1 Matrix

1.1 Permutation

Definition 1. *A permutation*

2 Group

Definition 2. *A group $(G, \cdot)$ is a set G equipped with a binary operation $\cdot$ which follows four axioms, namely* ***closure****,* ***associativity****,* ***identity*** *and* ***invertibility****.*

The four axioms are defined below:

closure For all a, b in G, the result of operation $\cdot$ is still in G. This can be written in the form: $\forall a, b \in G, a \cdot b \in G$.

associativity $\forall a, b, c \in G$, $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.

identity $\exists\ e \in G$ such that, $\forall a \in G$, the equation $e \cdot a = a \cdot e = a$ holds. Such an element is unique and is called the **identity element**.

invertibility For each $a \in G$, $\exists\ b$ in G, commonly denoted a^{-1}, such that $a \cdot b = b \cdot a = e$, where e is the identity element.