Group Members: ____

(1) Draw a small square with corners labeled, in the **counter-clockwise direction**, by $1, 2, 3, 4$. Recall that the group of plane symmetries of this square is D_4. Draw lines of reflection and label them appropriately with H, V, D, and D'.

(a) Select two group elements α, β which generate D_4, and write them as permutations by observing the start and finish point of each number. Use two-line notation.

(b) Compute α^{-1}, β^{-1}, $\alpha\beta$, and $\beta\alpha$. Write down the previous name we used for each group element (R_*, H, D, etc.).

(Continued on reverse)

(2) Rotational symmetries of the tetrahedron.

(a) How many types of rotational symmetries of the regular tetrahedron are there? Compute this by ignoring the labels and seeing generally the types of motions. By comparison, in D_4 there are 5 types: identity, 90 degree rotation, 180 degree rotation, reflection through a diagonal line, reflection through a line connecting midpoints of opposite sides. For some types there are more than one element, giving 8 total.

(b) List the group of rotational symmetries of the tetrahedron in cycle notation. The symbols in the cycles will come from the set $\{A, B, C, D\}$.

(c) Is this group in (b) the same as S_4?

(d) Compute the centralizers of $(AC)(BD)$ and (ABD). This can be done directly or after writing down a Cayley Table.