

30. On a Problem in Abelian Groups and the Construction of Fractionally Replicated Designs, R. C. BOSE, University of North Carolina AND R. C. BURTON, National Bureau of Standards.

Consider an Abelian group of order s^n , generated by n letters A_1, A_2, \dots, A_n , with the relations $A_1^s = A_2^s = \dots = A_n^s = I$, where I is the identity and s is a prime. If $G = A_1^{x_1} A_2^{x_2} \dots A_n^{x_n}$ is any element of the group, then the number of non-zero exponents x_i may be called the length of G . Given an integer $r < n$, the problem is to find a subgroup of order s^r , generated by r independent elements $G_i = A_1^{x_{i1}} A_2^{x_{i2}} \dots A_n^{x_{in}}$ such that the minimum length of the elements in the subgroup (except the length of the unit element) is greater than or equal to k . Consider the finite projective space $PG(r-1, s)$. To any point $x = (x_1, x_2, \dots, x_r)$ of this space, assign a non-negative integer m , which may be considered the measure of x , in such a way that the total measure for the space is n . To a point of measure m associate m different letters chosen out of A_1, A_2, \dots, A_n , each of these letters being assigned to one and only one point. Let $G_i = A_1^{x_{i1}} A_2^{x_{i2}} \dots A_n^{x_{in}}$ where x_{ij} is the i th coordinate of the point to which A_j is associated. It is proved that the length of the element $G_1^{m_1} G_2^{m_2} \dots G_r^{m_r}$ is the measure of the set of points not lying on the linear space $\lambda_1 x_1 + \lambda_2 x_2 + \dots + \lambda_r x_r = 0$. For example let $n = 10, r = 4, s = 3$. We can find exactly 10 points on an unruled quadric in $PG(3, 3)$. If we take the corresponding subgroup as the fundamental identity for generating a $\frac{1}{3^4}$ fraction in a factorial design with 10 factors, then all the aliases of a main effect will have five or more factors, and all the aliases of two factor interaction will have four or more factors. (Received January 21, 1957.)

NEWS AND NOTICES

Readers are invited to submit to the Secretary of the Institute news items of interest

Personal Items

Professor Felix Bernstein, the founder and director Emeritus of the Institute of Mathematical Statistics, University of Goettingen, Germany, died December 3, 1956 in Zuerich, Switzerland. Professor Bernstein was also a member of the International Statistics Institute, a fellow of the Royal Statistics Society, a fellow of the AAAS, and was professor of biometrics, New York University from 1936-1945. In 1950 he was American Fulbright professor at the Institute of Statistics, Rome, Italy.

Dr. Robert M. Blumenthal has been appointed to an instructorship at the University of Washington.

Glenn L. Burrows has been appointed Staff Statistician at the Knolls Atomic Power Laboratory, Schenectady, New York.

Victor Chew resigned on February 1, 1957 from the position of Assistant Professor of Statistics, University of Florida, to become Asst. Statistician at Institute of Statistics at Raleigh, North Carolina, and do work towards a Ph.D. in experimental statistics.

Professor Kai Lai Chung, on leave from Syracuse University, is a Visiting Professor at the University of Chicago during 1956-57.

George E. Ferris is now with the Statistics Department of General Foods' Corporation in Hoboken, New Jersey.