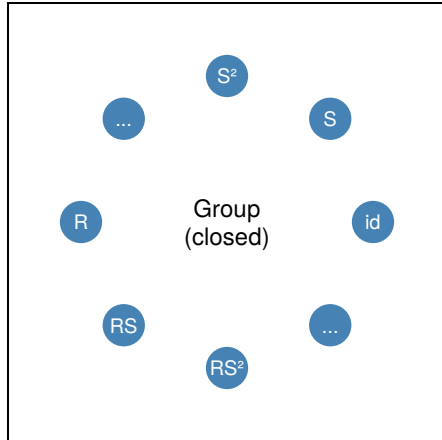
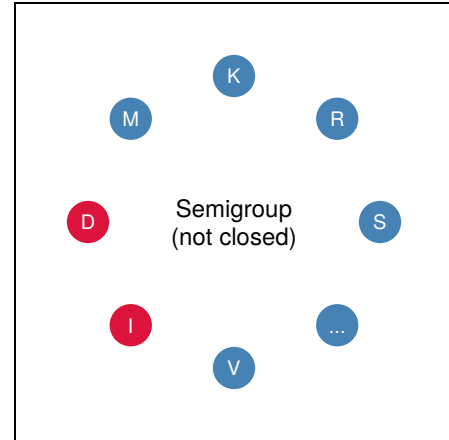


# Genomic Operator Algebra

Dihedral Group  $D_n$  (Invertible)



Semigroup (With Indels)



● Invertible operators ( $S, R, K, M, V$ )    ● Non-invertible operators ( $D, I$ )

Key Identities:

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