A Multinomial Extension of an Inequality of Haber

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Abstract:

In this paper, we establish the following: Let $a_1, a_2, \ldots, a_m$ be non negative real numbers, then for all $n \geq 0$, we have

$$\frac{1}{\binom{n+m-1}{m-1}} \sum_{i_1+i_2+\cdots+i_m=n} a_1^{i_1} a_2^{i_2} \cdots a_m^{i_m} \geq \left(\frac{a_1 + a_2 + \cdots + a_m}{m} \right)^n.$$

The case $m = 2$ gives the Haber inequality. We apply the result to find lower bounds for the sum of reciprocals of multinomial coefficients and for symmetric functions.

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