tors in any group in which more than half the operators are of order 2.

A $(2^\alpha, 2^\beta)$ isomorphism between G_1 and the direct product of the dihedral rotation group of order $2^{\beta+1}$ into an operator of order 2 can be established in such a manner as to obtain a group in which the number of operators of order 2 is either $3 + 2^\alpha + 2^{\beta+1} + 2^{\alpha+\beta}$, or $3 + 2^{\alpha+1} + 2^{\beta+1} + 2^{\alpha+\beta-1}, \beta > 0$. In fact, it is possible to form other such isomorphisms, but these two seem especially useful in this connection. Moreover, by establishing a $(2^\alpha, 2^\beta)$ isomorphism between G_1 and a group of order $2^{\beta+2}$ which is constructed in the same way as G_1, we arrive at groups which contain any of the following three numbers of operators of order 2: $3 + 2^\alpha + 2^\beta + 2^{\alpha+\beta}$, $3 + 2^{\alpha+1} + 2^{\beta+1} + 2^{\alpha+\beta-2}$, $3 + 2^{\alpha+1} + 2^\beta + 2^{\alpha+\beta-1}$.

From the above results it follows directly that there are groups of order 2^m which contain any prescribed number of operators of order 2 which satisfies the conditions that it is $\equiv 3 \bmod. 4$ and less than 124. By other considerations this limit can readily be extended, but my methods seem too special to be given here. It would be interesting to find a number $\equiv 3 \bmod. 4$ which could not equal the number of operators of order 2 in any group of order 2^m, or to prove the non-existence of such a number.

ON THE ARITHMETIC NATURE OF THE COEFFICIENTS IN GROUPS OF FINITE MONOMIAL LINEAR SUBSTITUTIONS.

BY DR. W. A. MANNING.

(Read before the American Mathematical Society, September 7, 1905.)

PROFESSOR MASCHKE * has proved (with a certain restriction) that the coefficients of finite linear substitution groups can, by proper transformations, be made rational functions of roots of unity. Professor Burnside † has also recently written on this subject. In this note it is proved that linear groups all of

* Maschke, *Math. Annalen* v. 50 (1898), p. 492.
† Burnside, *Proc. London Math. Society*, ser. 2, v. 3 (1905), p. 239.