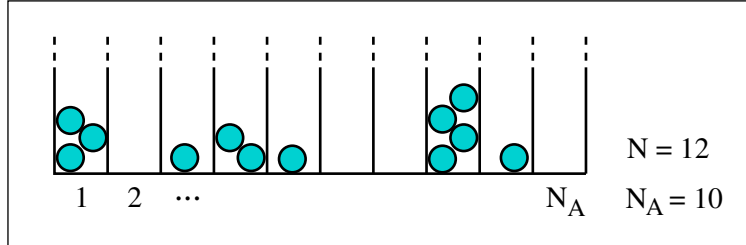


Combinatorics of bosons [pln5]

Consider the first variation of [pln4].
Multiple occupancy is now unrestricted.



Number of distinct microstates with N particles:

$$W(N) = \binom{N_A + N - 1}{N} = \frac{(N_A + N - 1)!}{N!(N_A - 1)!}.$$

Multiplicity expression in standard form (for one species):

$$W(N) = \binom{d + N - 1}{N}, \quad d = A - g(N - 1), \quad A = N_A, \quad g = 0.$$

Capacity of system is unlimited: $W(N) > 0 \forall N \geq 0$.

Introduce N_B effective orbitals with multiple occupancy prohibited.

$$W(N) = \binom{N_B}{N}, \quad N_B = N_A + N - 1.$$

Bosonic microstates for $N_A = 3$ and $N = 0, 1, 2, 3$:

000
100 010 001
200 020 002 110 101 011
300 030 003 120 102 012 210 201 021 111

Equivalent microstates for $N_B = 3 + N - 1$ and $N = 0, 1, 2, 3$:

00
100 010 001
1100 1010 1001 0110 0101 0011
11100 11010 11001 10110 10101 10011 01110 01101 01011 00111