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Promotion of Kreweras words

Kreweras words are words consisting of n A's, n B's, and n C's in which every prefix has at least as many A's as B's and at least as many A's as C's. Equivalently, a Kreweras word is a linear extension of the poset V×[n]. Kreweras words were introduced in 1965 by Kreweras, who gave a remarkable product formula for their enumeration. Subsequently they became a fundamental example in the theory of lattice walks in the quarter plane. We study Schützenberger's promotion operator on the set of Kreweras words. In particular, we show that 3n applications of promotion on a Kreweras word merely swaps the B's and C's. Doing so, we provide the first answer to a question of Stanley from 2009, asking for posets with "good" behavior under promotion, other than the four families of shapes classified by Haiman in 1992. Our proof uses webs (in the sense of Kuperberg) and we obtain some interesting enumerative corollaries about webs. This is joint work with Martin Rubey.