Torsion groups and the Bienvenu–Geroldinger conjecture

Weihao Yan

Abstract. Let M be a monoid (written multiplicatively). Equipped with the operation of setwise multiplication induced by M on its power set, the collection of all finite subsets of M containing the identity element forms a monoid itself, denoted by $\mathcal{P}_{\text{fin},1}(M)$ and called the reduced finitary power monoid of M. This naturally leads to the question of whether, for all H and K in a given class of monoids, $\mathcal{P}_{\text{fin},1}(H)$ and $\mathcal{P}_{\text{fin},1}(K)$ are isomorphic if and only if H and K are.

The problem originates from a conjecture of Bienvenu and Geroldinger [1], which was quickly settled in [4]. In this talk, I will discuss how the problem has a positive solution in the case where H and K are both torsion groups.

About the speaker. Weihao Yan is a first-year PhD student in the School of Mathematical Sciences at Hebei Normal University (HebNU), China. He is enrolled in the university's combined Master's–PhD program. During the Master's phase of his studies, he conducted research on power semigroups under the supervision of Salvatore Tringali (HebNU). He has published two papers on power semigroups, in the Proceedings of the American Mathematical Society and the Journal of Combinatorial Theory, Series A, with a third forthcoming in the Bulletin of the London Mathematical Society (pending final acceptance). Since June 2025, he has been working on geometric constructions of divisible design graphs and their applications to signed graphs under the supervision of Bart De Bruyn (Ghent University, Belgium) and Sergey Goryainov (HebNU).

References

[1] P.-Y. Bienvenu and A. Geroldinger, *On algebraic properties of power monoids of numerical monoids*, Israel J. Math. **265** (2025), 867–900.

[2] S. Tringali and W. Yan, *Torsion groups and the Bienvenu–Geroldinger conjecture*, Bull. London Math. Soc., hopefully to appear (https://arxiv.org/abs/2601.19592).

[3] S. Tringali and W. Yan, *On power monoids and their automorphisms*, J. Combin. Theory Ser. A **209** (2025), 105961, 16 pp.

[4] S. Tringali and W. Yan, *A conjecture of Bienvenu and Geroldinger on power monoids*, Proc. Amer. Math. Soc. **153** (2025), No. 3, 913–919.

School of Mathematical Sciences, Hebei Normal University | Shijiazhuang City, Hebei Province, 050024 China

E-mail: weihao.yan.hebnu@outlook.com