Kreuzer, Maximilian; Riegler, Erwin; Sahakyan, David A.
Toric complete intersections and weighted projective space. (English) [Zbl 1061.14037]

The seminal work of V. V. Batyrev [J. Algebr. Geom. 3, No. 3, 493–535 (1994; Zbl 0829.14023)] on Calabi-Yau hypersurfaces in toric varieties made toric varieties very popular in string theory, because this work explains as a combinatorial duality the duality for Hodge numbers which is predicted by mirror symmetry. Moreover, V. V. Batyrev and L. A. Borisov [Invent. Math. 126, No. 1, 183–203 (1996; Zbl 0872.14035)] have shown the corresponding duality for string-theoretic Hodge numbers of pairs of Calabi-Yau complete intersections in Gorenstein toric Fano varieties. These pairs are defined by a dual pair of so-called nef-partitions.

The aim of the paper under review is to provide as many examples as possible of pairs of Hodge numbers \((h_1,1,h_2,1)\) of combinatorial mirror pairs of Calabi-Yau varieties. They start their calculations with a reflexive polytope, typically with at most 20 vertices, and tests all possible partitions of the set of vertices of the dual polytope for being a nef-partition. Software which assists these calculations can be found on the website of the first author. The Hodge numbers are calculated with the help of a formula of Batyrev and Borisov. The authors compare their list with similar lists which were obtained previously without using toric geometry. A few examples could not be reproduced, which is probably due to the fact that they studied complete intersections of codimension one and two only. Not surprisingly, they find that there are pairs of Hodge numbers of Calabi-Yau complete intersections of codimension two which are not present in the list of all 30108 possible such pairs for Calabi-Yau hypersurfaces in toric varieties.

Reviewer: Bernd Kreußler (Limerick)

MSC:
14J32 Calabi-Yau manifolds (algebro-geometric aspects)
14M25 Toric varieties, Newton polyhedra, Okounkov bodies
81T30 String and superstring theories; other extended objects (e.g., branes) in quantum field theory

Keywords:
Calabi-Yau manifolds; mirror symmetry; toric varieties; string and superstring theories; complete intersections; Hodge numbers

Software:
PALP

Full Text: DOI arXiv

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