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An Extension on Conway's Wizard Problem

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Abstract of Report Talk: Conway's Wizard Problem can be mathematically summarized the following way. Given a sum s, does there exist a way to partition s into two or more distinct multisets of size n such that it results in the same p, defined as the product of elements in the multiset. If there is, we call s admissible. From this context, we define the following two functions. (1) $f(s)$ = number of n values such that s is admissible. (2) $g(s)$ = number of p values such that s is admissible; the case $g(s) = 1$ is precisely what we need to solve Conway's problem. Studying these functions required analyzing gathered data as well as defining new concepts such as primitive partitions, admissibility, and relevant algebraic methods. We further tackled the question: What would happen if we fixed p instead of s? Fixing the product as $p = m^j$, we were led to study a special polynomial $f(x) = (x - m)(x - 1)^2 g(x)$ with odd prime m and $g(x) \in \mathbb{Z}[x]$. We used the identity, $2j = \sum$[absolute value of coefficients of $f'(x)$], and eventually proved that there exists admissible $p = m^j$ *if and only if* $j \geq 2m + 4$.

[Joint work with Byungchul Cha, Adam Claman, Joshua Harrington, Ziyu Liu, Alexander Miller, Ann Palma, Tony Wong]
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