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**Pallavi Mishra\*** (mshrpal@gmail.com), Department of Mathematics, Indian Institute of Technology, Kharagpur, Kharagpur, 721302, India, and **Dharmendra Kumar Gupta**. *A new algorithm for finding valid permutations for solving Sudoku puzzles.*

A Sudoku puzzle of rank  $n$  involves a grid of size  $n^2 \times n^2$  partitioned into  $n \times n$  distinct blocks for some positive integer  $n$  in which the task is to fill each cell of the grid so that each row, each column and each block contain the integers 1 through  $n^2$  exactly once. Its solution is known as a Sudoku square of rank  $n$ . Permutations are called S-permutations if they are derived from  $n^2 \times n^2$  S-permutation matrices. A Sudoku square of rank  $n$  has one to one correspondence with a set of mutually disjoint S-permutations of cardinality  $n^2$ . In this paper, a new integer programming formulation is given for a Sudoku puzzle. Then, a new algorithm is proposed to generate the valid permutations for each block so as to solve the puzzles. Firstly, all the S-permutations are generated for the given puzzle. Then, the algorithm generates valid permutations for each block which is verified using the relation between Sudoku squares and a set of disjoint S-permutations.

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