Symmetries of finite projective planes

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Aut(Π) := set (group) of all automorphisms of Π

For $\Pi = PG(2, q)$, $\operatorname{Aut}(\Pi) \supseteq PGL(3, q)$ where PGL(3, q) = GL(3, q)/Z(GL(3, q)), $Z(GL(3, q)) = \{\lambda I_3 | \lambda \in \mathbb{F}_q^*\}$

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The collineation group preserving C is $P\Gamma L(2, q)$ and hence contains PSL(2, q).

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Open problem Classification of ovals in PG(2, q) for q even.

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Theorem If G is a (non-abelian) simple collineation group preserving Ω then $G \cong PSL(2, q)$ with $5 \le q \le n$.

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Remark The above results fail when Π has even order: In the dual Lüneburg plane of order 2^{2h} , $h \ge 3$ odd, $Sz(2^h)$ preserves an oval.

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Remark: Case (ii) occurs in PG(2, 29) with $G \cong PSL(2, 5)$ (and also in PG(2, 5) with $G \cong PSL(2, 3)$).

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Gábor Korchmáros Symmetries of finite projective planes

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Gábor Korchmáros Symmetries of finite projective planes

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Theorem If $G \leq \operatorname{Alt}_{\Omega}$ then either

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- **Theorem** If $G \leq \operatorname{Alt}_{\Omega}$ then either
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- (ii) G fixes a point-line pair $\{P, \ell\}$, where P is an internal point whereas ℓ is an external line to Ω and all involutions in G are homologies.

- $\Pi:= \text{projective plane of order } n \text{ with } n \equiv 1 \pmod{4}$
- Ω :=strongly irreducible oval in Π
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Classification of strongly irreducible ovals II

Gábor Korchmáros Symmetries of finite projective planes

Classification of strongly irreducible ovals II

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Theorem The subgroup H of G generated by all (involutory) elations is either

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Open problem: Does the case $H \cong PSU(3, q)$ actually occur (in some non-classical plane)?.

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