

ON CHARACTERIZATIONS OF LINEAR GROUPS III

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To Professor RICHARD BRAUER on the occasion of his sixtieth birthday

In his address at the International Congress of Mathematicians at Amsterdam [1] Professor R. Brauer proposed a problem of characterizing various groups of even order by the properties of the involutions contained in these groups and he gave characterizations of the general projective linear groups of low dimensions along these lines. The detail of the one-dimensional case has been published in [5], but the two-dimensional case has not appeared yet in detail. His work was followed by Suzuki [7], Feit [6] and Walter [11]. The present paper is a continuation of [7] and discusses a characterization of the two-dimensional projective unitary group over a finite field of characteristic 2. The precise conditions which characterize the group in question will be stated in the first section. The method employed here is similar to the one used in [7]. An application of group characters provides a formula for the order. However a difficulty comes in when one attempts to identify the group. In order to overcome this difficulty we will use a method primarily designed to study a class of doubly transitive permutation groups (cf. [9]). We need also a group theoretical characterization of a class of doubly transitive groups called (ZT)-groups. This is a generalization of a result in [8], and may be of independent interest.

1. Preliminaries. Let F denote the finite field of q elements. In this paper we consider the case when the characteristic of F is 2. We have

$$q = 2^n$$

for some integer n . If E is a quadratic extension of F , the mapping

$$a \rightarrow a^q \quad (a \in E)$$

is an automorphism of E , which generates the Galois group of E/F . Let V

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