VBBZW

9/15

1. Permutation is a bijection of set to itself
2. Functional composition of permutations forms a group
3. A set of n elements is the basis for a permutation group of ___ order.

$$a_1 \quad a_2 \quad a_3 \quad \cdots \quad a_n$$

$$\_\_ \quad \_\_ \quad \_\_ \quad \_\_ \cdots \quad \_\_$$

n places available for a_1
$n-1$ " " " a_2
$n-2$ " " " a_3
⋮
2 a_{n-1}
1 a_n
↓
$n!$ total number of bijections (assignments)

avaible.

Given n objects, can choose k subject to permutation and n-k would be "fixed".

$\#$ ways to do this $= \binom{n}{k} = \frac{n!}{k!(n-k)!}$

For convenience, pick integers to represent permuted elements

$\alpha = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \end{bmatrix}$ $\beta = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ ← array notation

$(1\ 3)(2)$

$\alpha \circ \beta = \gamma = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$

α: 2nd, β: 1st

	1	2	3		1	2	3
α:	2	1	3	β:	3	2	1
				α:	3	1	2

$\alpha \circ \beta = \gamma$

array to cycle notation

A "cycle" is a parenthetical expression where it is understood that an element that appears is mapped to the adjacent element to the right. If the element is farthest right, it is mapped to the first element (wrap around).

So... $(a_1\, a_2\, a_3 \cdots a_n)$ means

$$\begin{bmatrix} a_1 & a_2 & a_3 & \cdots & a_n \\ a_2 & a_3 & a_4 & & a_1 \end{bmatrix}$$

$$(a_1\, a_2\, a_3)(a_4\, a_5)$$

Let $\alpha = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 4 & 5 & 1 & 7 & 8 & 6 \end{bmatrix}$

$(1\,2\,3\,4\,5)(6\,7\,8) = (\,x\;x\;x\,)$

* Disjoint cycles commute

transpositions

$\alpha, \beta \qquad \alpha^{-1}, \beta\alpha, \alpha\beta$