Worksheet 8: Cycle Notation in the Symmetric Group

Math 335

Reporter:

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1. In S_6, write the permutation

$$(1,3)(2,5,6,4)$$

in function notation; that is, fill in:

$$f(1) = \_\_\_\_\_$$
$$f(2) = \_\_\_\_\_$$
$$f(3) = \_\_\_\_\_$$
$$f(4) = \_\_\_\_\_$$
$$f(5) = \_\_\_\_\_$$
$$f(6) = \_\_\_\_\_$$

2. In S_6, write the permutation

$$(1,3,2)(4,6)(5)$$

in function notation; that is, fill in:

$$f(1) = \_\_\_\_\_$$
$$f(2) = \_\_\_\_\_$$
$$f(3) = \_\_\_\_\_$$
$$f(4) = \_\_\_\_\_$$
$$f(5) = \_\_\_\_\_$$
$$f(6) = \_\_\_\_\_$$

3. In S_6, write the permutation

$$f(1) = 6$$
$$f(2) = 2$$
$$f(3) = 5$$
$$f(4) = 4$$
$$f(5) = 3$$
$$f(6) = 1$$

in cycle notation.

4. In S_4, consider the two permutations

$$f = (1, 3, 2)$$

and

$$g = (3, 4).$$

(We're using the convention that numbers sent to themselves are omitted; for example, f sends 4 to itself.) What is the composition $f \circ g$? Express your answer in cycle notation.

5. For the same f and g as above, what is the composition $g \circ f$? Do f and g commute?

6. In S_5, consider the two permutations

$$f = (1, 5, 2)$$

and

$$g = (3, 4).$$

Calculate both $f \circ g$ and $g \circ f$, in cycle notation. Do f and g commute now?