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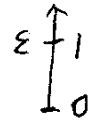
multiplicity $W \propto U$

$U_A = 2$ → "cold"
$U_B = 4$ → "hot" ?

$W_A = \frac{10!}{8!\,2!} = 45$

$W_B = \frac{10!}{6!\,4!} = 210$



$W_{tot(A+B)} = W_A \cdot W_B = 9450$

allow thermal contact between A and B, [A + B] insolated {isolated ?

Case 1: $U_B: 4 \to 3$, $U_A: 2 \to 3$

$W_{tot} = \frac{10!}{7!\,3!} \cdot \frac{10!}{7!\,3!} = 14400$

Case 2: $U_B: 4 \to 5$, $U_A: 2 \to 1$

$W_{tot} = \frac{10!}{9!\,1!} \cdot \frac{10!}{5!\,5!} = 2520$

ex: $U_A = 2$ 10 particles
$U_B = 2$ 4 particles

$W_{tot} = W_A \cdot W_B = \frac{10!}{8!\,2!} \cdot \frac{4!}{2!\,2!} = 270$

energy transfer only between A and B: $U_A = 3$, $U_B = 1$.

then $W_{tot} = \frac{10!}{7!\,3!} \cdot \frac{4!}{3!\,1!} = 480$

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ch 4. math tool

sequence: a set of quantities ordered by integers.
series: the sum of the sequence.

① power series
A. geometric series; B. arithmetic-geometric series
.....

$$f(x) = \sum_{k=0}^{\infty} C_k x^k = C_0 + C_1 x + C_2 x^2 + \cdots\cdots$$

A. geometric series: $S_m = a + ax + ax^2 + \cdots ax^{(m-1)}$

$$= \frac{a(1-x^m)}{1-x} \quad (\text{if } x \neq 1)$$

ex — $S_m = 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots$

$$S_\infty = \lim_{m\to\infty} \frac{a(1-x^m)}{1-x} \quad \text{when } |x|<1$$

$$= \sum_{k=1}^{\infty} a x^{(k-1)} = \frac{a}{1-x} = S_\infty$$

↓ closed form

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B. Arithemetic - geometric

$$t_n = \sum_{k=1}^{n} ak\, x^k$$

note. $x \frac{d S_\infty}{dx} = t_\infty \quad \Rightarrow \quad t_\infty = \frac{ax}{(1-x)^2}$