

studies have considered 100, 500, or once in England (to refute Lombroso's theory) 1500 cases. But from the correct statistical standpoint, far more cases are needed to establish a law. Over a period of years, an attempt has been made to use statistical methods in the study of penological problems in the Massachusetts Reformatory for Women, but the results will take on real significance and be conclusive only when similar investigations are made all over the United States. (Received August 1, 1942.)

289. D. S. Villars: *Significance tests for multivariate distributions.*

The observed mean of sets of m variates, each normally and independently distributed, is distributed around the population mean according to a χ^2 distribution with m degrees of freedom. The sum of squares of deviations of n observed points from the observed mean is distributed as χ^2 with $m(n-1)$ degrees of freedom (not with $n-1$). A much more powerful test for correlation than that by the correlation coefficient is described, which for bivariate distributions, involves comparisons between $n-1$ and $n-1$ degrees of freedom. This can be extended to $m-1$ tests with m variates. Distribution of distance between two means and distribution of fiducial radius is worked out in detail for two variates. (Received July 30, 1942.)

TOPOLOGY

290. D. W. Hall: *On a partial solution of a problem of J. R. Kline.*

As a partial solution of a problem of J. R. Kline, the following theorem is established. In order that a compact locally connected continuum M be homeomorphic with a sphere it is necessary and sufficient that it satisfy the following conditions: (a) no two points separate M , (b) for every simple closed curve J in M the set $M-J$ has at least two and at most a finite number of components. (Received June 22, 1942.)

291. W. M. Kincaid: *On non-cut sets of locally connected continua.*

This paper is concerned with certain generalizations of the well known result that corresponding to any non-cut point p of a space S which is a locally connected continuum, an arbitrarily small region having a connected complement and containing p can be found. It is shown that any closed non-cut set P of such a space S can be imbedded in the sum R of a finite number of regions (lying in a preassigned ϵ -neighborhood of P) so chosen that $S-R$ is a locally connected continuum. If, in addition, there exists a family of sets \mathcal{F} no element of which separates $S-P$, then another set R' , contained in R and having the same properties, can be found such that no element of \mathcal{F} contained in $S-R$ separates $S-R'$. If the elements of \mathcal{F} are single points, the sets R and R' can be replaced by a single set having the properties of both. Further results are obtained in the special case where S is not separated by any m points. (Received July 24, 1942.)

292. R. G. Lubben: *Mappings of spaces H Fréchet on completely regular spaces.*

Let T be a space H Fréchet, K be the aggregate of all completely regular Hausdorff decompositions (Alexandroff and Hopf, *Topologie*, p. 70; the space of this decomposition is to be a completely regular Hausdorff space) of T into mutually exclusive point sets, and \sum be the sum of the elements of K . If $T \supset M$ and for $G = \bar{G} \subset T - M$ there exists a function which is continuous over T , takes on values from zero to unity, and