Cylindric Young Tableaux and Their Properties

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Cylindric Young tableaux are combinatorial objects that are a natural extension of Young tableaux. Young tableaux -- grids of boxes with numbers that satisfy certain rules -- are useful throughout mathematics, most notably in representation theory. Cylindric tableaux are useful in their own right, and have been used to explore the Grassmannian, an object in algebraic geometry. Despite this, relatively little is known about cylindric tableaux. This project was an investigation of the properties of these objects. As part of this project, I extended the Robinson-Schensted-Knuth (RSK) correspondence, a well-known and very useful bijection concerning regular Young tableaux, to cylindric tableaux. In particular, the cylindric RSK correspondence that I found is a bijection between pairs of cylindric tableaux, and is a nontrivial extension of a similar bijection between pairs of skew tableaux. I used this correspondence to reach further results. Most notably, I showed that the correspondence is symmetric: if an input (T,U) produces an output (P,Q), then the input (U,T) produces the output (Q,P). I then established an interpretation of cylindric tableaux in terms of a game involving marble-passing and suggested a potential application of this interpretation to communication between a ring of computers. Finally, I demonstrated a generic method to use results concerning cylindric tableaux in order to prove analogous results about skew tableaux.

Awards Won:
American Mathematical Society: First Award of $1,000