# N-COLORED GENERALIZED FROBENIUS PARTITIONS: GENERALIZED KOLITSCH IDENTITIES 

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Let $N \geq 1$ be a squarefree integer coprime to 6 . Let $c \phi_{N}(n)$ denote the number of $N$-colored generalized Frobenius partitions of $n$ introduced by Andrews in 1984, and $P(n)$ denote the number of partitions of $n$. We prove that

$$
c \phi_{N}(n)=\sum_{d \mid N} N / d \cdot P\left(\frac{N}{d^{2}} n-\frac{N^{2}-d^{2}}{24 d^{2}}\right)+b(n)
$$

where $C(z):=(q ; q)_{\infty}^{N} \sum_{n=1}^{\infty} b(n) q^{n}$ is a cusp form in $S_{(N-1) / 2}\left(\Gamma_{0}(N), \chi_{N}\right)$. This extends and strengthens earlier results of Kolitsch and Chan-Wang-Yang which treated the cases when $N$ is a prime. We then use properties of modular forms to show that $b(n)$ is small compared to the linear combinations of partition function in our formula. This establishes an asymptotical formula for $c \phi_{N}(n)$ in terms of the partition function. These results are from a joint work with Professor Khoa Dang Nguyen of the University of Calgary.

