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The Free Product of Matroids

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We introduce a noncommutative binary operation on matroids, called the free product, and discuss some of its properties. In particular, the free product is characterized by a certain universal property, is associative, and respects matroid duality. We characterize matroids that are irreducible with respect to free product and show that, up to isomorphism, every matroid factors uniquely as a free product of such matroids. We use these results to prove an inequality involving the number of nonisomorphic matroids on n elements which was conjectured by Welsh, and to prove the freeness of the algebra of matroids whose product is dual to the restriction-contraction coproduct.

This is joint work with Henry Crapo.