Magic Rectangles with Empty Cells

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A magic rectangle of order $m \times n$ with precisely r filled cells in each row and precisely s filled cells in each column, denoted $MR(m, n; r, s)$, is an arrangement of the numbers from 0 to $mr - 1$ in an $m \times n$ rectangle such that each number occurs exactly once in the rectangle, the row sums are all the same and the column sums are also the same. In this talk we show necessary and sufficient conditions for the existence of $MR(m, n; r, 2)$, $MR(m, km; ks, s)$, and $MR(am, bm; bs, as)$.

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