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SOME RESTRICTED PARTITION FUNCTIONS: CONGRUENCES MODULO 11

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Ramanujan's congruences for the unrestricted partition function $p(n)$ with 5, 7 and 11 as moduli can be shown to be equivalent to precisely similar congruences for some restricted partition functions of the type

$$ {}_{r}^{t}p(n) , \tag{1} $$

where to determine the value of (1) we count all the unrestricted partitions of n excepting those which contain any number of the forms tn or $tn \pm r$ as a part. The purpose of the present paper is to deal with congruences modulo 11.

In [5] the author has established a number of congruences modulo 3 for (1) with certain selected values of t and r. Functions of the type (1) are not new in number theory literature; for example, in the combinatorial interpretation of the famous Rogers-Ramanujan identities one finds

$$ {}_{1}^{5}p(n) , \qquad {}_{2}^{5}p(n) . $$

2. **The final results.** The restricted partition function (1) with $t = 363$ and $r = 121$ has a somewhat simpler interpretation. It is easily seen that this function counts the unrestricted partitions of n excepting those which contain 121 or any multiple thereof as a part. We use the simpler notation

$$ {}^{121}p(n) = {}_{0}^{121}p(n) = {}_{121}^{363}p(n) , \tag{2} $$

in the theorems to emphasize this interpretation.

The phrase 'for almost all values of n' appearing in Theorem 1 means that the number of integers $n \leqq N$ for which any specified congruence does not hold is $o(N)$. We assume ${}_{r}^{t}p(m)$ to be 1 when $m = 0$, and 0 when $m < 0$.

THEOREM 1. *For almost all values of n the following congruences with respect to the modulus 11 hold.*