

## Abstract

Upper and lower bounds on the largest number of weights in a cyclic code of given length, dimension and alphabet are given. An application to irreducible cyclic codes is considered. Sharper upper bounds are given for the special cyclic codes (called here strongly cyclic), {whose nonzero codewords have period equal to the length of the code}. Asymptotics are derived on the function  $\gamma(k,q)$ , {that is defined as} the largest number of nonzero weights a cyclic code of dimension  $k$  over  $\mathbb{F}_q$  can have, and an algorithm to compute it is sketched. The nonzero weights in some infinite families of Reed-Muller codes, either binary or  $q$ -ary, as well as in the  $q$ -ary Hamming code are determined, two difficult results of independent interest.