§ 14. *Isomorphisms between Various Linear Groups.*

The conception of "the compounds of a given linear homogeneous group," introduced in recent papers by the writer,[*] has proven to be a powerful means of setting up isomorphisms. The group of quaternary linear homogeneous substitutions of determinant unity in the $GF[p^n]$ is isomorphic with a subgroup of the senary linear group leaving invariant $\xi_1\eta_1 + \xi_2\eta_2 + \xi_3\eta_3$, and hence, according as $p^n = 2^n$, $4l + 1$, or $4l - 1$, to the senary first hypoabelian group, the senary orthogonal group, or the group of § 10.

The simple group of order $\frac{1}{2}(p^{4n} - 1)(p^{2n} - 1)p^{4n}$ derived from the quaternary abelian group and that from the quinary orthogonal group, each in the $GF[p^n], p > 2$, are simply isomorphic.

The following four simple groups of order 25920 are simply isomorphic : [†]

1°. The abelian group on four indices modulo 3.

2°. The second hypoabelian group on six indices modulo 2.

3°. The orthogonal group on five indices modulo 3.

4°. The hyperabelian group on four indices in the $GF[2^2]$.

In the paper cited an abstract group, a substitution-group on 36 letters, and one on 27 letters are given, each isomorphic to the above groups of order 25920.

SHORTER NOTICES.

Leçons sur la détermination des orbites, professées à la Faculté des Sciences de Paris. Par F. Tisserand ; redigées et developpées pour les calculs numériques, par J. Perchot ; avec une Préface de H. Poincaré. Paris, Gauthier-Villars et Fils. 1899. 4to, xiv + 124 pp.

Tisserand is chiefly known outside of France for his Traité de mécanique céleste—a monument of labor undertaken and carried out amid the pressure of many duties. He had in fact an enormous capacity for work and in his numerous memoirs left few parts of theoretical astronomy untouched. The volume of 120 quarto pages before us, edited by M. Perchot, shows him working for the practical

---

[*] "Concerning a linear homogeneous group in $C_{m,q}$ variables isomorphic to the general linear homogeneous group in m variables," BULLETIN, Dec., 1898. "The structure of certain linear groups with quadratic invariants," *Proc. Lond. Math. Soc.,* vol. 30, pp. 70–98. "A new definition of the general abelian linear group," *Transactions* (read Feb. 1899).

[†] *Proc. Lond. Math. Soc.,* vol. 31. Abstract in BULLETIN, May, 1899, p. 384.