Name _____ Period _____ Date _____

Square Exploration
Don't be a "square"
Thinking for yourself

Background
What is the mathematical definition of a square?

We can describe a square a few different ways. Fill in the following:

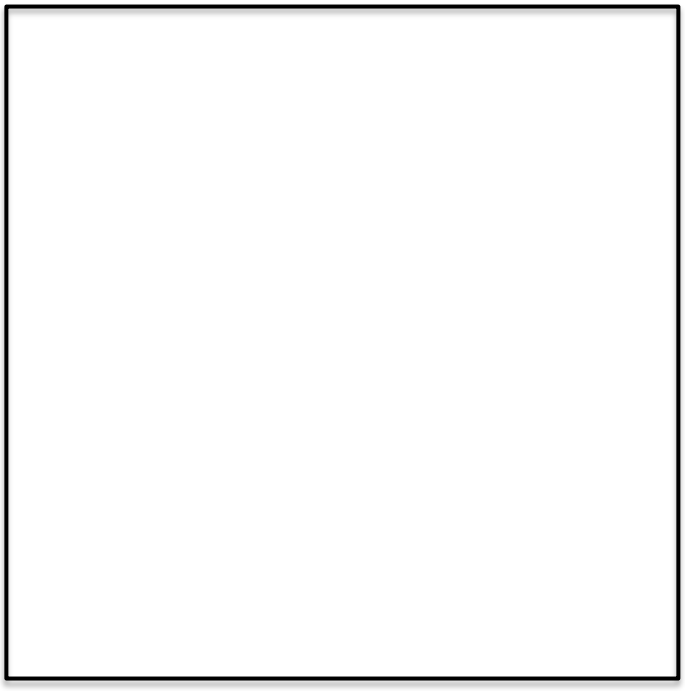
A square has _____ Vertices
_____ Edges
_____ Faces

Thinking about symmetries
Informally, a "symmetry" of the square is a way of placing the color cardstock square within the outline of the square on the paper.

More mathematically, we apply a transformation to the square. This is a symmetry if the square lands back onto itself.

The first symmetry of a square is to rotate it 360° (Can you see why that works?)

How many more symmetries can you find?



Becoming More Precise
It can be tricky making a list of all our symmetries with no repeats.

Label a point c in the center of your color cardstock square (on both the front and the back). Side note: This is labeling the face, as in faces, edges, and vertices.

Try out some of the symmetries you found before. Is our point c helpful for keeping track of all the options?

Label four more points (vertices), A,B,C, and D in each of the four corners (on both the front and the back). Label the sides (edges) AB, BC, CD, and DA.

Try out some of the symmetries you found before. Are the new labels helpful for keeping track of all the options?

Saying a lot with a little
We have probably over labeled our square. What is the smallest amount of labeling we can do that will still help us see different symmetries?

The Importance of a Rigid and Isometric Transformation
While using the color cardstock square, every transformation was **rigid**, meaning the shape stayed the same, the angles were the same, and the side lengths were all the same before and after the transformation. Use the pipe cleaners and scissors (twist together 4 corners) to create a same size square.

Can you find things that look like they might be symmetries, but are NOT rigid transformations? Check carefully, are these new transformations isometric?