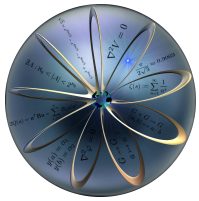

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(p, q) shuffle

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Definition. *Let p and q be positive natural numbers. Further, let $S(k)$ be the set of permutations of the numbers $\{1, \ldots, k\}$. A permutation $\tau \in S(p+q)$ is a* (p, q) shuffle *if*

$$\begin{aligned} \tau(1) < & \quad \cdots \quad < \tau(p), \\ \tau(p+1) < & \quad \cdots \quad < \tau(p+q). \end{aligned}$$

The set of all (p, q) shuffles is denoted by $S(p, q)$.

It is clear that $S(p, q) \subset S(p+q)$. Since a (p, q) shuffle is completely determined by how the p first elements are mapped, the cardinality of $S(p, q)$ is $\binom{p+q}{p}$. The wedge product of a p-form and a q-form can be defined as a sum over (p, q) shuffles.