Abstract

The finite simple groups are important because in a certain sense they are the "basic building blocks" of all finite groups, somewhat similar to the way prime numbers are the basic building blocks of the integers. The classification of finite simple groups was declared accomplished in 1955 through 1983 by Daniel Gorenstein [14]. After announcement on the classification of finite simple groups investigation of known simple groups becomes one of the most important problem in finite group theory. In particular, subgroups structure of known finite simple group is of interest. The most important subgroups are maximal subgroups, maximal soluble subgroups, maximal nilpotent subgroups, and maximal abelian subgroups. In 2000 Vdovin, E. P. [22] devoted his work to abelian and nilpotent subgroups of maximal order of finite simple groups. In 1986 , Mann, A. [19] , found all solvable subgroups of maximal order in symmetric and alternating groups , and between 2006 to 2012 , Breuer,T., [3] , determined the orders of solvable subgroups of maximal orders in sporadic simple groups and their automorphism groups, using the information in the ATLAS of Finite Groups [23] and the GAP system , he also determined the structures and the conjugacy classes of these solvable subgroups in the big group.

The aim of this work is using the information in the ATLAS of Finite Groups [23] and the GAP computational system , [24], to determine the solvable subgroups of maximal orders in the finite non-abelian simple group $L_2(p)=PSL_2(p)$, the projective special linear groups of dimension 2x2 on GF(p) , and in the finite non-abelian simple groups of orders less than 10^6 . The (p,q,r)-generators , the structures , the character tables and the permutation representations of these subgroups have been found. Also in this work we determine the permutation representations of solvable subgroups of large orders in 20 out of the 26 sporadic simple groups , which have been determined by Breuer,T. , [3] .