On Enumeration of Semigroup Ideals

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Computing the Frobenius number for numerical semigroups with more than three generators is a famous unsolved problem in number theory and computational complexity. Given a numerical semigroup, its Frobenius number and the generating function for the number of ideals of each size have many known applications in dynamic systems and algebraic geometry. Existing methods in the literature provide the ideal generating function for the two-generator semigroup. We provide an enumeration and the generating function of the number of ideals of numerical semigroups with three generators a, b, c when b + c is a multiple of a. As an application, we also provide a method to compute the Frobenius number for such numerical semigroups using the generating function. The Frobenius number and ideal generating function for the numerical semigroup with generators 3, n + 2, 2n +1 has been explicitly computed in our paper.

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