

# On the number of primitive designs on projective line and their antiflag-transitivity

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(Talk)

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(joint work with Joško Mandić and Snježana Braić)

It is known that "projective groups"  $G$ ,  $PSL(2, q) \leq G \leq P\Gamma L(2, q)$ , act primitively on the projective line  $X = \{\infty\} \cup GF(q)$ . Taking  $X$  as the set of points, we have considered, up to isomorphism and complementation, the construction of primitive block designs on projective line, i.e. designs with an automorphism group acting primitively on both point and block set. The number of such designs we denote by  $n_{pd}(q)$ . We make use of the study of maximal subgroups of  $PSL(2, q)$  (commonly classified into Aschbacher's classes  $C_2, C_3, C_5, C_6$  and  $C_9$ ), taken as block stabilizers of our designs. In addition to previously completely solving the problem in case when a block stabilizer is not in the fifth Aschbacher's class and, in particular, to describing and counting all primitive designs with automorphism group  $PSL(2, p)$ ,  $p$  prime, recently we have determined  $n_{pd}(q)$  for  $q = p^{2^\alpha 3^\beta}$ ,  $\alpha, \beta$  nonnegative integers. Further, all designs  $D$  with  $PSL(2, q)$  as the socle of  $AutD$ , have been analysed regarding flag and antiflag-transitivity. For  $q \geq 13$ ,  $q \neq 23$  the proved properties can roughly be put as follows.

1. There exist exactly one infinite series of primitive, flag-transitive designs with the base block stabilizer in the second Aschbacher's class and  $q \equiv 1 \pmod{4}$ .
2. There exist exactly one infinite series of primitive, both flag and antiflag-transitive designs with the base block stabilizer in the third Aschbacher's class and  $q \equiv 1 \pmod{4}$ .
3. There exist exactly two infinite series of primitive, both flag and antiflag-transitive designs with the base block stabilizer in the fifth Aschbacher's class.
4. There exist exactly 9 primitive, antiflag-transitive designs with the base block stabilizer in the sixth Aschbacher's class.
5. There exist exactly 8 primitive, antiflag-transitive designs with the base block stabilizer in the ninth Aschbacher's class.

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