

Reminder XIII

- Representation of $SU(3)$: Lie algebra L of dim 8, rank 2, construction of roots and weights, importance of maximum weight (indexed by $(k_1, k_2) \in \mathbb{N} \times \mathbb{N}$).
- Irreducible representation of $SU(3)$ denoted by $D^{(k_1, k_2)}$ or n (or \bar{n}) dimension of the representation when $k_1 \geq k_2$, similarly, when $k_2 > k_1$.
- Tensor product can be decomposed, as for example
$$3 \otimes \bar{3} = 8 \oplus 1, \quad 3 \otimes 3 \otimes 3 = 10 \oplus 8 \oplus 8 \oplus 1.$$
- \uparrow Decomposition used for describing some families of elementary particles.
- Casimir operator: polynomial expressions in terms of elements of L , commuting with all elements of L , equal to constants in each irreducible representation.
- Classification of all simple Lie algebras, represented with Dynkin diagrams: 4 infinite families, 5 exceptional cases.