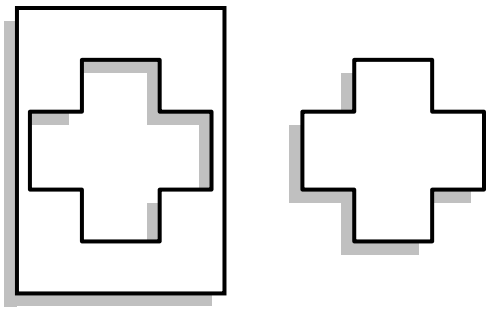
Plus Sign Algebra

NAME _____

On the last page of this worksheet, carefully cut along the dotted lines of the plus sign. Keep the rest of the page intact. When you are done cutting, you should have two pieces that look like this:



Shape Sorter Plus Sign

There are eight different moves possible with the plus sign. If you start with the plus sign placed in the shape sorter, the plus sign will completely fill the hole after any of these moves is performed.

N..... do nothing

¼ .....one-quarter turn clock-wise

½ .....one-half turn clockwise

¾ .....three-quarter turn clockwise

H .....rotation about the horizontal axis

V.....rotation about the vertical axis

R..... rotation about the right diagonal

L..... rotation about the left diagonal

Perform each of the eight moves listed above. After each move, use the labels to indicate the top front after each move has been performed.

Start with the plus sign in original position — that is, in the shape sorter with the N at the top front.

The symbol * means "followed by," so the expression ½ * V means to do a first move of one-half turn followed by a second move of rotation about the vertical axis. What is the result? In the chart on the back of this sheet, indicate the result in the appropriate square.

Now, perform all possible combinations of first moves followed by second moves to complete the entire chart.

		2ND MOVE							
	*	¼	½	¾	N	H	V	R	L
1ST MOVE	¼								
	½								
	¾								
	N								
	H								
	V								
	R								
	L								

1. What is ¾ * V?

2. What is L * R?

3. What is (H * ¼) * (N * ½)?

4. Does any symmetry exist in the completed chart?

5. Is the * operation commutative?

6. What relationship is there between symmetry in the chart and whether or not the operation is commutative?