

Some remarks on 3-partitions of multisets

D. Andrica¹ and O. Bagdasar²

¹ Babeş-Bolyai University of Cluj-Napoca, Romania

² University of Derby, United Kingdom

¹dandrica@math.ubbcluj.ro; ²o.bagdasar@derby.ac.uk

Abstract: The study of partitions has led to numerous developments in combinatorics and is closely related to integer sequences. An interesting example is the number of solutions at level n to the *signum equation* denoted by $S(n)$, representing the number of partitions of the set $N = \{1, \dots, n\}$ into two subsets with equal sum [7] (see A063865 in OEIS [8]). Formulated as a conjecture by Andrica-Tomescu in 2002 [2], the asymptotic behaviour of $S(n)$ was solved in 2013 [10]. Partitions are also connected to unimodal polynomials [3] and Erdős-Suranyi representations of integers [5],[6]. Recently, we used the theory developed in [1] to investigate recurrence formulae, generating functions and integral formulae for the number of ordered 2-partitions of the multiset M (containing multiple copies of N [9]) having equal sums, and to formulate conjectures regarding its asymptotic behaviour [4]. In this paper we investigate 3-partitions of the multiset M , discovering new integer sequences, and laying the foundation for further investigation concerning k -partitions.

Keywords: complex numbers, geometric patterns, recurrent sequences, sequence of ratios

MSC2010: 05A16, 05A15, 05A18, 11B75.

References

- [1] Andrica, D., *A combinatorial result concerning the product of two or more derivatives*, Bull. Cal. Math. Soc., 92 (2000), 299–304.
- [2] Andrica, D., Tomescu, I., *On an integer sequence related to a product of trigonometric functions, and its combinatorial relevance*, J.Integer Sequences, Article 02.2.4, 5 (2002).
- [3] Andrica, D., Văcăreţu, D., *Representation theorems and almost unimodal sequences*, Studia Univ. Babeş-Bolyai, Mathematica, Volume **LI**, 4 (2006), 23–33.
- [4] Bagdasar, O., Andrica, D., *New results and conjectures on 2-partitions of multisets*, Proceedings of the 7th ICMSAO'17 (2017), 1–5.
- [5] Dressler, R.E., *A stronger Bertrand's postulate with an application to partitions*, Proc. Amer. Math. Soc., 33 (1972), 226–228.
- [6] Entringer, R.C., *Representation of m as $\sum_{k=-n}^n \epsilon_k k$* , Canad. Math. Bull., 11 (1968), 289–293.
- [7] Finch, S. R., *Signum equations and extremal coefficients*, people.fas.harvard.edu/~sfinch/
- [8] The On-Line Encyclopedia of Integer Sequences, <http://oeis.org>, OEIS Foundation Inc. 2011.
- [9] Stanley, R.P., *Weyl groups, the hard Lefschetz theorem and the Sperner property*, SIAM J. Algebraic and Discrete Methods, 1 (1980), 168–184.
- [10] Sullivan, B.D., *On a Conjecture of Andrica and Tomescu*, J. Integer Sequence, 16 (2013), Article 13.3.1.