Towards Common Algorithm for Computation of Polygonal Numbers

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Polygonal numbers are important for Number Theory and in modern recreational and educational mathematics . A Polygonal Number is a number represented as dots arranged in the shape of any regular polygon starting from a triangle. Regular Polygonal Numbers (RP Numbers) are numbers which belong to two different polygonal sequences at the same time. The core question of the project is development of the mathematical algorithm for identification of polygonal numbers that are common to any pair of polygonal sequences. For Regular Polygonal Numbers, the corresponding Diophantine equations were reduced to generalized Pell equations. Then, solutions of the associated Pell equations enabled us to resolve the problem of finding Polygonal Numbers common to any pair of polygonal sequences. As a result, we derived a novel recurrent relation for discovery of RP Numbers for any two polygonal sequences. It was shown that the derived formula is valid and does not contradict with previous results. Developed methods made computation of new sequences possible. They also could be implemented in education, crystallography, computer simulations or mathematical cryptography for data protection.

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