Discrete Mathematics Seminar

Illinois State University

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Ryser's Theorem for ρ-latin Rectangles

Let L be an $n \times n$ array whose top left $r \times s$ subarray is filled with k different symbols, each occurring at most once in each row and at most once in each column. We find necessary and sufficient conditions that ensure the remaining cells of L can be filled such that each symbol occurs at most once in each row and at most once in each column, and each symbol occurs a prescribed number of times in L. The case where the prescribed number of times each symbol occurs is n was solved by Ryser (Proc. Amer. Math. Soc. 2 (1951), 550–552), and the case $s = n$ was settled by Goldwasser et al. (J. Combin. Theory Ser. A 130 (2015), 26–41). Our technique leads to a very short proof of the latter.