$(S_1S_2S_3S_4)$, such that $ad_{ii} = \sum_{k=1}^{4} {}_ks_{ii}^2$, where ${}_ks_{ii}$ is the entry in the ith column of S_k. This can always be done by the 4 square problem ([2], p. 235). Let $B = a^{1/2}(P^T)^{-1}B_1$, then B has integral entries, since B_1 and $a^{1/2}(P^T)^{-1}$ have integral entries. Then

$$P^TB = a^{1/2}B_1, \qquad P^TBB^TP = aB_1B_1^T = a^2D,$$

Thus $BB^T = a(P^T)^{-1}a^{1/2}Da^{1/2}P^{-1}$. But $A = (P^T)^{-1}DP^{-1}$. Thus $BB^T = a^2A$.

REFERENCES

[1] C. C. MacDuffee, *The Theory of Matrices*, Chelsea Publishing Co., 1946.
[2] Edmund Landau, *Vorlesungen uber Zahlentheorie*, Vol. 1, Chelsea Publishing Co., 1949.

ABSTRACTS OF PAPERS

(Abstracts of papers presented at the Iowa City Meeting of the Institute, November 26–27, 1945)

1. The Distribution of the Number of Components of a Random Mapping Function. (Preliminary Report.)

Leo Katz, Michigan State College, and Jay E. Folkert, Michigan State College and Hope College.

A set H, of N elements, is mapped into itself by a function f. The most general function takes each point into an arbitrary number of points of the set. A function is said to be random if the r_i images of the point x_i may with equal probability be any subset of r_i points of H. A subset h of H is a *component* of the mapping if it is a minimal subset such that $f(h) \subset h$ and $f^{-1}(h) \subset h$. Every mapping f decomposes H into a number of disjoint components. The probability distribution of the number of components of a random mapping, where only the numbers of images of each point are known in advance, is obtained. The probability distribution of the number of components is also obtained for a variant case in which the mapping is hollow in the sense that no point maps into itself. The two distributions are obtained through a modification of the King-Jordan-Frechét formula. For each case two specializations are considered; first, one in which the multiplicity of images is the same for each point of the set, and second, where this common multiplicity is unity (so that the function f is single-valued). Numerical examples and approximations to the exact distribution are considered. This work was supported by the Office of Naval Research.

2. Approximate Sequential Tests for Hypotheses about the Proportion of a Normal Population to One Side of a Given Number.

William Kruskal, University of Chicago.

It is sometimes of interest to test the hypothesis that the proportion of a given population exceeding a given number U is p_0 against the hypothesis that this proportion is p_1. This testing situation has been called that of testing for one-sided fraction defective. If the population is normal then the problem is to test the hypothesis $(U - \mu)/\sigma = K_0$ against the hypothesis $(U - \mu)/\sigma = K_1$. (Here μ is the mean, σ^2 the variance, and K_i the unit-normal deviate exceeded with probability p_i.) A simple translation puts this in the form: $\mu/\sigma = K_0$ vs. $\mu/\sigma = K_1$. If a sequential test is desired, it is very reasonable to base it on the sequence of Student t values computed from the first n observations. Application of the Wald sequential probability-ratio method to this sequence gives a procedure that may be called the WAGR test (after Wald, Arnold, Goldberg, and Rushton). Another sequential test