



## Project Summary

# Updated User-Friendly Computer Programs for Solving Sampling and Statistical Problems

Philip C. L. Lin

User-friendly computer programs for solving sampling and related statistical problems have been updated. Many more programs are included in the updated version. Specific, detailed written instructions and examples built into the programs are provided so that the user can review them before using the programs. The programs are designed so that people without an in-depth understanding of statistics can easily use them.

*This Summary was developed by EPA's Risk Reduction Engineering Laboratory, Cincinnati, OH, to announce updating of computer programs for solving sampling and statistical problems (see ordering information at back).*

### Introduction

To help you select and use the computer programs, a series of questions and answers has been developed. These questions, which may aid in designing field sampling programs and laboratory analyses, are answered by directing you to the proper program.

- Q. Which program will determine how many samples must be taken to reduce the anticipated error to some reasonably fixed value?
- A. Program 9, "Calculation of Sample Number Based on the Accuracy of the Sample Variance," or program 10, "Calculation of Sample Number Based on the Accuracy of the Sample Mean."
- Q. How can I find the probability of an emission exceeding a standard?

- A. By using program 11, "Probability of Exceeding a Standard."
- Q. Which program will test whether a sample belongs in a particular population?
- A. Program 12, "Hypothesis Testing."
- Q. Which program should be used to find the sampling frequency required to capture a significant event in a long-term monitoring program?
- A. Program 13, "Power Spectrum Analysis."
- Q. To determine the sample mean, standard deviation, and confidence intervals for the mean and variance, which program should be used?
- A. Program 8, "Calculation of Sample Mean, Standard Deviation, and Confidence Intervals for Population Mean and Variance."
- Q. Which program should be used to correlate observed data in a linear manner for one or two independent variables?
- A. Program 2, "Linear Regression," for one independent variable and program 25, "Multiple Regression," for two independent variables.
- Q. A material is treated by two different processes. Would there be any justification for saying that a difference existed between the two processes? Which program should be used to answer this question?
- A. Program 16, "Comparing Two Means."
- Q. New equipment is used to measure a compound and it is expected that the measurement uniformity would



improve. The questions to ask are: does the improvement really exist? has it occurred by chance? Which program should be used to test for the significant difference between variances of the two samples?

- A. Program 19, "Test for Significant Difference between Variability of Two Samples."
- Q. Materials may be treated differently. Which program should be used to separate the treatment effects from the random errors in determining whether the treatment effects do statistically exist?
- A. Program 22, "Analysis of Variance for Samples with Random Errors and Treatment Effects."
- Q. Materials may be treated differently and are analyzed by using different laboratory instruments. Which program should be used to separate the treatment effects from the random errors and the instrument effects (block effects) in determining whether the treatment effects do statistically exist?
- A. Program 23, "Analysis of Variance for Samples with Random Errors, Treatment Effects, and One Block Variable."
- Q. Materials may be treated differently and are analyzed by using different laboratory instruments under different conditions (such as different days or temperatures). Which program should be used to separate the treatment effects from the random errors, the instrument effects (a block variable), and the different conditions (another block variable) in determining whether the treatment effects do statistically exist?
- A. Program 24, "Analysis of Variance and Latin Square Design for Samples with Random Errors,

Treatment Effects, and Two Block Variables."

### Instructions for Using Sampling Programs on the IBM PC

To load and use these programs on the IBM PC or compatible computer:

Place the program disc in the selected drive and type RRELSTAT and press ENTER. The program menu will appear on the screen of the monitor. (Note: the programs can also be copied to the hard disk.)

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\* PROGRAM MENU .....PAGE 1 ...\*  
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1. Introduction
2. Linear Regression
3. Calculation of Normal Deviate Z
4. Calculation of the Percentage Area of Normal Distribution for One or Two Tailed Test
5. Calculation of Student T
6. Calculation of the Percentage Area of Student T Distribution for One or Two Tailed Test
7. Calculation of Chi Square
8. Calculation of Sample Mean, Standard Deviation, and Confidence Intervals for the Population Mean and Variance
9. Calculation of Sample Number Based on the Accuracy of the Variance
10. Calculation of Sample Number Based on the Accuracy of the Sample Mean
11. Calculation of the Probability of Exceeding a Standard
12. Hypothesis Testing
13. Power Spectrum Analysis
14. Proceed to Next Page
15. Quit

Type the desired option number and press ENTER.

Type the option number and press ENTER. The desired program will appear on the screen of the monitor. If option number 14, is selected, then program menu 2 will appear as follows:

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\* PROGRAM MENU .....PAGE 2 \*  
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16. Comparing Two Means
17. Calculation of the Percentage Area in F-Distribution
18. Calculation of the F Value in F-Distribution
19. Test for Significant Difference between Variabilities of Two Samples
20. Test for Significant Difference between the Population Variance and the Sample Variance
21. Analysis of Variance (ANOVA) for Samples with Random Errors
22. Analysis of Variances (ANOVA) for Samples with Random Errors and Treatment Effects
23. Analysis of Variances (ANOVA) for Samples with Random Errors, Treatment Effects and Block Effects
24. Analysis of Variances (ANOVA) and Latin Square Design for Samples with Random Errors, Treatment Effects and Two Block Variables
25. Multiple Regression
26. Return to Previous Page

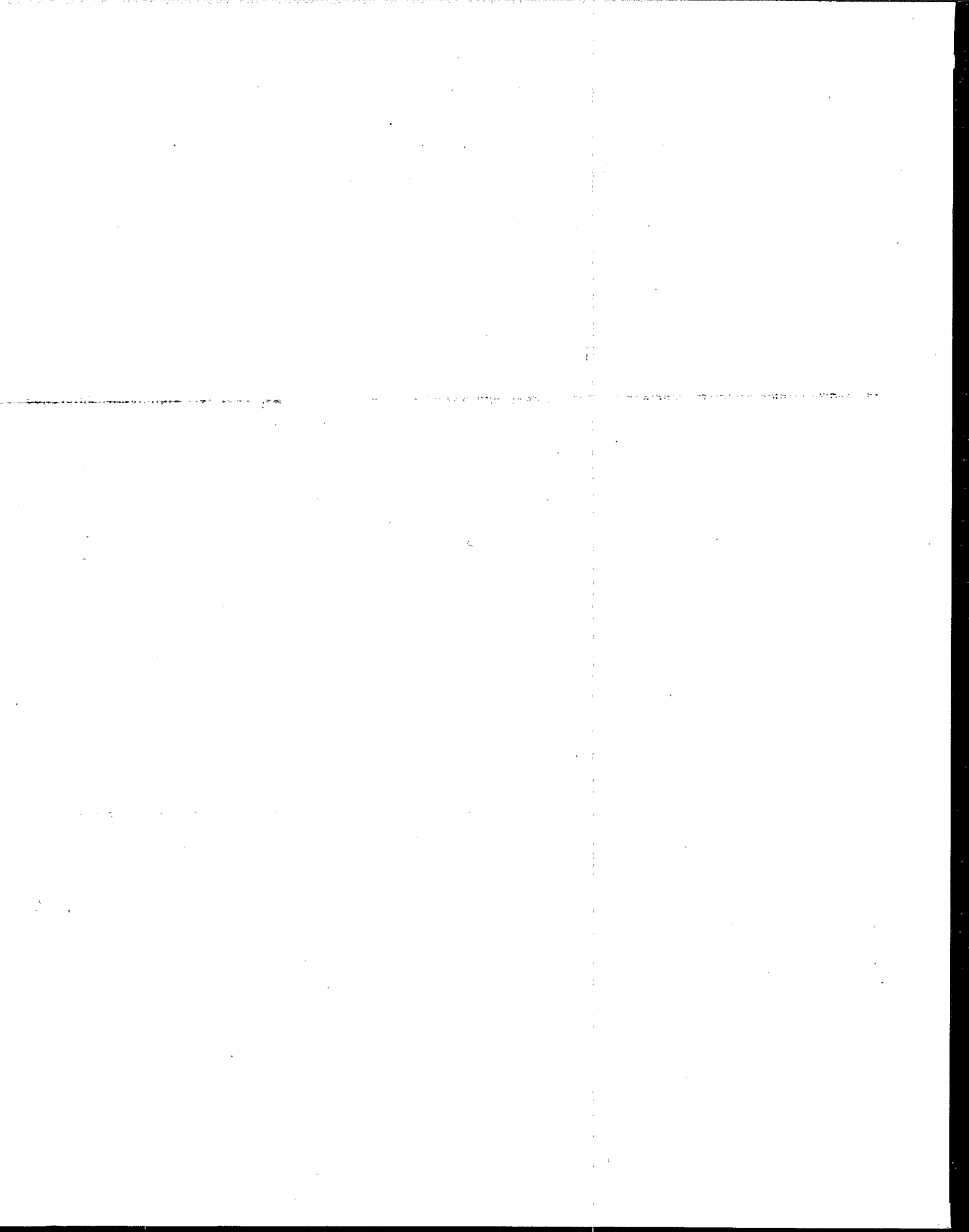
Type the desired option number and press ENTER.

After the desired program is run, one of several choices can be selected:

- (a) go back to program menu,
- (b) do another calculation, or
- (c) quit

by typing the requested number and pressing ENTER.

The diskette was submitted by Philip C. L. Lin under the sponsorship of the U.S. Environmental Protection Agency.



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The diskette, entitled "Updated User-Friendly Computer Programs for Solving Sampling and Statistical Problems," (Order No. PB93-505907AS; Cost: \$90.00, subject to change) will be available only from:

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Telephone: 703-487-4650

The EPA Project Officer can be contacted at:  
Risk Reduction Engineering Laboratory  
U.S. Environmental Protection Agency  
Cincinnati, Ohio 45268

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Environmental Protection Agency  
Center for Environmental Research Information  
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