Consider two normal populations $N(a_1, \sigma_1^2)$ and $N(a_2, \sigma_2^2)$, where σ_1/σ_2 (ratio of the standard deviations) has a known value C. If the equality of the means, $a_1=a_2$, is to be tested by a t-test (one-sided or symmetrical) using n_1 sample values from $N(a_1, \sigma_1^2)$ and n_2 values from $N(a_2, \sigma_2^2)$ $(n_1+n_2=n$, fixed), it is shown that this experiment is most powerful when $n_1/n_2=\sigma_1/\sigma_2$ (integer considerations neglected). The t-tests satisfying this condition are called balanced. Thus information is lost by not using a balanced experiment. A quantitative measure of the information lost by using given values of n_1 and n_2 is determined by the total sample size m $(m_1+m_2=m)$ of the balanced t-test (same significance level) having approximately the same power. Then $n-m$ sample values are wasted by using (n_1, n_2) rather than (m_1, m_2), that is, only $100m/n\%$ of the information obtainable per observation is used by (n_1, n_2). A symmetrical t-test with significance level 2α has the same value of m as a one-sided t-test with significance level α. For one-sided t-tests with significance level α: $m \doteq 2^{-1}(B+(B^2-8A)^{1/2})$, where $B=2+A+K_\alpha^2/2$, $A=(C+1)^2[1-K_\alpha^2/2(n-2)] \cdot [C^2/n_1+1/n_2]^{-1}$, and K_α is the standardized normal deviate exceeded with probability α. This approximation to m is valid for $m \geqq 5$ if $\alpha=.05$, $m\geqq 6$ if $\alpha=.025$, $m \geqq 7$ if $\alpha=.01$, $m\geqq 8$ if $\alpha=.005$. (Received July 16, 1947.)

350. J. E. Walsh: *Some significance tests for the median which are valid under very general conditions.* Preliminary report.

Consider n independent values drawn from populations satisfying only: (1) Each population has a unique median. (2) The median has the same value ϕ for each population. (3) Each population is symmetrical. (4) Each population is continuous. (No two of the values are necessarily drawn from the same population.) Significance tests are derived for ϕ. These tests are based on order statistics of certain combinations of order statistics, each combination being either a single order statistic of the n values or one-half the sum of two order statistics. The tests are reasonably efficient if the values represent a sample from a normal population. The significance levels are of the form $r/2^n$ $(r=1, \cdots, 2^n-1)$. Each value of r can be obtained for some one-sided test. The major disadvantage of these tests is the limited number of suitable significance levels for small n. This disadvantage is partially eliminated by the development of tests having a specified significance level if the values are a sample from a normal population and a significance level bounded near this value if only (1)–(4) hold. Applications of these tests furnish generalized results for the Behrens-Fisher problem, certain large "sample" cases, quality control, slippage tests, the sign test, and situations where some of the n values are dependent. (Received July 16, 1947.)

TOPOLOGY

351. S. S. Chern: *On the characteristic ring of a differentiable manifold.*

Let M be a differentiable manifold of dimension n, which may be finite or infinite, orientable or non-orientable, and let $H(n, N)$ be the Grassmann manifold of all the linear spaces of dimension n through a fixed point O of a Euclidean space E^{n+N} of dimension $n+N$, $N\geqq n+2$. By imbedding M in E^{n+N} and constructing through O the linear spaces parallel to the tangent linear spaces of M, a mapping of M into $H(n, N)$ is obtained. This mapping induces a ring homomorphism of the cohomology ring of $H(n, N)$ into the cohomology ring of M, whose image is called the characteristic ring $C(M)$ of M. Take as coefficient ring the ring of residue classes mod 2. Formulas