ABSTRACTS OF PAPERS

(Abstracts of papers presented at the New York meeting of the Institute on April 8–9, 1949)

1. Adjustment of an Inverse Matrix Corresponding to a Change in One Element of a Given Matrix.

JACK SHERMAN and WINIFRED J. MORRISON, The Texas Company Research Laboratories, Beacon, New York.

If one element, a_{RS}, in a square matrix A is changed by an amount Δa_{RS}, all the elements b_{ij} in the inverse matrix B are generally changed. A simple equation has been derived by means of which the elements b_{ij} in the resulting inverse matrix B' can be computed directly in terms of Δa_{RS} and the elements of B. The equation is

$$b'_{ij} = b_{ij} - \frac{b_{Sj} b_{iR} \Delta a_{RS}}{1 + b_{SR} \Delta a_{RS}}$$

It follows that any given square matrix can be transformed into a singular matrix by increasing any one element in the transposed inverse matrix.

2. The Distribution of the Number of Exceedances.

E. J. GUMBEL, New York and H. VON SCHELLING, Naval Research Laboratory, New London, Conn.

The probability for the mth observation in a sample of size n taken from a population with an unknown distribution of a continuous variate to be exceeded x times in N future trials is studied. The averages, moments, and the cumulative probability of the number of exceedances are calculated with the help of the hypergeometric series. The tolerance limits constructed by Wilks are special cases of the cumulative probability. The mean number of exceedances is the same as in Bernoulli's distribution. In some cases there are two modes, namely $m - 1$ and $m - 2$. If $n = N$, the most probable number of exceedances over the mth largest value is either m, or $m - 1$, and the median number of exceedances is equal to $m - 1$. In 50% of all cases, the largest (smallest) of n past observations will not (always) be exceeded in n future observations. If n and N are both large and equal, the distribution of the number of exceedances over the median is normal whereas the distribution of the extremes, similar to Poisson's distribution, has a mean m, and a variance $2m$. The variance of the number of exceedances is largest for the median, and smallest for the extremes of the previous sample. These distribution-free methods may be applied to meteorological phenomena, such as floods, droughts, extreme temperatures (the killing frost), largest precipitations, etc., and permit the forecasting of the number of cases surpassing a given severity.

3. Note on the Power Function of a Quality Control Chart.

LEO A. AROIAN, Hunter College, New York.

The power function of a quality control chart is given for a sequence of N sample points in terms of α and γ, the probability of a Type I error and the power function respectively for a single sample point. Two different models are considered and the generalization to two quality control charts is indicated.

4. Tests Between Two Means or Regression Coefficients When Observations are of Unequal Precision.

UTTAM CHAND, University of North Carolina, Chapel Hill.

Relative merits of different tests available for testing two means or two regression coefficients in relation to asymmetric and symmetric aspects of Student's hypothesis in case of unequal population variances have been reconsidered. In this connection the distribu-