

Lesson 1

WHAT IS A GROUP – PRACTICE

1. Multiply the following permutations together. Multiply left to right.

a. $(1,2,3,4)(3,4,5)$

b. $(1,2,3,4)(4,3,2,1)$

c. $(1,2)(1,3)(1,4)$

d. $(1,2)(1,2)$

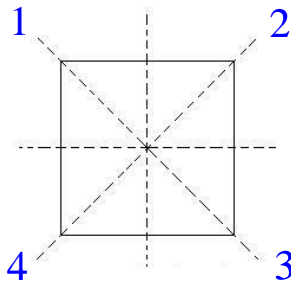
2. Verify the associative law by performing the multiplication in two ways as indicated by the grouping symbols. Multiply left to right.

$$[(1,2,3,4)(2,4)](1,3,5) = ?$$

$$(1,2,3,4)[(2,4)(1,3,5)] = ?$$

3. If $a = (1,2,3)$, find a^2 and a^3 .

4. If you rotate the square below through multiples of 90° or flip the square about one of the indicated axes of symmetry, then eight configurations are possible. Represent each configuration in terms of the corresponding cycle(s).



5. Explain why each of the following is not a group.

a. The set of real numbers under subtraction.

b. The set of real numbers under multiplication.

c. The set of irrational numbers under multiplication.

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6. Identify two cycles from your physical world that are based upon symmetries or repetition of patterns, and identify one cycle that is based upon events that you repeat over time. Also, give the length of each cycle. The goal here is to realize that cycles are everywhere in your life!