

An Instructional Computer-Based Package for Probability and Statistics

An instructional package has been developed for a year-long course in mathematical statistics and probability. The package includes a 330-page laboratory manual and supporting computer software.

The laboratory manual contains more than 280 exer-

cises with complete solutions for 25 of the exercises. The manual parallels the textbook by Hogg and Tanis (1977). It has also been used successfully with other textbooks.

Computer use involves student programming in

FORTRAN. The students write their own program for solving the exercises; however, 58 subprograms are provided for their use.

The subprograms that are provided include

1. Programs that give the values of the binomial, chi-square, F , gamma, normal, Poisson, and t distribution functions;
2. Programs that give the inverse of the chi-square, F , normal, and t distribution functions;
3. Programs that select random samples from the standard distributions;
4. Graphing routines for
 - a. a relative-frequency histogram with the option of superimposing the theoretical probability density function.
 - b. the empirical distribution function with the option of superimposing the theoretical distribution function.
 - c. a relative-frequency ogive curve with the option of superimposing the theoretical distribution function.
 - d. a scatter diagram with the option of adding the least squares regression line.
 - e. a relative frequency power function with the option of superimposing the theoretical power function.
 - f. printing the graph of any nonnegative valued function.

It is possible to run these programs through batch processing, or they may be run interactively at a terminal. The graphing routines use essentially a 100×50 character grid when run through batch processing and a 60×30 character grid when run interactively.

Some examples of exercises and typical output are given in three papers that were presented at the third (Tanis 1972), fourth (Tanis 1973), and eighth (Tanis 1977) Conferences on Computers in the Undergraduate Curricula.

At Hope College, students who are enrolled in our year-long postcalculus course in mathematical statistics and probability may also enroll in an optional laboratory in which we use these materials. The laboratory meets for a two-hour block each week and is a one-credit-hour course. These materials can also be used in other ways. For example, a student could solve some of the problems as an independent-study project. Or the professor, possibly with student help, could prepare classroom illustrations.

The laboratory manual and subprograms have received a favorable review by CONDUIT and are being distributed by them. Computer systems on which these materials have been used are the Cyber 72, Cyber 175, DEC System 10, DEC System 20, IBM 360/91, IBM 370/135, PDP 1100 series (11/40, 11/45, 11/70), Sigma VI, and UNIVAC V-75.

Copies of the manual and tape containing the subprograms are available from CONDUIT, P.O. Box 388, Iowa City, IA 52240.

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REFERENCES

- Hogg, Robert V., and Tanis, Elliot A. (1977), *Probability and Statistical Inference*, New York: Macmillan Co.
- Tanis, Elliot A. (1972), "Theory of Probability and Statistics Illustrated by the Computer," *Proceedings of the 1972 Conference on Computers in Undergraduate Curricula*, 513-520.
- (1973), "A Computer Laboratory for Mathematical Probability and Statistics," *Proceedings of the Fourth Conference on Computers in the Undergraduate Curricula*, 416-426.
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