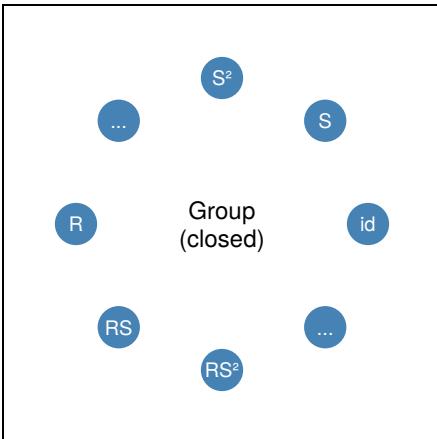
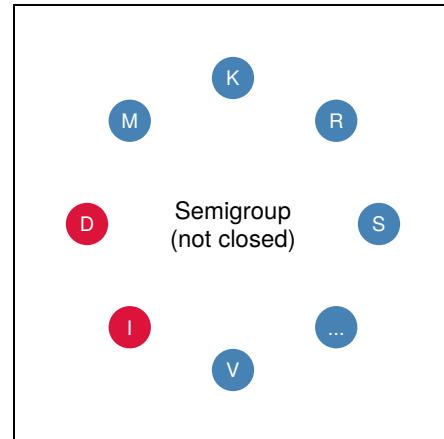


# Genomic Operator Algebra

Dihedral Group D\_n (Invertible)



Semigroup (With Indels)



● Invertible operators (S, R, K, M, V)

● Non-invertible operators (D, I)

## Key Identities:

- $R \circ R = \text{id}$  (reflection is involution)
- $K \circ K = \text{id}$  (complement is involution)
- $S^n = \text{id}$  ( $n$  rotations = identity)
- $R \circ S = S^{-1} \circ R$  (dihedral relation)
- $D \circ I \neq \text{id}$  (indels non-invertible)