- The dimension d of a Young tableau (i.e. the dimension of the associated irrep) can be obtained by the following ratio: $d = num/den$.
  - *Numerator:* start writing the number N in the top left box of the Young tableau. Moving to the right, write the number *increased* by a unit at each step. Moving to the bottom, write the number *decreased* by a unit at each step. The numerator is obtained by the product of the entries in each box. E.g.

$$\begin{array}{|c|c|c|}\hline N & N{+}1 & N{+}2 \\ \hline N{-}1 & N & \\ \cline{1-2} N{-}2 & N{-}1 & \\ \cline{1-2} N{-}3 & & \\ \cline{1-1}\end{array} \quad , \qquad num{=}N(N{+}1)(N{+}2)(N{-}1)N(N{-}2)(N{-}1)(N{-}3) \quad .$$

  - *Denominator:* write in each box the number of boxes being to its right plus the number of boxes being below it plus a unit (*the hook length*). The denominator is obtained by the product of the entries in each box. E.g.

$$\begin{array}{|c|c|c|}\hline 6 & 4 & 1 \\ \hline 4 & 2 & \\ \cline{1-2} 3 & 1 & \\ \cline{1-2} 1 & & \\ \cline{1-1}\end{array} \quad , \qquad den{=}6{\times}4{\times}4{\times}2{\times}3 \quad .$$

- Any irrep of $SU(N)$ can be constructed starting from the fundamental irrep. The *direct product* of irreps can be decomposed in a *direct sum* of irreps with the following rules.
  - Write the two tableaux which correspond to the direct product of irreps and label successive rows of the second tableau with indices $a, b, c, \ldots$, e.g.

$$\begin{array}{|c|c|}\hline & \\ \hline & \\ \cline{1-1} & \\ \cline{1-1}\end{array} \quad \otimes \quad \begin{array}{|c|c|c|}\hline a & a & a \\ \hline b & b & \\ \cline{1-2} c & & \\ \cline{1-1}\end{array}$$

  - Attach the boxes from the second to the first tableau, one a time following the order $a, b, c, \ldots$, in all the possible way. The resulting diagrams should be valid Young tableaux with no two (or more) a in the same column (neither b or c or $\ldots$).
  - Two generated tableaux with the same shape but labels *distributed differently* have to be kept. If two tableaux are *identical* only one has to be kept.
  - Counting the labels from the first row from *right to left*, then the second row (from right to left) and so on, at any given box position there should be no more b than a, more c than b and so on (if it is not the case discard the tableau). E.g. the tableau $\begin{array}{|c|c|c|}\hline & a & b \\ \hline & \\ \cline{1-1}\end{array}$ has to be discarded.