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# GL(n, q)-analogues of factorization problems in the symmetric group

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## Abstract

We consider  $GL_n(\mathbb{F}_q)$  - analogues of certain factorization problems in the symmetric group  $S_n$ : rather than counting factorizations of the long cycle  $(1,2,\dots,n)$  given the number of cycles of each factor, we count factorizations of a regular elliptic element given the fixed space dimension of each factor. We show that, as in  $S_n$ , the generating function counting these factorizations has attractive coefficients after an appropriate change of basis. Our work generalizes several recent results on factorizations in  $GL_n(\mathbb{F}_q)$  and also uses a character-based approach. We end with an asymptotic application and some questions.

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