in "not symmetrical". Students may know the word "typical" and "atypical", meaning "not typical." Next find objects that use asymmetry.
- Use the Capital Letter Symmetry Venn Diagram or to look at the capital letters of our alphabet in regards to symmetry. You can also do this as a class and write all the letters of the alphabet in

- a simple block script on the board and create your own Venn diagram.
- Ask the students if they think most of the letters of the alphabet are symmetrical or asymmetrical.
  - Begin with "A". Can it be divided in 2 halves? How? By drawing a line vertically from top to bottom, the left side a mirror or reflective equal of the right side. This line is called the "line of symmetry". Can "A" be divided horizontally? No.
  - Point to "B". Can "B" be divided into 2 identical halves? Yes, but not vertically. The line of symmetry can be drawn horizontally through the midpoint of "B", making the top and bottom halves equal.
  - Proceed through the rest of the alphabet, or ask the students to work on their own worksheets.
  - BDEC can be divided horizontally. AMTUVWY can be divided vertically. HIOX can be divided both horizontally and vertically. FGJKLNOPQRSZ are not reflectively symmetrical.

*Reinforcement Exercise*

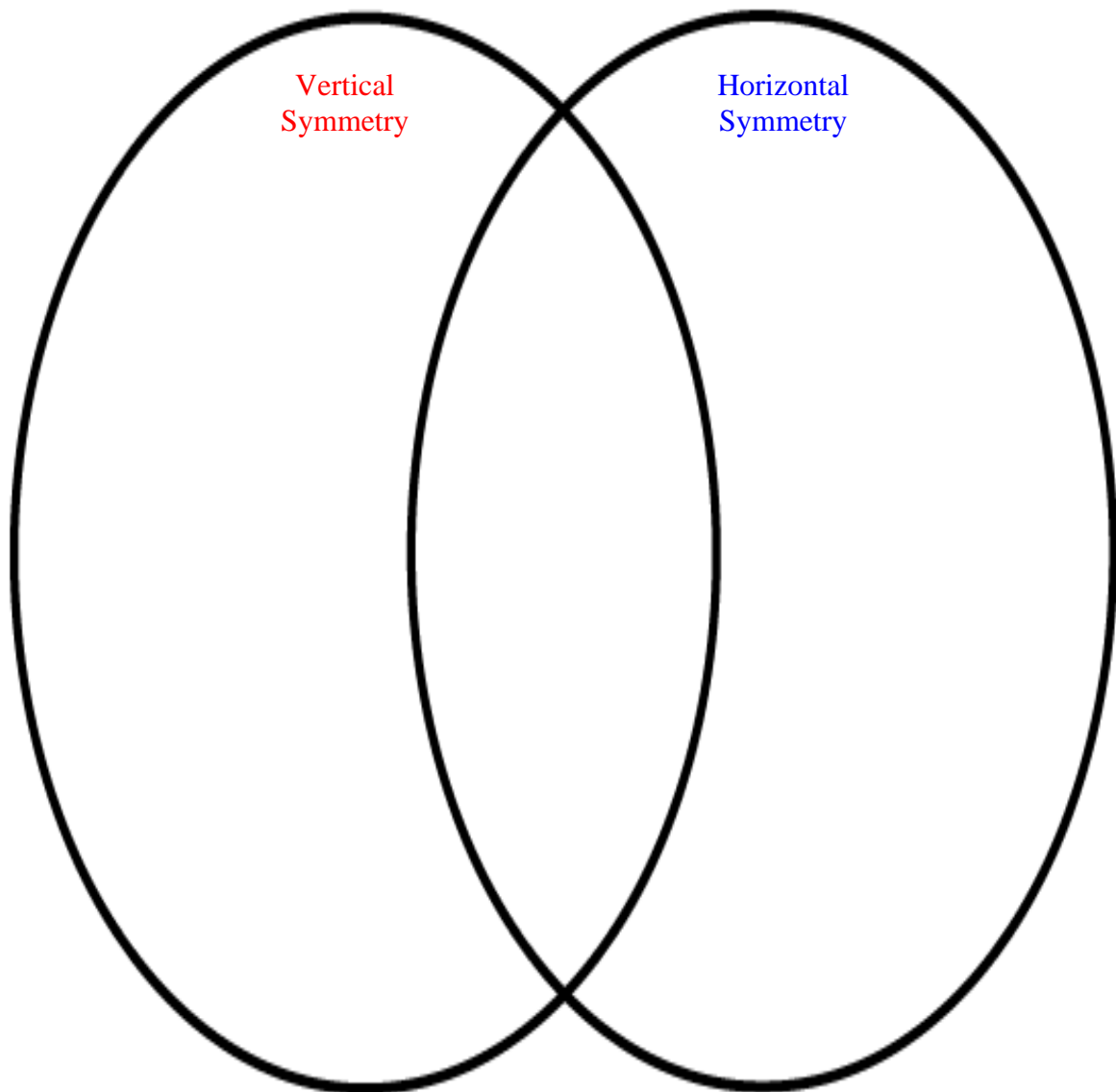
- Discuss symmetry as a way of making patterns using the Patterns Everywhere worksheet
- The School of Education at Loyola University Chicago has several QuickTime videos on symmetry and PDF worksheets  
[http://countdown.luc.edu/NCTM\\_cat/Geometry/Symmetry/](http://countdown.luc.edu/NCTM_cat/Geometry/Symmetry/)

# Capital Letter Symmetry

## Venn Diagram

Use the Venn diagram below to classify capital letters by their symmetry, whether they have horizontal symmetry, vertical symmetry, both types, or neither.

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z



# Patterns Everywhere!

Every day we see symmetrical patterns: brick buildings, wallpaper, tire tracks, playing cards, insects, and more.



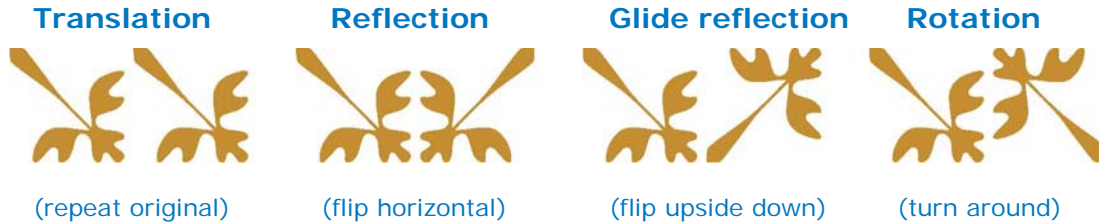
These are all symmetrical patterns because they repeat a design by sliding it over a line, flipping it over a line, or turning it around a point.

## Did you know all patterns are based on MATH?

You need two things to make a pattern:

1. A form and
2. A way to organize the pattern (usually a grid like you would use in tic-tac-toe, only much bigger).

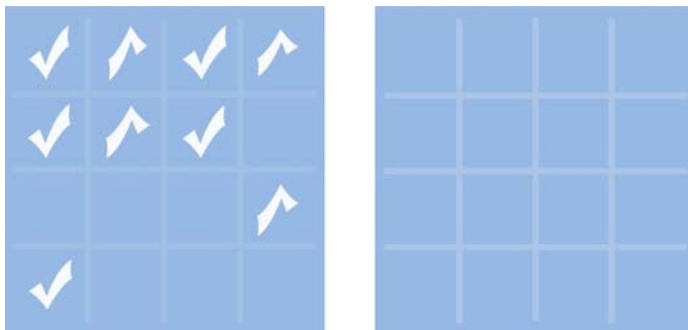
To make a pattern you take a copy of your original form and move it in one of these four ways:



Using these motions, mathematicians have discovered that there are 17 symmetrical patterns you can make. The simplest pattern is to repeat the object exactly the like the original over and over again (translation) on the grid.

## Producing a Pattern

Can you finish this pattern?  
What type of motion is it?



Design your own symmetrical pattern using one of the four motions shown above.