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Sign of permutation

Permutations of 4 elementsOdd permutations have a green or orange background. The numbers in the column on the right are the inversion numbers (sequence A034968 in OEIS), which have the same parity as the permutation. In mathematics, when X is a limited set of at least two elements, the permutations of X (that is, the bijektive functions from X to X) fall into two classes of the same size: the smooth permutations and odd permutations. If a total order of X is fixed, the parity (oddness or evenness) of a permutation σ {\displaystyle \sigma } of X can be defined as the parity of the number of inversions for σ, that is, pairs of elements x, y of X so that x < y and σ(x) > σ(y). The character, signature, or signum of a permutation σ is marked sgn(σ) and defined as +1 if σ is smooth and −1 if σ is odd. The signature defines the alternating character of the symmetrical group Sn. Another notation for signs of permutation is given by the more general Levi-Civita symbol (εσ), which is defined for all maps from X to X and has a value zero for non-bijektive maps. Signs of permutation can be expressly expressed as sgn(σ) = (−1)N(σ) where N(σ) is the number of inversions in the σ. Alternatively, the sign of a permutation σ can be defined from the decomposition of the product by transpositions such as sgn(σ) = (−1)m where m is the number of transpositions in the decomposition. Although such degradation is not unique, the parity of the number of transpositions in all degradations is the same, which means that signs of permutation are well defined. [1] Example Think of the permutation file σ set {1, 2, 3, 4, 5} making the original scheme 12345 to 34521. It can be achieved by three transpositions: first switch the numbers 2 and 4, then switch 1 and 3, and finally switch 1 and 5. This shows that the given permutation action σ is strange. After the method of cycle notation article, this can be written, composing from left to right, as σ = (1 2 3 4 5 3 4 5 2 1) = (1 3 5) (2 4) = (1 3) (1 5) (2 4) . {\displaystyle \sigma ={\begin{pmatrix}1&2&3&4&5\\3&4&2&1\end{pmatrix}}={\begin{pmatrix}1&3&5\end{pmatrix}} {{begin{pmatrix}2&4\end{pmatrix}}={{{begin{pmatrix}1&3\end{pmatrix}} {\begin{pmatrix}}.</a0></a0></a0>