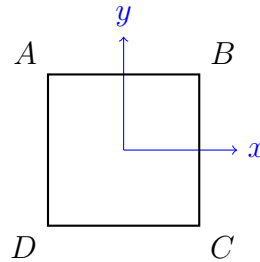


### Quiz 3

We consider the dihedral group  $D_4$ . Recall that  $D_4$  is the symmetry group of a square :



1. Geometric study.

- How many elements does  $D_4$  have?
- List all the elements of  $D_4$  in terms of explicit reflections and rotations.
- For each of the elements listed above, draw the square after applying the transformation.

2. Algebraic study. Recall that we have the algebraic definition

$$D_4 = \{r^i s^j, r^4 = s^2 = (rs)^2 = \text{id}\}.$$

Identify  $r$  and  $s$  in the list of Question 1.(c), and write all elements of  $D_4$  in the form  $r^i s^j$ .