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DEVELOPMENT OF A COMPUTER-ASSISTED INSTRUCTION COURSEWARE PACKAGE IN STATISTICS AND A COMPARATIVE ANALYSIS OF THREE MANAGEMENT STRATEGIES FOR THIS COURSEWARE

The Louisiana State University and Agricultural and Mechanical Col. PH.D. 1985

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DEVELOPMENT OF A COMPUTER-ASSISTED INSTRUCTION COURSEWARE PACKAGE IN STATISTICS AND A COMPARATIVE ANALYSIS OF THREE MANAGEMENT STRATEGIES FOR THIS COURSEWARE

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
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in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Interdepartmental Program of Education

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This work is dedicated to my loving daughter, Erica LaRonica Dinkins, whose devotion and understanding helped to sustain me to this end.

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ABSTRACT

The purpose of this study was to develop and evaluate a tutorial computer-assisted instruction (CAI) lesson teaching the normal distribution and standard scores. Instruction on the normal curve, the unit-normal curve, z-scores, areas under the normal curve, and standard scores was given in this study. This CAI courseware was created in order to teach or review these concepts to graduate students in education.

An evaluation of this CAI lesson was conducted. It consisted of a small scale pilot test, and a 2 x 3 factorial design experiment. The pilot test study was conducted so that reaction data to this software package could be collected and utilized in revising this software. The 2 x 3 factorial design experiment was conducted to determine which of three management strategies for this CAI lesson is most effective for a given level of aptitude. The two quantitative aptitude levels were low-aptitude and high-aptitude levels. The participants' median score on the quantitative portion of the Graduate Record Examination (GRE) was used to determine low-aptitude and high-aptitude. The three management strategies were learner-control, program-control with a mastery criterion and advisement, and program-control with neither a mastery criterion nor advisement.

The following conclusions were drawn on the basis of the findings in this study.

1. The mean of the posttest scores for the group of participants in the pilot test study was significantly higher than the mean of their pretest scores.
2. High-aptitude learner-control students had a significantly higher posttest mean score than low-aptitude learner-control students in the 2 x 3 factorial design experiment.
3. The data collected in this study indicated a trend of assigning low-aptitude students to a program-control management strategy.
4. Gagne's cognitive theory of learning was effectively utilized in the development of this courseware.

An analysis of the data collected in this study, including the statistical comparison of pretest and posttest scores, indicated that this CAI package was effective in teaching its defined objectives.

CHAPTER 1

INTRODUCTION

The microcomputer with its various capabilities and relatively low cost is an important technological advancement. The advent of the microcomputer into the educational arena has made it possible for the increased use of computer-assisted instruction (CAI) in colleges and universities. In general, the cost of computer hardware, software, and courseware has decreased over the years. Consequently, more and more institutions of higher learning are now purchasing computers to be used in a classroom setting. Some colleges and universities are now requiring that all incoming freshman students have access to a microcomputer to facilitate teaching by CAI.

The microcomputer has various applications in the classrooms of higher education. Instructors now have an interactive medium, the microcomputer, which can be used to simulate a real situation, to provide for drill and practice, or to give tutorial instruction. Microcomputers can also be used to give classroom examinations and to check student responses which facilitates grading of these examinations.

The graphical capability of a computer has made it possible to draw accurate graphs in a relatively short period of time. This is a welcome addition to any class which

utilizes graphic displays in the presentation of instructional lessons. Many professors are less than enthusiastic when it comes to drawing a detailed graph on a blackboard and simply sketch a graph that only vaguely resembles the correct graph. A well constructed CAI courseware package that utilizes graphics will give the learner an attractive and correct graph.

The computer has facilitated the teaching of statistics through the use of statistical packages, tutorials, simulations, and by other means. The computer's graphic capability and its ability to perform fast numerical calculations have made the computer especially adaptable to teach the normal distribution and standard scores. The normal distribution or normal curve is one of the most fundamental distributions in all of statistics. Many of the problems in statistics can be solved if one is allowed to assume that a given set of data is normally distributed. A thorough understanding of the normal distribution and its properties is necessary in order to understand many of the more advanced topics in statistics, particularly in hypothesis testing. Also, standard scores should be easier to explain and understand given a graphical interpretation of their meaning.

The future of CAI in higher education in general and

statistics in particular is uncertain in many ways because CAI has yet to realize its full potential value in the classrooms of higher education. CAI has proved to be effective in many educational settings. As more and more qualified and conscientious programmers enter this arena, and collaborate with content area specialists, CAI in statistics should become even more challenging and rewarding.

Statement of the Problem

In this study, the researcher was concerned with:

1. developing a computer-assisted instruction (CAI) courseware package in statistics, and
2. comparatively analyzing the effectiveness of three management strategies for this courseware at two quantitative aptitude levels.

This courseware provided instruction on the normal curve, the unit-normal curve, z-scores, areas under the normal curve, and standard scores. A graphical interpretation of these concepts was provided, when practical, in order to enhance clarification of the topics discussed. The purpose of this CAI lesson was to review or teach these concepts to graduate students in education.

An evaluation of this CAI lesson was conducted. A small scale pilot test by graduate students in education and a team

of experts constituted one portion of the evaluation. The team of experts consisted of a statistical expert and an expert in CAI lesson design.

The research portion of the evaluation consisted of a 2 x 3 factorial design experiment. This experiment was conducted in order to compare three management strategies of this software package to determine which learning strategy, if any, is the most effective for a given aptitude level. The three strategies were learner-control (Group 1), program-control with a mastery criterion and advisement (Group 2), and program-control with neither a mastery criterion nor advisement (Group 3). Two quantitative aptitude levels were also used in this study. They were low-aptitude learners (Level 1) and high-aptitude learners (Level 2).

Rationale

The normal distribution (also called the Gaussian curve, the normal curve, and the normal probability curve) is the most fundamentally important distribution in statistics because many statistics are based on or assume the normal distribution. It is used extensively in many statistics textbooks in the development of other statistical concepts, particularly in hypothesis testing (Glass and Hopkins, 1984). The graphical capabilities of a microcomputer can be

effectively utilized in plotting this curve, calculating and shading areas under the curve, and it can assist the learner in visualizing what effect the changing of a single parameter in the normal distribution formula will have on the shape of a normal curve. The precise and timely manner in which these properties are unfolded should be clarifying and motivational to the student.

Since standard scores are so important in the interpretation of raw scores, it is necessary that prospective users of standard scores have more than just a surface level understanding of the contents of this topic. A graphical interpretation of standard scores should reinforce the underlying concepts discussed in this lesson.

In essence, the microcomputer performed at least three functions in the development of this study which were beneficial to the learner. It generated accurate and attractive graphs of a normal curve, it illustrated concepts of the normal distribution and standard scores that were discussed in the lessons, and it performed tedious calculations required in the plotting of graphs and determining the areas of shaded regions under a normal curve. The ability of a microcomputer to draw attractive graphs (Anderson, 1984; Collis, 1983), to clarify key concepts (Collis, 1983; Andrew, 1973), and to give individualized

instruction (Wassertheil, 1979; Skavaril, 1974) made it especially attractive to be used in this study.

The 2 x 3 factorial design experiment conducted in this study sought to answer the question as to whether a particular management strategy for this CAI program would be more effective for a given learning aptitude. Fry (1972) concluded from his research that students high in both aptitude and inquisitiveness should be placed in a student-control instructional treatment and that low-aptitude students tend to learn the least under a high degree of student-control when compared to other strategies. Some research studies have demonstrated that when the learner controls the amount of CAI he receives, he often terminates the lesson prematurely and fails to learn what he should (Felixbrod & O'Leary, 1974).

Hypotheses

1. The mean posttest score of the group of participants in the pilot test study will be significantly higher than the mean of their pretest scores.
2. High-aptitude learner-control students will have a significantly higher posttest score than low-aptitude learner-control students during the research portion of this study.

3. Low-aptitude students will perform better under a program-control strategy with a mastery criterion and advisement than under a learner-control strategy.

Definition of Terms

Adaptive CAI. CAI that includes strategies for assessing both the learner's cognition and memory (e.g., aptitudes, prior achievement, on-task learning progress) and the characteristics of the learning task (e.g., difficulty level and content structure) so that the CAI lesson can be continuously adjusted to meet the on-task learning needs of the learner (Johansen & Tennyson, 1984).

Courseware. Software and printed materials which support instruction in a complete course of study or a definable subset of a course (MicroSIFT, 1981).

Computer-Assisted Instruction (CAI). Instruction that is assisted or aided through the use of the computer (Harrod and Ruggles, 1983).

Software Design. Defining the order of material to be presented and the interaction of computer and student (Kosel, 1980).

Formative Evaluation. The collection of the opinions, suggestions, and criticisms of project participants for the purposes of revision and improvement. (Reeves and

Lent, 1982).

Graphics. Images displayed on a video screen or printer which are generated by a computer program. (MicroSIFT, 1981).

Hardware. Equipment, including computers, disk drives, cassette players, cables, and monitors (MicroSIFT, 1981).

Internal Review. The process of reviewing the content and instructional processes before it is put into operation (Reeves and Lent, 1982).

Learner-Control CAI. CAI in which the learner maintains a direct role in decision making (Johansen & Tennyson, 1984).

Microcomputer. A computer system, including peripheral hardware such as disk drive and monitor, based on a microprocessor (or "chip"), and having a typewriter-like keyboard. (MicroSIFT, 1981).

Normal Distribution. A distribution that can be approximated by the formula:

$$y = \frac{1}{\sigma\sqrt{2\pi}} e^{-(X - u)^2/2\sigma^2},$$

where y is the height of the curve directly above any given value of X in the plotted frequency distribution, π is the ratio of the circumference of any circle to its diameter and is equal to 3.14159..., e is the base of the system of natural logarithms and is equal to 2.71828..., and u and σ

are the mean and standard deviation of the given population, respectively. (Glass and Hopkins, 1984).

Operating System. A program or set of programs which controls and coordinates the operations of the components of a computer system (MicroSIFT, 1981).

Operational Testing. The process of collecting information for improving instruction during and after its implementation (Reeves and Lent, 1982).

Program. A computer program, written in BASIC, Pascal, machine code or other computer programming language (MicroSIFT, 1981).

Software. Programs, including application programs, operating systems, and languages (MicroSIFT, 1981).

Tutorial CAI. CAI that assumes the place of the teacher and gives independent instruction on a one-to-one basis. Tutorial CAI presents the concepts and roles of the subject matter, evaluates the student's comprehension, and gives practice through branching in the specific skills and concepts taught. Cognitive objectives of the tutorial CAI are knowledge acquisition and comprehension (Manion, 1985).

Significance of the Study

This research study provided knowledge as to how to best effect learning concepts in statistics by means of CAI. This

is a significant educational research problem because it is important to know which is the most efficient method at a given quantitative aptitude level to learn statistics by means of CAI. Some studies have demonstrated that when the learner is allowed to control the amount of instruction, he often terminates prematurely, and fails to learn what he should (Tennyson & Buttrey, 1980; Felixbrod & O'Leary, 1974). This study sought to determine if knowledge acquisition through CAI is affected by the design management strategy used in the development of CAI lessons in statistics. The answer to this question is important so that the most effective CAI strategy might be assigned to fit the specific characteristics of the learner.

Constraints

This CAI lesson was designed to run on the IBM Personal Computer (PC) with Color/Graphics Monitor Adapter. The computer language used in this program was Advanced BASIC (Beginners All-Purpose Symbolic Instruction Code). This courseware consisted of instruction on the normal distribution and standard scores, and was designed for graduate students in education.

CHAPTER 2

REVIEW OF RELATED LITERATURE

The review of the literature will be divided into five sections. These are: (1). Computers as an Instructional Tool in Higher Education, (2). Computer Use in the Teaching of Statistics in Higher Education, (3). Designing Educational Software, (4). Evaluation of CAI Materials, and (5). Management Strategies for CAI. A summary of each section will be provided at the end of each section.

Computers as an Instructional Tool in Higher Education

The number of computers on college and university campuses has increased tremendously in the last decade with the advent of microcomputers into the educational system. Faculty members in higher education are now using the computer in the teaching of such courses as statistics, mathematics, English, engineering, chemistry, and physics. This section will discuss the types of computer-assisted instruction (CAI), the benefits of CAI, and computer use as an instructional tool in higher education.

Types of CAI

This section will discuss the types of CAI and provide an example of the most common types of CAI. The three most

common types of CAI instruction are drill and practice, tutorial, and simulation. The purpose of drill and practice is to provide practice for skills already learned. It is possible to teach new skills by this technique, but such learning would be more of "trial and error" than of directed learning, and would not constitute an efficient use of learner's time (Gagne', Wager, & Rojas, 1981).

Stockburger (1982) reports on the utilization of a drill and practice program at a Midwestern university to evaluate what effect participating in three computer exercises would have on the performance of students enrolled in an introductory statistics class. Stockburger states that the exercises were performed on a Polymorphic 88 microcomputer. One exercise, called "means," presented the student with 10 estimation problems. Each estimation problem presented the student with 10 to 100 randomly generated numbers with a mean between 1 and 100 and a standard deviation between 1.0 and 20.0. Criteria were given for a correct score which involved both student reaction time and student response. One conclusion reached by Stockburger was that this exercise improved the ability of the student to estimate the mean and standard deviation of a collection of numbers.

In the tutorial mode (Manion, 1985), CAI assumes the place of the teacher and provides independent instruction on

a one-to-one basis. A tutorial program presents the concepts and rules of the subject matter, evaluates the students' comprehension, and provides practice through branching in the specific skills taught. Manion also states that the cognitive objectives of the tutorial mode are knowledge acquisition and comprehension. Gagne' et al. (1981) state that a tutorial program is usually considered to be "primary" instruction as opposed to "supplementary" instruction. That is, a good tutorial program ought to be able to stand alone.

Agbor-Etang (1979) reports on the development of CAI tutorial units in calculus for students at the university level. These CAI units were designed to provide instruction and related practice problems for mathematics, engineering, and science students who were enrolled in Mathematics 121 at Iowa State University. The PLATO terminals at Iowa State University were used in this study. Agbor-Etang states that twenty CAI units were used in this study. Each unit contained an explanation of the concepts involved, examples, and provided several practice problems.

CAI simulation programs imitate a real situation and/or they model the underlying characteristics of a real phenomenon (Manion, 1985). Students must interact with and become part of the simulated reality. While simulations may incorporate many features of games, their real power comes

from their "capacity to teach about problem-solving" (Harrod and Ruggles, 1983, p. 5). They are effective in helping students learn such diverse concepts as driving a car, trading on the stock market, or the effects of stress on the heart. In essence, simulations provide "highly accessible laboratories" (Appel and Hurley, 1984, p.3).

Kosinski (1984) reports on a simulation exercise to be used in a biology laboratory in higher education. This program is called ALIEN and it is a simulation of cardiopulmonary physiology. Kosinski states that ALIEN starts with a screen showing a stylized extraterestrial with an animated heart beat. The extraterestrial is subjected to various simulated conditions on his heart and the learner is asked both quantitative and qualitative questions concerning the proper treatment of the extraterestrial's condition. After the student responds, ALIEN provides feedback to the learner regarding the appropriateness of the response.

Other types of CAI programs include educational gaming and problem-solving (Manion, 1985; Bohrer, 1981). Bohrer states that educational gaming can be thought of as drill and practice using skill and/or strategy. A student may compete or cooperate with another student or with the computer, for a score or other result indicating his level of achievement. In the problem-solving mode (Manion, 1985), the student

combines previously learned rules into a new, yet higher level rule that will, in turn, solve a problem.

Benefits of Computers for Instruction

This section concerns itself with some of the reasons for using the computer as an instructional tool. According to a search of the literature done by McMurray and Hoover (1984), the following benefits relative to the use of a computer as an instructional tool were found:

1. The computer is accepted as an instructional medium that may stimulate interest or motivation (Fisher, Johnson, Porter, Bleich, & Slack, 1977; Hebenstreit, 1980; Witschi et al., 1976).
2. The computer can provide the advantage of individualized instruction which moves at the pace of the user (Charp, Bozeman, Altschuler, D'Orazio, & Spuck; 1982; West, 1983; Fisher et al., 1977).
3. The computer can provide immediate application of facts and feedback that may enhance learning (Kulhavy, 1976).
4. Information for the computer can be standardized and free from biases such as facial expressions and tone of voice. Abstract information may be simplified through visual analogies (Schwartz & Hanson, 1982).

5. The use of a computer can be as effective as or superior to traditional instructional methods (Aiken & Braun, 1980; Dence, 1980).

6. Computers can simulate experiences that would be difficult, expensive, or impossible to have in everyday life, and they can provide practice so that learners gain competency in real-life situations. The computer user becomes an active participant, rather than a passive observer, and this creates a positive learning environment (Van Cura, Jensen, Greist, Lewis, & Frey, 1975).

Other reasons for utilizing the computer as an instructional tool are given in the research study done by Chambers and Sprecher (1980). These are as follows:

1. The use of CAI can reduce learning time when compared to the regular classroom instruction (Deignan & Duncan, 1978; Kearsley, 1976; Magidson, 1978; Sakamoto, 1978; Splittgerber, 1979; Taylor, 1974).

2. The use of CAI can improve student attitudes toward the use of computers in the learning situation (Kearsley, 1976; Magidson, 1978; Murphy and Appel, 1977; Splittgerber, 1979; Taylor, 1974).

3. The development of CAI courses following specified guidelines can result in portability and their

acceptance and use by other faculty (Laurillard, 1977; Mckenzie, Elton, & Lewis, 1978).

The Computer as an Instructional Tool

In this section, the use of the computer as an instructional tool will be discussed. A review of the literature has indicated that some colleges and universities are now requiring that all or part of their student body have access to a personal computer (Magarrell, 1982; Smith et al., 1984). Smith et al. state that starting with the class in the fall of 1983, Drexel University, in Philadelphia, Pa., is requiring every incoming freshman to own a microcomputer. Some of the desired goals to be achieved by student ownership of a microcomputer at Drexel are to provide stand-alone computational power, to provide access to larger computer systems, and to enable the introduction of computer-based instruction into the curriculum. Magarrell (1982) states that starting with the fall class of 1983, freshmen at the Stevens Institute of Technology are required to have personal computers. Magarrell also states that plans for equipping all students with personal computers have been announced at Carnegie-Mellon University and Clarkston College of Technology.

A visit made to 14 universities, including the

University of Alabama, Brigham Young University, The University of California-Davis, Colorado State University, University of Pennsylvania, Florida State University, University of Nebraska-Lincoln, Pennsylvania State University, Utah State University, and Virginia Polytechnic Institute, revealed that most of these universities had a considerable interest in microcomputers (Bedient, 1981). Bedient states that the interest ranged from word processing, to management of data, to CAI applications.

A survey was conducted at the University of Georgia by Jackson, Clements, and Jones (1984), in order to determine the various uses of computers among faculty members. This survey indicated that the interest in computers was high. Faculty members were using micros, minis, and mainframes for both instruction and research in all academic units of the university and many faculty members indicated an interest in learning more about the various uses of the computers.

Two multi-million dollar computer systems developed for instructional purposes are the Programmed Logic for Automatic Teaching Operation (PLATO) system and the Time-shared Interactive Computer-Controlled Information Television (TICCIT) system. Although there are substantial differences between the two systems, both use computer technology to provide individualized instruction, with two-way

communication between student and machine. The development of these systems was funded by the National Science Foundation (NSF) (Chambers and Sprecher, 1980; Magarrell, 1976).

The PLATO system (Chambers and Sprecher, 1980; Magarrell, 1976; Suppes and Machen, 1978; Suppes, 1981) is housed at the University of Illinois under the direction of Donald Bitzer. With the PLATO system, a single computer can give individualized instruction to as many as 500 students at once, maintaining two-way communication with each of them. PLATO terminals are also operational on the campuses of the Universities of Arizona, Colorado, Delaware, Florida State, Quebec, and Minnesota. At the University of Delaware, the PLATO terminal emphasizes support for music education, while at Florida State, installation support is provided to select Florida high schools for PLATO-based remedial studies in mathematics.

TICCIT was developed at the University of Texas and Brigham Young University under the direction of Victor Bunderson (Chambers and Sprecher, 1980; Magarell, 1976; Wilson, 1984). This system was designed to provide basic undergraduate instruction in mathematics and English. On standardized tests in English and mathematics, students taught by TICCIT have done just as well as those who had

the best human teachers.

At the University of California, Irvine, a CAI project has been under way for a number of years under the direction of Alfred Bork. This project has produced a significant amount of courseware of a fairly complex nature supporting instruction in physics. Also, entire CAI courses are now offered in Russian and mathematics at Stanford under the direction of Patrick Suppes (Chambers and Sprecher, 1980).

Herbert Simon and his colleagues at Carnegie-Mellon University (Newell and Simon, 1972) have used the computer as a model of what kinds of information-processing activities can be accomplished, and they have tried to represent the variety of problem-solving tasks that can be done by means of a computer program. These researchers believe that there is a parallel when comparing what the computer has to do in order to solve a problem, and what the human beings say they are doing in solving the same problems. However, Gagne' believes that there is some question about how much valid information one can get from having people attempt to report their own mental processing (Lipsitz, 1982). Gagne' also states that in some cases this process works, and gives some very interesting and important information about how human cognitive activity takes place.

Summary

The three most common types of CAI are drill and practice, tutorial, and simulation. The literature supports the fact that CAI has various applications in the classrooms of higher education. Generally speaking, CAI can be motivational, provide individualized instruction, and in many cases can reduce significantly the amount of time needed for instruction.

Several colleges and universities are now requiring that all or part of their student body have access to a personal computer. This list includes Drexel University, Stevens Institute of Technology, Carnegie-Mellon University and Clarkston College of Technology. The microcomputer can give computer-based instruction as well as provide for access to larger terminals. Also, large scale CAI systems, such as PLATO and TICCIT, are being used at various colleges and universities to teach courses such as mathematics, English, physics, and Russian.

Computer Use in the Teaching of Statistics in Higher Education

This section has been divided into three parts: (1). Reasons for Using CAI in Statistics, (2). Approaches to Using CAI in Statistics, and (3). Summary. The summary will consist of a brief synthesis of the other parts discussed in this section.

Reasons for Using CAI in Statistics

Over the last decade, the use of the computer in the research, application, and teaching of statistics has been on the increase. The availability of sophisticated statistical packages, quality software and courseware, high powered computers, and the advent of the microcomputer have all made it possible for statisticians and students to perform complicated tasks with ease. Computers can be very useful in the teaching of both descriptive and inferential statistics.

Among the major reasons for teaching statistics with the aid of a computer are the following:

1. Easy generation of attractive graphs (Anderson, 1984; Collis, 1983; Ling, 1978).
2. Easy performance of routine numerical calculations (The Committee on the Undergraduate Program in Mathematics (CUPM), 1975; Collis, 1983; Anderson, 1984; Andrew, 1973; Mausner et al., 1983).

3. Clarification of key concepts (CUPM, 1975; Collis, 1983; Scalzo & Hughes, 1976; Andrew, 1973).

4. Promotion of active student participation in the acquisition of statistical concepts (CUPM, 1975; Skavaril, 1974).

5. Individualization of instruction (Wassertheil, 1979; Mausner et al., 1983; Skavaril, 1974).

6. CAI in statistics can save students classroom time (Wassertheil, 1979; Skavaril, 1974).

7. CAI in statistics is motivational (Caffarella, 1882-83; Andrew, 1973; Scalzo and Hughes, 1976).

8. CAI can free the teacher from tedious, time consuming tasks (Wassertheil, 1979).

In her study, Collis (1983) gives three functions that a microcomputer can perform in a unit on statistics: the easy generation of attractive graphs; the illustration of concepts; and the performance of routine and tedious calculations. One of the computer programs mentioned in Collis' study was WORD COUNT STATISTICS. This program performed various descriptive statistical tests on a portion of written text. Descriptive data given on a passage of text by this program included the number of words, number of sentences, mean length of word, and standard deviation of length of word. Collis states that this program has the

option of listing all the words of a certain length and presenting a simple frequency distribution of the lengths of words. This program also allows for an attractive histogram to be generated of the data for length. Other options in this program, says Collis, permit the drawing of skewed distributions, and a discussion of the concepts of "peakedness" or "kurtosis" for a distribution.

Collis believes that the WORD COUNT STATISTICS program effectively teaches basic statistical concepts such as simple frequency distributions, histograms and line graphs. The graphics display, Collis states, can also be used to reinforce graph-reading skills and to illustrate the nature of a "linear trend" that can be visualized from the graph.

Scalzo taught an undergraduate course involving elementary statistics at Queensborough Community College of the City University of New York (Scalzo and Hughes, 1976). The course, Mathematics 36: Elementary Computer-Assisted Statistics, lasted for one semester. Seven units were covered in this course: Understanding the Use of Computers; Descriptive Statistics; Sets, Permutations, and the Binomial Theorem; Elementary Probability Concepts; Random Variables and Normal Distribution; Hypothesis Testing; and Additional Statistical Techniques. There were 14 prepackaged programs integrated in the topic units. Some of the units were STAT1:

Ungrouped Data, STAT2: Grouped Data, STAT3: Counting Program, STAT4: The Binomial Experiment and STAT9: Computing the observed Z-score or observed t-score for differences between a Sample Mean and a Population. Each of these statistical programs included an instruction sheet, a flowchart, coding in BASIC and a problem set. In the STAT9 package, the student inputs a given set of data, and the computer would print out the observed Z-score and the observed T-score. No tutorial assistance was provided by these statistical packages.

Scalzo and Hughes also state that a large majority of the student participants indicated an enthusiasm for learning elementary statistics via CAI. These authors believe that in a basic course which emphasizes statistical concepts, the computer may assist in obtaining an understanding of these concepts. They also concluded that students appeared to have a better understanding of statistical concepts offered in this CAI course than did those students in a traditional or standard non-computer elementary statistics course.

Skavaril (1974) describes in detail the instruction of an introductory statistics course using the computer not only for tutorial CAI support, but also for the generation of statistical exercises and answers and for its capabilities as a tool to help students complete data analyses. The course,

Genetic 650, is a one quarter introductory statistics course taught in the Department of Genetics at The Ohio State University. The computers utilized in the teaching of this course were the IBM 370/165 and the IBM 370/158 central computers together with terminals and various other processing equipment. The software components of the computer base for this course consist of twenty-nine modules, nine exercise generating programs, 21 data analysis programs, and various programs supplied by the central administration of the University. The CAI modules were written in the Coursewriter III, Version 3, author language. Topics in the CAI modules included the central limit theorem, t-distribution, F-distribution, one-way analysis of variance, linear regression, and correlation. Students accessed the modules from the terminals using a central computer in a student, interactive, on-line mode.

Skavaril found that the students using computer-based materials completed the course in much less time than by other students to complete the same course. He also found that students can proceed through the CAI module at a pace that is consistent with their abilities and time commitments. The Skavaril study indicated that the concentration required of a student at a computer terminal during CAI precluded inattention; thus such a student achieved a degree of

efficiency that would be difficult to match even in the best-organized classroom environment.

In her paper, Wassertheil (1969) successfully incorporates CAI into the laboratory portion of an introductory statistics course. The laboratory was used in conjunction with a standard statistics text plus lectures. The laboratory was called the Computer-Assisted Instruction Problem Laboratory in Statistics. It was used in an introductory statistics course at the State University College at New Paltz, New York in the Division of Biological Science and Mathematics during the fall quarter of 1966. The text used in the course was Probability and Statistics, third edition, Alder and Roessler, published by Freeman, and the "Stats Workbook of Problems" published by IBM. The first ten chapters in the textbook as well as a portion of Chapter 12 on Regression and Correlation was covered. In the workbook, the first 8 chapters (including the section on standard scores) were covered.

Wassertheil states that the course was given during a ten week period with three sessions a week. Two of these sessions consisted of lecture and the third session was a problem laboratory session in which homework was discussed and previous materials reviewed.

Wassertheil states that there were 27 student

participants in the course. These students were divided into two groups. Fourteen students (one subsequently withdrew) volunteered for the experimental group and received CAI. The others did not volunteer and were placed in the control group. All students in both groups were given workbooks and required to complete one chapter per week. Students in the computer group were asked not to attend the class laboratory period. Rather, they spent an hour a week on the computer terminal receiving computer instruction in the mode called "problem laboratory." Wassertheil found that CAI was able to eliminate one standard 75-minute class period a week without deterioration in performance. Such usage would permit more time for individual contact between student and instructor or would free the instructor for other duties.

In a study at Beaver College, Mausner et al. (1983) discuss the development of a CAI course in statistics using a PDP 11/70/45 computer. In this course, both descriptive and inferential statistics were taught, as well as the most widely used computational techniques, such as ANOVA. Students would interact with the computer and receive immediate feedback. This course was divided into units or modules. At the end of each unit there would be a test to determine mastery of the content covered. A final examination would also be given to cover the entire course.

Students were able to pace themselves, and the weaker students received proddings if they moved too slowly.

Mausner et al. state that the results of this study indicate that CAI units give a great deal of individual attention to weak students, given adequate training of tutors and full participation by an instructor. Mausner et al. also state that CAI frees the strong student to move quickly through the acquisition of the analytical tools necessary to plan and carry out research.

In her paper, Caffarella (1982-83) discusses the introductory graduate level educational statistics course at the University of Maine at Orono which was taught using an interactive computer system. The University of Maine operates a mainframe computer which is an IBM 3031 computer with a VM/370 operating system. The students entered the course with no skill in educational statistics nor any skill in the utilization of computers. By the end of the course, the students were proficient in basic statistical techniques used in educational research and in the use of the computer to calculate various statistics. Student evaluations of the course were very high with many students changing from a negative to positive attitude toward statistics during the semester.

The major computer packages utilized in the Caffarella

study included the Montana State University Interactive Statistical Analysis Program (MSUSTAT) and the Statistical Package for the Social Sciences (SPSS). The MSUSTAT system runs completely interactively and allows the student to calculate simple statistics with relative ease. Caffarella goes on to say that the MSUSTAT system covers such topics as the mean, standard deviation, summary descriptive statistics, and correlations. The SPSS is run in a batch mode system on the University of Maine computer. The student can create an SPSS job, send it to the batch system where it is actually run, and the batch system will route the output back to the interactive system. Using this system, Caffarella states that students study such topics as frequency distributions, t-test, and ANOVA.

Stockburger (1982) reports on an experimental study done at a Midwestern university which evaluated the effect of participation in three computer simulation exercises by a group of students enrolled in an introductory statistics class. The exercises were performed on a Polymorphic 88 microcomputer and they were given by three computer programs. The first computer exercise, "means estimation," required the students to estimate the mean and standard deviation of a set of numbers presented on a Cathode ray tube (CRT). The second program, "normalguess," tested the

ability of students to estimate either the area below a raw-score on a normal curve with a given mean and standard deviation or the raw-score given the area, mean, and standard deviation. No graphing of the normal curve was indicated. The third program, "scattest," presented a 20-point scatterplot on the CRT. The students were then required to estimate the size of the resulting correlation coefficient. For each of these exercises, criteria for a correct response were given which involved both reaction time and student response.

Stockburger also states that one-half of the students in this study were required to participate in these exercises. At a later date, all students were given a paper-and-pencil test of their ability to quickly estimate statistics. Results demonstrated that the students who participated in the exercises attempted significantly more exercises with greater success than those who did not. Stockburger also points out that the estimation exercises were effective in increasing the accuracy and speed with which students estimated statistical parameters. Questionnaire results also indicated that the students felt that the exercises were useful.

Computer Approaches in the Teaching of Statistics

In this section, the various methods that a computer can be utilized in the teaching of statistics will be discussed. In his research, Stockburger (1980) listed five approaches that have been taken concerning the use of computers as an aid in the teaching of statistics: (1) CAI question and answer dialogs, (2) statistics as a tool in the teaching of a computer language, (3) the computer as a computational tool, (4) computer-generated tests and homework, and (5) the computer as simulator.

Anderson (1977) describes a system called CAPS (computer-assisted problem solving system) which utilized the question and answer approach. One part of CAPS asked students to estimate parameters of distributions on the basis of a graphic display. For example, a scatterplot is illustrated on a cathode ray tube (CRT) and the student must guess the correlation coefficient within some specified range. This drill would continue until the student correctly responded to a certain number of estimates.

Tubb and Ringer (1977) in their research found that several programming textbooks, such as Introductory Statistics with FORTRAN by Kirch (1973), used statistics as a vehicle for teaching FORTRAN. These authors state that this textbook attempts to complement and enhance statistical

development. However, Tubb and Ringer state that this textbook overwhelmingly emphasizes the learning of FORTRAN at the expense of the statistical content. This text, Tubb and Ringer state, organizes the introduction of FORTRAN from the simple manipulation of constants to complex operations on arrays.

In his research, Carpenter (1984) did a comparative analysis of 24 statistical packages. One of these, called HSD, has three programs that can be used as a computational tool. One program provides general descriptive statistics (Stats Plus), another provides regression (HSD Regress II), and the third provides analysis of variance (ANOVA II) capabilities. Carpenter states that in addition to the data-handling capabilities and high resolution scatterplots of Stats Plus, Regress II features five regression procedures: simultaneous solution, forward solution, stepwise solution, backward solution, and polynomial regression.

Stockburger (1980) states that he has generated both homework and the problem section of tests on a microcomputer. Relative to the homework assignments, Stockburger states that he selects from a menu of possibilities which appear on a CRT screen. BASIC programs then generate both the problem set and the correct solutions to the problem set. The correct solutions will be provided to the student after his homework

has been submitted and corrected. Stockburger points out that the solution set to the homework problems allows the student to observe the problems worked correctly.

Summary

Whereas CAI has not solved all of the problems in the teaching of statistics, it has been a welcome addition to the classroom by many teachers. CAI in statistics has proved to be of great assistance in providing individualized instruction. The weak student in statistics can now be provided with a great deal of individual attention and the strong student can now progress through the concepts at a much faster pace. Also, with the computer's capability of drawing attractive and precise graphs, graphical interpretations of statistical concepts can now be applied in order to reinforce the learning process.

Other findings in this section indicate that the computer can be used to perform routine numerical calculations, clarify key ideas in statistics, and promote active student participation. CAI can also save students classroom time, can be motivational, and can free the teacher from tedious, time consuming tasks.

Among the approaches that have been used in the teaching of statistics are CAI question and answer dialogs, statistics

as a tool in the teaching of a computer language, the computer as a computational tool, computer generated tests and homework, and the computer as simulator.

Designing Educational Software

In this section, the following topics dealing with software design will be discussed: learning theories, text, feedback, graphics, color and sound, and flowcharting and screen mapping. A summary of this section will be given at the end of this section.

Learning Theories

One important aspect to consider when designing or planning instruction is the applicability of the various educational learning theories. Two main theories of learning in education are the behavior theory of learning and the cognitive theory of learning. B.F. Skinner is one of the foremost proponents of the behavior theory of learning and Robert M. Gagne' has been one of the outspoken advocates of the cognitive theory of learning.

The behavior theory of learning proclaims that all we are and do is shaped through our environment by what Skinner calls "the contingencies of reinforcement." Skinner goes on to say that the contingencies are "the relations that prevail

between behavior on the one hand and the consequences of that behavior on the other" (Green, 1984, p. 23). Skinner claims that what's true for a rat pressing a lever to produce food is true for humans, but on a more complex scale. He believes that we act and think in the ways for which we are reinforced, and cease acting and thinking when reinforcement ceases. Reinforcement comes in many guises, from material rewards such as money and food, to less tangible forms such as approved and "automatic reinforcement" - the inner feeling of mastery or satisfaction.

Skinner has been the developer and the promoter of teaching machines and programmed instruction. With the rise of computer-assisted instruction (CAI), Skinner and his ideas are resurfacing (Green, 1984). Skinner views his teaching machine as an effort to do mechanically what can now be done more effectively with computers. As for the notion of presenting materials and evaluating an answer, Skinner believes that the computer can perform beautifully these activities.

Skinner advocates straightforward CAI with few or no frills (Green, 1984). He says that "the main thing is straight programmed instruction and the design of well-tested programs to teach basic subject matter". He believes that a good program of instruction guarantees a great deal of

success for the learner.

Skinner has this advice for courseware developers (Green,1984):

1. Break the subject matter into small steps that are easily taken. The steps should progress so that after you have taken one, you are in a better position to take the next.
2. A student should learn immediately whether or not he has been successful through feedback.
3. There should be no penalties attached to failure, and no testing while the lesson is being presented.
4. Present the material, and give the student as much assistance as possible in order to obtain the correct answer to questions asked in the program.
5. Test program and revise it.

These are just some of the suggestions Skinner has for developers of CAI.

Gagne' believes that the major change in learning psychology today (Lipsitz, 1982) was the shift from behaviorist, stimulus-response (S-R) psychology to cognitive learning psychology. The cognitive theory is an information-processing kind of theory. This theory says that the initial stimulation that comes to the senses of the learner becomes transformed first into some neural impulses, and then goes

through more than one phase of additional transformation. Each of these transformations is important to learning. See Table 1 for these internal learning processes (Gagne', Wager, & Rojas, 1981). Gagne' goes on to say that the various processes that are proposed as part of the information-processing theory of learning and memory, are the kinds of processes that one needs to take into account when designing instruction (Lipsitz, 1982). It is important to know the kinds of external events that can effect the internal learning process. Gagne' thinks of instruction as a set of external events - deliberately planned ones - whose purpose is to support internal learning processes. The relation of these events to the internal learning processes is denoted in Table 1. More extensive accounts of these relationships are contained by Gagne' (1977) and Gagne' and Briggs (1979).

One of the first steps in designing CAI, so as to take advantage of principles of learning derived from theory and research, is to categorize the type of learning outcomes (Gagne' et al., 1981). This is usually done by examining the target objectives of a lesson, and identifying what type of performance is expected of the learner following instruction. Gagne' (1977) lists five categories of learning outcomes: (1) verbal information; (2) intellectual skills; (3) cognitive strategies; (4) motor skills; and (5) attitudes. Once the

Table 1

Internal Processes of Learning and the External Instructional Events Which May Be Used to Support Them

Internal Learning Process	External Instructional Event
1. Alertness	1. Gaining attention
2. Expectancy	2. Informing learner of lesson objective
3. Retrieval to working memory	3. Stimulating recall of prior learning
4. Selective perception	4. Presenting stimuli with distinctive features
5. Semantic encoding	5. Guiding learning
6. Retrieval and responding	6. Eliciting performance
7. Reinforcement	7. Providing informative feedback
8. Cueing retrieval	8. Assessing performance
9. Generalizing	9. Enhancing retention and learning transfer

learning outcomes have been classified, the courseware designer should proceed with a series of displays that stimulate the learner in accordance with the events outlined in Table 1 (Gagne' et al., 1981).

The planning of CAI needs to make potential provisions for the display of frames containing print and diagrams to reflect all of the nine events of instruction given in Table 1 (Gagne' et al., 1981). However all of the different events are not always presented in each display. Sometimes the learning audience or the learning task makes inclusion of an event unnecessary.

Text

In this section, the appropriate use of text on a screen will be discussed. Kosel (1980) found that materials should be organized to allow frequent interaction between the student and the computer. Large blocks of text that do not give students a chance to respond should be avoided. In their research study, Friend and Milojkovic (1984) indicate that for greatest readability, text should be displayed in both upper-case and lower-case letters, and should be double-spaced. Hathaway (1984) in his research also concluded that the displayed text should be double-spaced and should have 80 characters per line consisting of upper- and lower-case

print. Friend and Milojkovic also state that text should not be crowded at the top or at the left of the screen. These authors go on to say that there should ordinarily be no more than 100 words per exercise for adults. Kosel (1980) indicates that scrolling of the screen should be avoided and that the reading speed should be controlled by the student in order to accomodate the learner's reading capability.

Feedback

In this section, some of the theories concerning the effective use of feedback will be discussed. Feedback is defined as the message which follows the response made by the learner (Cohen, 1985). In her research, Cohen found that some proponents of the operant conditioning theory believe that immediate feedback following correct responses could be used to shape behavior and maintain it in strength (Deterline, 1964; Fry, 1963; Skinner, 1968). Others believe that immediate feedback following positive responses does not act in a reinforcing manner (Anderson, Kulhavy, & Andre, 1972; Bardwell, 1981; Barringer & Gholson, 1979; Kulhavy, 1976)

Cohen (1985) found that still others believe the main function of feedback is not to strengthen or reinforce correct responses, but to locate errors and provide

information so that the learner can correct them (Anderson, 1972; Bardwell, 1981; Barringer & Gholson, 1979; Guthrie, 1971).

One particular kind of feedback message is called knowledge of correct results (KCR). KCR is defined as either a "right" or "wrong" feedback message. Anderson et al. (1972) did a study to determine the effects that knowledge of correct results (KCR) would have on student performance. They found that 100 percent KCR is the most effective, no KCR was the least effective and KCR given after wrong responses only was almost as effective as 100 percent KCR.

Graphics

In this section, research done on computer graphics will be discussed. Computer graphics will be defined as non-textual images displayed on a video screen or printer which are generated by a computer program (MicroSIFT, 1981). Computer graphics should not be included in CAI programs for entertainment purposes, but to enhance learning (Green, 1984; Kosel, 1980; Merrill & Bunderson, 1979; Friend and Milojkovic, 1984). In their research, Merrill and Bunderson (1979) found that graphics can be helpful in exposing learners to new concepts, objects, or events for which they

have no labels or corresponding visual images. They also found that interactive, dynamic computer graphics (those graphics controlled or changed based on user input) offer a unique, but largely unknown, training application potential.

Merrill and Bunderson also indicated that of the various forms of graphic art, simple black-and-white line drawings are the most effective for increasing achievement. In his research, Hathaway (1984) found that color graphics were not statistically different from black-and-white graphics. That is, Hathaway found that black-and-white graphics were just as effective on student performance as color graphics.

Bork (1971) found that graphics can be utilized as an alternate conveyor of information, different from the manner information is conveyed through words or numbers, and for motivational purposes. Bork also found that an advantage video graphics has over textbook graphics is that with video graphics, the entire text and the whole picture do not need to be displayed at once. With textbook graphics, there is no sense of information evolving in time to aid the student in understanding the information. Graphics can also be used for reinforcement (Kosel, 1980; Green, 1984) and to illustrate concepts (Kosel, 1980). The national assessments on the topic of graphics indicate that students should use graphics for the purposes of inferring and predicting (Bestgen, 1980).

Color and Sound

In this section, research studies concerned with the correct use of color and sound in the design of CAI will be discussed. According to research (Merrill and Bunderson, 1979; Green, 1984), color has little demonstrated impact on student performance. Even though color can be used to attract student attention (Kosel, 1980), it should not be used randomly without specific educational objectives in mind (Kosel, 1980; Merrill and Bunderson, 1979). In a research study done by Hathaway (1984), it was found that color graphics were not statistically different from black-and-white graphics. That is, graphics in black-and-white had the same effect on learning as color graphics.

In his research study, Kosel (1980) found that the CAI developer should judiciously make use of sound. The author found that the proper use of headphones, when sound is utilized in a CAI program, can prevent the sound from disturbing the rest of the class.

Flowcharting and Screen Mapping

In this section, research studies concerned with the effective use of flowchart and screen mapping will be discussed. The preparation of a visual representation of the program's flow is an important step in the design process.

Two techniques used are flowcharting (Hord, 1984) and screen mapping (Hord, 1984; Kosel, 1980). Hord defines flowcharting as a graphic description of the steps the programmer will take in presenting lessons to the learner. Screen mapping, says Hord, depicts what the user will see on the computer monitor, and denotes the logical order in which the screens will appear in the program. To prepare a screen map, Hord and Kosel indicate that one should mapout the information that will appear on the computer monitor for each screen. Hord and Kosel also indicate that the screen design should contain information such as the identification of the unit, screen number, and the content of the screen.

Summary

The literature has shown that the designer should always keep in mind the lesson objectives in the design phase of CAI materials. Emphasis should be placed on the proper utilization of the external events of instruction in order to stimulate the internal learning processes. The literature has also shown that proper applications of the learning theories in education should be utilized when designing CAI materials. Two theories of learning and their relation to CAI design were discussed. These theories are the behavior theory of learning and the cognitive theory of

learning.

The literature also revealed that the preparation of a visual representation of the program's flow, and the judicious use of sound, color, and computer graphics, should all be emphasized when designing CAI units. It was also found that computer graphics can be utilized to reinforce the learning process and that black-and-white graphics were just as effective on student learning as color graphics.

Evaluation of CAI Materials

In some sense, judgements will have to be made concerning the quality of a CAI product. One needs to know how "good" is a piece of courseware material that will be used in an educational setting. Unfortunately, no universal set of accepted criteria exists for evaluating educational courseware. However, the literature contains many articles which provide guidelines for assessing the quality of a piece of CAI material.

Walker and Hess (1984) define evaluation of CAI material in three ways: the assessment of the quality of a piece of educational software, the appraisal of the effectiveness of a computer-based program to affect student learning, and the use of the computer's capabilities to assess the progress of a given student through a program of study.

This section will discuss evaluation in courseware development and the levels of evaluation for courseware. A summary for this section will be given at the end of this section.

Evaluation in Courseware Development

In this section, evaluation in courseware development will be discussed. It is generally agreed that some type of evaluation should take place in the development stage as well as the implementation stage of the courseware material (Walker and Hess, 1984; Reeves and Lent, 1982; Tennyson, 1978; McPherson-Turner, 1979). Walker and Hess (1984) give five evaluation options that a developer might consider when writing his CAI programs. From these five options, the developer can best choose those best suited to his particular situation. They are informal evaluations by the developer, systematic reviews using formal criteria, open-ended reviews, field trials, and formal evaluations. In informal evaluation, the courseware developer uses his knowledge and judgement to decide what features will be incorporated in the program. Systematic reviews using formal criteria might include such things as quality of content and goals, instructional quality, and technical quality. Open ended-reviews are done by an experienced courseware reviewer while

field trials consist of trial runs by an audience for whom the courseware is intended. Walker and Hess state that a formal evaluation is a controlled formal field test of the educational effectiveness of the program. These authors point out that such studies are not customary in courseware development.

Levels of Evaluation for Courseware

This section concerns itself with four levels of courseware evaluation. Anderson and Ball (1978) state that the purpose of evaluation during the development and implementation of CAI is to provide decision makers with accurate information which will contribute to decisions about the improvement, continuance, and/or expansion of the program. To accomplish this goal, Reeves and Lent (1982) list four levels of evaluation. These are called documentation, formative evaluation, assessment of immediate learner effectiveness, and impact evaluation.

In their study, Reeves and Lent (1982) consider the documentation level as that level which involves keeping records of when and where various project activities occur, the associated cost, and a record of the participant. Administrators could use documentation data to account for the use of project funds. Formative evaluation is the

collection of the opinions, suggestions, and criticisms of project participants. Assessment of immediate learner effectiveness of CAI involves measuring the degree to which the short-term learning objectives of CAI have been accomplished. One of the most common methods of evaluating immediate learner effectiveness of CAI is to include pretests and posttests in the CAI program.

Reeves and Lent (1982) describe impact evaluation as the process of assessing the long-term effects of CAI. One way to achieve impact evaluation is by using interviews and anecdotal records. These can be used to answer questions concerning the transfer of the knowledge and skills learned through CAI to other environments.

Reeves and Lent noted that very few CAI projects have employed more than one or two levels of evaluation. Many researchers concentrate their efforts at the formative level (Fitzpatrick & Howard, 1976; Muston & Wagstaff, 1976; Rubin, Geller, & Hanks, 1977) using the student questionnaire. On the other hand, other researchers concentrate their efforts on assessing the immediate learner effectiveness of their CAI project by using tests and/or quasi-experimental designs (Fletcher & Suppes, 1976; Su & Eman, 1975; Swigger, 1976).

In general, the kind of formative evaluation utilized will depend on whether the courseware is in the development

or implementation phase (Reeves & Lent, 1982). These authors in their research found that there are two major approaches to formative evaluation. They are internal review and operational testing. Internal review is the process of systematically reviewing the content and instructional processes of CAI before the implementation phase. An internal review includes small-scale pilot tests and expert review. Operational testing is obtained by using computer-based questionnaires, personal interviews, observations by designers and other observers, and measures of participant performance. Reeves and Lent (1982) suggest that designers and other observers might use a systematic review package, such as MicroSIFT's Evaluator's Guide for Microcomputer-Based Instructional Packages (MicroSIFT, 1981), in the operational testing phase of the formative evaluation.

From her research, Duquette (1984) developed a student formative evaluation form using the courseware criteria set forth in the research studies done by Roblyer (1981), Jay (1983), and Cohen (1983). The major categories of Roblyer's study are: essential characteristics, aesthetic characteristics, and differential characteristics. Criteria set forth by Jay's study include: memory and attention demands, text characteristics, graphics and visual processing, and feedback.

Summary

A review of the literature indicates that an evaluation of CAI materials is necessary in order to assess the quality of the CAI material. Evaluations are also performed in order to determine if any revision in the CAI material is necessary. Evaluation should be initiated during the development stage and it should be continued even after the CAI courseware has been implemented in order to continually improve the quality of the courseware materials.

Four levels of evaluation were discussed in this section. One of these levels, formative evaluation, is defined as the collection of the opinions, suggestions, and criticisms of project participants. A formative evaluation will consist of two parts: an internal review and operational testing.

Management Strategies for CAI

A problem which naturally arises in the design of CAI is where the locus of control should lie, with the computer program or with the learner. This section will discuss several studies relevant to this particular question.

Research by some has indicated that when students control the amount of CAI, they sometimes terminate too soon and consequently learn less (Felixbrod & O'Leary, 1974).

Tennyson and Buttrey (1980) attempted to answer the question of whether giving learners information during CAI about their progress would improve learner-control systems and program-control systems.

Tennyson and Buttrey used four groups in their research study dealing with advisement and management strategies in CAI. The 139 participants in this experiment were twelfth grade male and female students in psychology at Eisenhower Senior High School in Hopkins, Minnesota. The concepts discussed in this study - positive reinforcement, negative reinforcement, positive punishment, and negative punishment - were taken from the area of psychology (Tiemann, Kroeker, & Markle, 1977). Three subordinate concepts - stimulus, aversive stimulus, and attractive stimulus - were also discussed along with the concept relating to behavior consequences resulting from the stimulus.

Group 1, the learner-control with advisement group, consisted of students who were given control over the amount and sequence of instruction. Advisement was given following the pretest and after each response. Group 2, adaptive-control with advisement, consisted of students for which the amount and sequence of instruction was determined by the program. Students were advised of their progress at the completion of the pretest and after each response. Group 3,

learner-control without advisement, consisted of students who controlled the amount and sequence of instruction. No advisement was extended to this group. Group 4, adaptive-control without advisement, consisted of learners for which the amount and sequence of instruction were controlled by the program and no advisement was extended.

The results of this research indicated that the variable of advisement was significant in providing students in the learner-control with advisement condition with meaningful information which helped them make the correct decisions about learning the concepts. On the posttest, students in the learner-control with advisement condition did as well as students in the two adaptive-control conditions (each group achieved over 80% correct). Students in the learner-control without advisement scored only 58% on the posttest. Students in the learner-control with advisement condition remained on task long enough to obtain mastery. They were on task about 39% longer than the students in the conventional learner-control condition. Participants in the learner-control-with-advisement group on-task time was 22% less and their amount of instruction was 25% less than the program-control adaptive condition, respectively.

To determine the effect of student characteristics and student control on learning, Fry (1972) utilized three

experimental variables (college aptitude, inquisitiveness, and student control) in a 2 x 2 x 4 factorial design. Fry's three-factor experimental design included four levels of instructional treatment, two "inquiry" levels, and two aptitude levels. The instructional treatments were student-controlled instruction (SCI) treatment, expert treatment, random treatment, and control treatment. The subjects consisted of 192 volunteers in an introductory psychology course taught at Michigan State University during the fall term of 1969 and the winter term of 1970. The topic of discussion was "Computers and How They Work."

In the SCI treatment group, each subject was given a deck of cards, and each card contained a question about computers. Corresponding to each card, there was a videotape segment which answered the question on that card. Each subject could decide the sequence in which he wanted the questions answered. In the expert treatment group, a group of six computer-science instructors predetermined the sequence of instruction. The predetermined sequence was presented as a list of questions identical to those on the SCI cards. The subjects in the random treatment group viewed the video tape segment concerning computers in a completely random order, whereas the subjects in the control treatment group received instruction or information relative to the

computer. No other information concerning this latter group was provided.

Levels of inquiry were derived from a battery of tests by Shulman, Loupe, and Piper (1968). A total high score on these tests reflected individuals having a high level of inquisitiveness. Such individuals were considered to be high in cognitive complexity, preferring the ambiguous, the asymmetrical, and the unexpected. These students were also thought to be high in verbal problem solving. The aptitude levels were determined by standardized scores on college aptitude tests (ACT, CQT, or SAT). The distribution of scores for both inquiry and aptitude was divided at the median of the scores, respectively, in order to determine high and low groups.

Fry concluded that students high in both aptitude and inquisitiveness should be placed in a student controlled instructional treatment. Otherwise, the student should be assigned to an "expert-type" instruction. Fry found that low aptitude students learning under a high degree of student control tend to learn the least when compared to the other methods of instruction.

Johansen and Tennyson (1984) investigated whether learner-control can be facilitated by directly affecting perception of learning need. Perception was defined as the

learner's cognitive attitude toward what is to be learned based in part on previously learned information (Lindsay & Norman, 1977). The participants in this experiment were 48 11th-grade students enrolled in English classes at Eisenhower High School, Hopkins, Minnesota. The CAI in this study was taken from the area of English composition. It consisted of literacy terms, rules for footnoting research papers, and punctuation skills.

To evaluate the advisement-learner-control-management-strategy, three management control strategies were employed. The first strategy was the advisement-learner-control condition consisting of two components (a) an introductory component of instruction used to make the first assessment and (b) the learner-control section which contained the advisement information. The second strategy was the partial-learner-control condition including the introductory section of the first strategy but no advisement in the learner-control section. The third strategy was the conventional learner-control section. It consisted of just one section of continuous instruction with complete learner control and no initial assessment or advisement given.

The results of this experiment indicated that the students using the first strategy, the advisement-learner-control condition, performed better on the posttest than the

students in the other two conditions. Johansen and Tennyson concluded that learner-control can be a useful management strategy for CAI when the learner is told of his learning needs relative to a defined level of mastery. This study also indicated that learners can manage their own instruction and develop responsibility for their learning.

Tennyson (1980) utilized 135 male and female undergraduate students at the University of Madrid (Spain) in a research experiment. These participants were enrolled in an introductory physics course. The CAI concepts discussed were force, power, velocity, speed, molecular molecule, and atom structures. Tennyson considered three management strategies (learner-control, adaptive-control, and learner-adaptive control) in this experiment. This experiment demonstrated that students in a computer-based, learner-control condition learned more effectively if they are informed of their progress toward mastery of a given objective and given advice on the instruction needed to obtain mastery.

A review of the literature on the variable of advisement (Tennyson, Christensen, and Park, 1984) has indicated that (a) participants under a learner-control strategy do not stay on-task long enough to master the concepts discussed; (b) a program-control management strategy should be utilized to

keep learners on task before giving them complete learner-control; and (c) with practice, the learner will gradually improve his ability to make correct decisions concerning advisement information.

Summary

In summary, research on management strategies for CAI indicates that:

a. many students in learner control groups do not stay on task long enough to achieve mastery.

b. with practice, learners will gradually improve in their ability to make correct decisions from advisement information.

c. a program-control management strategy to keep learners on task before giving them full learner-control options results in better overall performance.

d. students high in both aptitude and inquisitiveness should be placed in a student-controlled instructional treatment.

e. low-aptitude students learning under a high degree of student-control tend to learn less when compared to other methods of instruction.

The literature also indicates that even though sophisticated

adaptive systems will in many cases eliminate the concern of premature termination by the learner, these systems still ignore the problem of learner responsibility.

CHAPTER 3

METHOD

In this chapter, the methodology used in the development and evaluation of NORSTAN will be discussed. NORSTAN is the name of the computer courseware program that was developed in this study (see Appendix A). The name NORSTAN originated from the two major topics discussed in this study: the normal distribution and standard scores.

Subjects

The student participants in this study were 59 graduate students matriculating in the College of Education at Louisiana State University during the summer and fall semesters of 1985. The number of subjects participating in the pilot field test was 9. There were 50 students who participated in the 2 x 3 factorial design research experiment. They were randomly assigned to one of three treatment groups. Each participant was categorized as either high-aptitude or low-aptitude, depending on whether his quantitative score was above or below the median of this group's quantitative scores on the Graduate Record Examination (GRE).

Development and Design

In this section, the courseware objectives and other design strategies of NORSTAN will be discussed.

Courseware Objectives

NORSTAN was programmed so that at the end of this courseware lesson, the student will be able to perform the following courseware objectives:

1. Give the distinguishing characteristics of a normal curve.
2. Tell what effect increasing the magnitude of the standard deviation or the mean has on the shape of a normal curve.
3. Determine the points of inflection of a normal curve.
4. Give the distinguishing characteristics of the unit normal curve.
5. Give the points of inflection of the unit normal curve.
6. Approximate the ordinate at a given z-value using a table of ordinates.
7. Give the definition of the term "z-score".
8. Transform a raw-score belonging to a normal population into its equivalent z-score.

9. Transform a z-score into its equivalent raw-score, given the mean and standard deviation of the normal raw-score population.
10. Approximate the proportion of the area under a normal curve lying below a given observation.
11. Compute the percentile rank of a given raw-score under the assumption that the population of raw-scores is normally distributed.
12. Approximate the proportion of the area under a normal curve lying above a given observation.
13. Approximate the proportion of area under a normal curve lying between two given observations.
14. Give the percent of area under a normal curve relative to the curve's standard deviation.
15. Approximate the number of observations that belong to a given normal population relative to the population's standard deviation.
16. Approximate the proportion of the area of a normal distribution lying below one observation and above a second observation.
17. Identify the distinguishing characteristics of a standard-score scale.
18. Transform a raw-score into its equivalent T-score.
19. Determine the percentile rank of a given T-score.

20. Transform a z-score into its corresponding standard-score on a given standard-score scale.
21. Compare the relative performances of the same student on two different tests assuming that the test scores are normally distributed.

Design Strategies for NORSTAN

In this section, the design strategies of NORSTAN will be discussed. NORSTAN is a tutorial computer-assisted instruction (CAI) lesson teaching the normal distribution and standard scores. The Normal Distribution and Standard Scores software package consists of the following seven units.

Unit 1	The Normal Curve
Unit 2	The Unit Normal Curve
Unit 3	z-Scores
Unit 4	Area Under a Normal Curve Lying Either Below or Above a Given Observation
Unit 5	Part 1. Area Under a Normal Curve Lying Between Two Observations. Part 2. Area Under a Normal Curve Relative to the Curve's Standard Deviation

Unit 6	Total Area Under a Normal Curve Lying Below One Observation and Above a Second Observation
Unit 7	Standard Scores

Graphical interpretations of these concepts were provided, when practical, to enhance clarification of the text presented. The purpose of this CAI lesson was to review or teach these concepts to graduate students in education. The prerequisites for this courseware were an understanding of the statistical concepts of the mean, median, mode, and standard deviation.

The NORSTAN courseware program contains both text and graphics. NORSTAN was designed in order to allow frequent interaction between the student and the computer, as Kosel (1980) advocates. No scrolling of the screen was permitted and the reading speed was controlled by the learner in accordance also with Kosel. The text utilized in this program was displayed in both upper-case and lower-case letters, and was double-spaced. Such a strategy is advocated by Hathaway (1984). The text was centered on each screen as Friend and Milojkovic (1984) advocate. The graphs were done in black-and-white. Hathaway (1984) found that graphics in black-and-white had the same effect on learning as color graphics. Sound was not utilized in this courseware in order

to eliminate any distraction that sound might have on the student participants.

The researcher utilized the cognitive theory of learning in the development of this courseware. The display of screens used in NORSTAN reflected the nine events of instruction given by Gagne' (1977). Appropriate use of color, graphs, and highlighting were useful in gaining the learner's attention. The learners were informed of the objectives of the lesson at the beginning of each unit. As the learner worked through the lesson, he was required to utilize the concepts learned in the earlier units. Color, graphs, and highlighting were also used to present stimuli with distinctive features.

The "RULEG" method was used by the programmer to guide student learning. This method requires that the programmer presents the rules to the learner, works some examples to illustrate the concepts in the given rules, and then asks the learner to work a similar problem. The learner was required to answer several questions in this courseware. Feedback was given when the student responded to a given question. The learner was first informed as to whether his answer was right or wrong. If the learner's response was incorrect, the researcher's program would branch in accordance with the remediation necessary for the learner. If the learner's response was correct, he would be allowed to continue to the

next screen. One of the ways the programmer employed to enhance retention and learning transfer was to require the learner to determine the value of a variable in a given formula utilizing the concepts discussed in this lesson.

The text utilized in this study was synthesized from chapter 6 in Glass and Hopkins (1984), chapter 3 in Hopkins and Stanley (1981), and chapter 6 in Glass and Hopkins (1978). Subroutines were incorporated into this program which draw the normal curve, approximate the ordinates of the unit normal curve (Appendix B), shade in the area under a unit normal curve, approximate the area under the normal curve lying below a given z-value (Appendix B), and approximate the area under the unit normal curve lying above a given z-value (Appendix B).

In this study, three management strategies and two aptitude levels were incorporated in a 2 x 3 factorial design in order to determine which strategy was most effective for a given level. The two aptitude levels were low-aptitude learners and high-aptitude learners. Both low-aptitude and high-aptitude learners were determined by the participants' median score on the quantitative portion of the GRE. The first strategy, learner-control (Group 1), consisted of two sections in each of the seven units discussed in this program. Section one consisted of text, examples, and

exercises. Section two consisted of ten review problems of which the learner had complete control over the number of review problems he desired to work. The second strategy, program-control with a mastery criterion and advisement (Group 2), also contained two sections in each of the seven units. Section one of this strategy was identical to section one of strategy one. Section two consisted of five review problems that the learner was given if he answered less than 80% of the exercises in section one. Section two of a given unit was omitted if the learner's score was at least 80%. The third strategy, program-control with neither a mastery criterion nor advisement (Group 3), consisted of only one section, which was identical to section one of the other two strategies.

At the end of each unit, NORSTAN provided the learner with a summary of his results. The summary consisted of the number of correct and incorrect responses in each section, the identity of the questions answered correctly and those answered incorrectly, the response given to each question, and the on-line learning time for each section.

Evaluation of NORSTAN

In this section, an evaluation of the CAI courseware (NORSTAN) developed in this study will be discussed. Three

of the four levels of evaluation advocated by Reeves and Lent (1982) were conducted: documentation, formative evaluation, and assessment of immediate learner effectiveness.

A small scale pilot test using 9 graduate students in education constituted one portion of this evaluation. These students were given a pretest and a posttest to ascertain learner performance on this courseware. The pretest and the posttest were identical, consisting of twenty multiple choice questions. A student evaluation form (see Appendix C), synthesized from an evaluation form given in a research paper by Duquette (1985), was administered to the student to ascertain student reaction data to NORSTAN. Another portion of the pilot test review consisted of a review by a team of experts. This team consisted of a statistical expert and an expert in CAI lesson design. This team utilized the courseware evaluation form developed by MicroSIFT (MicroSIFT, 1981) while conducting its evaluation. In their evaluations, the experts and the student participants considered such questions as:

1. Is the instructional content of the statistical program accurate?
2. Are the principles and applications of effective CAI utilized in NORSTAN?

3. Does the lesson cover all of the planned behavioral objectives?

4. Is NORSTAN interesting and motivating?

These portions of the evaluation process aided in diagnosing and remedying problems within the courseware before the third stage of the evaluation. Subsequently, NORSTAN was revised after taking these recommendations into account.

The second phase of the evaluation consisted of determining which of three management strategies for NORSTAN was the most effective for a given level of aptitude. Fifty graduate students studying in the College of Education at Louisiana State University were used in this phase of the evaluation. The student's posttest scores were used to ascertain which learning strategy was the most effective.

Instrumentation

This CAI lesson was designed to run on the IBM Personal Computer (PC) with Color/Graphics Monitor Adapter and printer. The computer language used in this program was Advanced BASIC (Beginners All-Purpose Symbolic Instruction Code).

The pretest and posttest (see Appendix D) instruments were both 20 item multiple choice criterion-referenced tests. For the pilot study, the pretest and the posttest

instruments were identical.

A complete table of areas and ordinates for the unit normal distribution was derived by the researcher, with the aid of the microcomputer, for the participants in this study (see Appendix B). The researcher was unable to find such a complete table in the literature.

Procedure

The 9 participants for the pilot test of this software package reported to the IBM Open Laboratory in Peabody Hall, room 114, during the summer semester of 1985. The learner was seated at a terminal and was given the pretest. After the pretest, the student was given a printed introduction to the program, which included the contents of the program, how to load the program, and what summary information the program would print. After running the program, the participants were given the posttest. Subsequent to taking the posttest, the learner was given a student evaluation form in order to react to the entire experiment. The participant was then permitted to leave.

The two experts who evaluated this software also reported to the IBM Open Laboratory during the summer semester of 1985. They were given the same information as the participants in the pilot study. To evaluate this

program, however, they were given the courseware evaluation form developed by MicroSIFT (MicroSIFT, 1981).

The 50 students who participated in the 2 x 3 factorial design research experiment were first randomly assigned to one of three management strategies for this software. Each student was later classified as either low-aptitude or high-aptitude depending on his/her quantitative score on the GRE. These learners were given a written introduction to this software package but they were not given a pretest, nor were they asked to evaluate the program. However, each student was given a posttest after running the program in order to determine which version was the most effective for a given level.

Summary

In this chapter, the methodology used in the development and evaluation of NORSTAN were discussed. NORSTAN is a tutorial computer-assisted instruction (CAI) lesson teaching topics on the normal distribution and standard scores. The evaluation of NORSTAN consisted of a small-scale pilot test, a review by a team of experts, and a 2 x 3 factorial design research experiment.

CHAPTER 4

ANALYSIS OF DATA

In this chapter, an analysis of the data collected during the pilot test and the 2 x 3 factorial design experiment will be discussed.

Pilot Test

This section will discuss student performance data, student evaluations, and expert evaluations conducted during the pilot test.

Student Performance

Nine graduate students matriculating in the College of Education at Louisiana State University participated in this pilot study. The means of the pretest and posttest scores were 13.14 and 18.67, respectively (Table 2). At the .01 level of significance, there was a significant difference between pretest and posttest mean scores. The test statistic utilized in this analysis was the dependent t-test. The calculated value of t was 3.838.

The questions presented in this lesson to the learner were of two types. There were exercises incorporated into each unit along with the text, and there was a section of review problems at the end of each unit. Descriptive statistics for each unit are shown in Table 3. The student

Table 2[a]

Number of Observations, Mean, and Standard Deviation of the Pretest and Posttest Scores for the Pilot Experiment

	Pretest	Posttest
N	9	9
M	13.44	18.67
SD	4.16	1.32

[a] Maximum number of questions on the pretest and the posttest was 20.

Note. N denotes the number of participants, M denotes the mean, and SD denotes the standard deviation.

Table 3

Number of Exercises Per Unit, Mean, and Standard Deviation of the Exercises for the Pilot Experiment

Unit of Instruction	n[a]	Mean
Unit 1	6	M = 5.22 SD = 0.83
Unit 2	7	M = 6.00 SD = 1.00
Unit 3	8	M = 7.67 SD = 0.50
Unit 4	6	M = 5.22 SD = 0.67
Unit 5	16	M = 13.56 SD = 1.67
Unit 6	3	M = 2.33 SD = 0.87
Unit 7	7	M = 6.00 SD = 0.87

Note. The number of participants in the pilot study was 9.

[a] The letter n denotes the number of exercises in the given unit.

mean score on the exercises was highest in Unit 3. Unit 5 had at least twice as many exercises as did any of the other units. In this unit, the students answered incorrectly an average of 2.44 exercises out of a possible 16 exercises given. In the remaining units, the students answered incorrectly an average of 1 exercise or fewer.

Relative to the review exercises, the students' mean score was higher in Unit 1 and Unit 2 than in any of the remaining units (Table 4). The students on the average answered incorrectly one review problem or fewer in each of the units given.

Of the seven units included in this lesson, the students spent the most time on Unit 5 and the least time on Unit 6 (Table 5). The time t denotes the total time spent on the text, exercises, and review problems. Overall, the lesson took an average time of 1 hour and 50 minutes to complete.

Student Evaluations

All of the student participants during the pilot test study either agreed or strongly agreed that the objectives and the pretest were helpful in understanding what they were to learn from this program and identifying those parts of the software package they were probably familiar with. The

Table 4

Number of Review Problems Per Unit, Mean, and Standard Deviation of the Review Problems for the Pilot Experiment

Unit of Instruction	n[a]	Mean
Unit 1	5	M = 4.78 SD = 0.44
Unit 2	5	M = 4.78 SD = 0.44
Unit 3	5	M = 4.67 SD = 0.50
Unit 4	5	M = 4.11 SD = 0.60
Unit 5	4	M = 3.22 SD = 1.20
Unit 6	3	M = 2.67 SD = 0.71
Unit 7	5	M = 4.00 SD = 0.50

[a] The letter n denotes the number of review problems.

Table 5[a]

Mean and Standard Deviation On-Line Learning Time Per Unit for the Pilot Experiment

Unit	t(min)
Unit 1	
M	12.00
SD	4.32
Unit 2	
M	9.17
SD	4.28
Unit 3	
M	10.95
SD	5.72
Unit 4	
M	16.92
SD	5.53
Unit 5	
M	38.98
SD	12.01
Unit 6	
M	7.08
SD	3.60
Unit 7	
M	15.15
SD	5.97
Overall	
M	110.27
SD	37.50

[a] Total number of participants was 9.

learners also indicated that this lesson was given in a logical order, that the language was easy to understand, and that there were enough examples and questions during the lesson to help understand the concepts that were taught. The students also agreed that feedback was effectively employed.

Relative to the technical quality of the program, the participants indicated that the screens were easy to read, that there were not too many words on the screens, and that the colors were not distracting. They strongly agreed that the graphics in this program helped to reinforce the concepts discussed.

Overall, the participants indicated that the posttest was generally fair. However, two participants felt that one question on the posttest was ambiguous and needed clarification. This question was subsequently reworded to remove this ambiguity.

All of the student evaluators expressed their approval of this program. They specifically indicated a fondness for the graphics in this program as well as the real-life examples and exercises. However, a few suggestions were made by the student evaluators which were used in the revision of this courseware. Some of the students believed that some of the units had too many similar exercises and that some of these exercises should be eliminated. The students were most

helpful in pointing out a few typing and grammatical errors, and making general suggestions which improved the overall quality of this program. NORSTAN was subsequently revised in order to incorporate these suggestions. All of the learners believed that this program would be very useful for any student desiring to learn or review the concepts discussed in this lesson.

Expert Evaluations

Two experts were selected to evaluate this software program. One is a teaching expert in statistics and the other is an expert in CAI lesson design. Both experts utilized the MicroSIFT Courseware Evaluation Form produced by the Northwest Regional Laboratory to evaluate this software.

Both experts agreed that the content of this program was accurate and had educational value. They also agreed that the purpose of this program was well defined, that the program achieved its defined purpose, that the presentation was clear and logical, and that both graphics and color were used for appropriate instructional reasons. They further agreed that the use of this program was motivational.

With regard to the technical characteristics, both experts indicated that the user support materials were comprehensive, and that teachers should easily be able to

employ this program. The experts also indicated that the intended user should easily and independently be able to operate this program.

On a scale of 1 to 5, with 5 being high and 1 as low, the experts rated this program a 5 with respect to content characteristics. Both experts agreed to recommend the use of this program with few suggested changes to be made. One of the experts indicated that Unit 5 was disproportionately longer than the other units in length, and should be streamlined in order to approximate the others in length. Efforts were made to implement this suggestion, as well as others.

While writing this program, two other experts made valuable suggestions concerning the screen layouts and lesson content of the program. One of these is an expert in statistics and the other is an expert in CAI lesson design. Their suggestions were implemented before the pilot test was initiated.

Factorial Design Experiment

The participants in this 2 x 3 factorial design were matriculating in the college of education at Louisiana State University during the fall semester of 1985. The number of participants was 50 (Table 6). The cell sizes were approximately equal, with each cell consisting of either 8 or 9 students. A one-factor ANOVA was conducted on the participants' GRE quantitative aptitude scores. No significant differences were found among the three treatment groups ($F(2,47) = 0.23$; Group 1 mean = 530.35, Group 2 mean = 520.00, Group 3 mean = 507.06). Relative to the dependent variable of posttest scores, note that for Level 1, Group 1 cell had the highest mean for all of the cells and that for Level 2, Group 1 cell had the lowest. The independent t-test revealed a significance difference between these two cell means at the .05 level of significance. This finding was consistent with the research hypothesis of a significant difference between the posttest scores of high-aptitude learner-control subjects and low-aptitude learner-control subjects.

It should be noted that in Level 1, the group having the highest mean was Group 1. In Level 2, the group having the highest mean was Group 2. These findings were consistent with the review of the literature which advocated a learner-

Table 6

Number of Observations, Mean, and Standard Deviation of the Posttest Scores for the 2 x 3 Factorial Design Experiment

	Group 1[a]	Group 2[b]	Group 3[c]	Overall
	N = 9	8	8	25
Level 1[d]	M = 17.44	16.38	16.25	16.72
	SD = 2.50	3.46	4.03	3.26
	N = 8	8	9	25
Level 2[e]	M = 12.50	15.88	14.33	14.24
	SD = 4.75	4.29	2.45	3.98
	N = 17	16	17	50
Overall	M = 15.12	16.12	15.24	15.48
	SD = 4.41	3.77	3.33	3.81

Note. Maximum posttest score = 20

[a] Student-Control Group

[b] Program-Control with a Mastery Criterion and Advisement

[c] Program-Control with neither a Mastery Criterion nor Advisement

[d] High-Aptitude Learners

[e] Low-Aptitude Learners

control strategy for high-aptitude students and a program-control strategy for low-aptitude subjects.

Table 6 also indicates that Level 1 overall posttest mean was higher than Level 2 overall posttest mean. An ANOVA on the posttest dependent variable indicated that this difference was significant at the .05 level of significance (Table 7). Group 2 had the highest overall mean and Group 1 had the lowest overall mean. An ANOVA on the treatment factor revealed that there was no main effect for the treatment variable (Table 7). Interaction of the aptitude factor and the treatment factor was not significant at the .05 level.

Relative to the exercises, the students' mean score performance for the High-Aptitude Learner-Control Group was the highest for Unit 2 and the lowest for Unit 1 (Table 8). They spent the most time on the text and exercises in Unit 5 and the least amount of time in Unit 7. Overall, the learner took an average time of about 1 hour and 26 minutes to complete the text and exercises. These students requested a greater number of review problems toward the beginning of the program and a lesser number of review problem toward the end.

The average learner in the Low-Aptitude Learner-Control Group took about 1 hour and 58 minutes (Table 9) in order to complete the text and the exercises, whereas the average

Table 7

Analysis of Variance Summary Table for the Dependent Variable of Posttest Mean Score Using the Factors of Treatment and Aptitude

Dependent Variable: Posttest Mean Scores			
Source	DF	SS	F-value
Error	44	582.47	
Treatment	2	11.58	0.44
Aptitude	1	75.03	5.67*
Aptitude x Treatment	2	42.75	1.61

* $p < .05$

Table 8

Number of Exercises, Time on Text and Exercises, Number of Review Problems, Time on Review Problems, Means, and Standard Deviations, for the High-Aptitude Learner-Control Group in the 2 x 3 Factorial Design Experiment

	Exercises	t(min) Text and Exer.	Review Problems	t(min) Review
			[a]	
	n = 6		(5.78)	
Unit 1	M = 4.44	11.65	5.55	2.82
	SD = 0.88	2.89	4.36	2.28
	n = 7		(3.33)	
Unit 2	M = 7	7.18	3.33	1.43
	SD = 0	2.03	4.15	1.84
	n = 8		(3.44)	
Unit 3	M = 7.89	9.36	3.11	2.26
	SD = 0.33	2.24	3.69	2.58
	n = 6		(4.00)	
Unit 4	M = 5.22	11.41	2.89	4.26
	SD = 0.67	2.95	3.62	5.46
	n = 11		(2.67)	
Unit 5	M = 10.33	20.92	2.56	3.34
	SD = 0.71	5.76	4.06	5.77
	n = 8		(2.22)	
Unit 6	M = 7.67	13.84	1.77	4.17
	SD = 0.71	6.96	3.67	8.35
	n = 7		(2.22)	
Unit 7	M = 6.44	12.00	1.78	1.93
	SD = 0.53	3.86	3.56	3.83
	n = 53		(23.56)	
Overall	M = 49	86.35	21.00	20.21
	SD = 2.60	21.33	24.96	27.15

Note. n denotes the number of exercises in the given unit

[a] The learner had the option of working from 0 to 10 review problems. Each number in parenthesis represents the average number of review problem requested.

Table 9

Number of Exercises, Time on Text and Exercises, Number of Review Problems, Time on Review Problems, Means, and Standard Deviations, for the Low-Aptitude Learner-Control Group in the 2 x 3 Factorial Design Experiment

	Exercises	t(min) Text and Exer.	Review Problems	t(min) Review
			[a]	
	n = 6		(5.12)	
Unit 1	M = 4.12	14.36	4.38	3.49
	SD = 1.25	5.18	4.50	3.71
	n = 7		(4.25)	
Unit 2	M = 6.00	9.80	3.25	2.73
	SD = 1.20	2.98	3.88	2.98
	n = 8		(3.25)	
Unit 3	M = 6.38	18.27	1.88	3.70
	SD = 1.68	7.11	2.47	6.30
	n = 6		(3.75)	
Unit 4	M = 4.50	15.38	2.12	4.03
	SD = 1.20	4.98	2.75	6.34
	n = 11		(1.12)	
Unit 5	M = 8.25	25.95	0.88	1.39
	SD = 2.38	4.90	1.64	2.86
	n = 8		(0.50)	
Unit 6	M = 6	16.97	0.13	0.86
	SD = 1.41	4.38	0.35	2.06
	n = 7		(1.62)	
Unit 7	M = 4.25	16.99	1.12	2.28
	SD = 2.05	4.13	2.47	4.25
	n = 53		(19.11)	
Overall	M = 39.50	117.72	13.75	18.48
	SD = 6.70	25.50	13.70	21.66

[a] The learner had the option of working from 0 to 10 review problems. This number represents the average number of problems selected.

student in their high-aptitude counterpart spent an average of 32 minutes less to complete this same portion. This group's mean exercise score in each unit is also less than their high-aptitude counterpart. Their best effort was in Unit 2 and their worst effort was in Unit 7. Note also that this group tended to select a greater number of review problems toward the beginning of the program and a lesser number of review problems toward the end, just as their high-aptitude counterpart.

For the High-Aptitude Program-Control with a Mastery Criterion and Advisory Group, all students were above the 80% mastery level in Unit 2, Unit 3, and Unit 6 (Table 10). Only 1 student was required to work the five review problems in Unit 5 and Unit 7. This group needed the most help in Unit 1, where 5 out of the 8 participants were required to work the section of review problems. The average time for the text and exercises was 1 hour and 22 minutes.

For the Low-Aptitude Program-Control with a Mastery Criterion and Advisory Group, all students were above the 80% mastery level in Unit 5 and Unit 6 (Table 11). These students also had the most difficulty in Unit 1, just as their high-aptitude counterpart. Only 1 student needed the review problems for Unit 2. In each of the remaining sections, only two students required the review problems. The average time

Table 10

Number of Exercises, Time on Text and Exercises, Number of Review Problems, Time on Review Problems, Means, and Standard Deviations, for the High-Aptitude Program-Control with a Mastery Criterion and Advisement Group in the 2 x 3 Factorial Design Experiment

	Exercises	t(min) Text and Exer.	Review Problems	t(min) Review
	n = 6		(k = 5)	
Unit 1	M = 4.38	11.42	4.80	1.92
	SD = 0.92	4.06	0.48	0.69
	n = 7			
Unit 2	M = 6.88	5.92	*	*
	SD = 0.35	1.60		
	n = 8			
Unit 3	M = 7.88	9.69	*	*
	SD = 0.35	3.36		
	n = 6		(k = 3)	
Unit 4	M = 5.25	11.48	3.67	5.16
	SD = 1.04	4.51	1.53	0.58
	n = 11		(k = 1)	
Unit 5	M = 10	20.08	2.00	10.23
	SD = 1.20	1.28	0.00	0.00
	n = 8			
Unit 6	M = 7.75	11.63	*	*
	SD = 0.46	2.38		
	n = 7		(k = 1)	
Unit 7	M = 6.38	12.00	5.00	7.08
	SD = 1.06	3.69	0.00	0.00
	n = 53			
Overall	M = 48.30	82.20		
	SD = 3.07	22.21		

Note. The variable k denotes the number of students out of 8 requiring the 5 review problems.

* Students did not require any review problems

Table 11

Number of Exercises, Time on Text and Exercises, Number of Review Problems, Time on Review Problems, Means, and Standard Deviations, for the Low-Aptitude Program-Control with a Mastery Criterion and Advisement Group in the 2 x 3 Factorial Design Experiment

	Exercises	t(min) Text and Exer.	Review Problems	t(min) Review
	n = 6		(k = 5)	
Unit 1	M = 4.12	15.26	4.60	3.75
	SD = 1.12	9.17	0.55	3.85
	n = 7		(k = 1)	
Unit 2	M = 6.50	9.06	5.00	2.22
	SD = 1.07	3.01	0.00	0.00
	n = 8		(k = 2)	
Unit 3	M = 7.00	15.83	4.00	7.56
	SD = 0.76	2.71	1.41	4.70
	n = 6		(k = 2)	
Unit 4	M = 5.12	14.90	2.50	5.60
	SD = 0.83	4.64	2.12	2.37
	n = 11			
Unit 5	M = 9.88	30.23	*	*
	SD = 0.83	9.07		
	n = 8			
Unit 6	M = 7.87	15.96	*	*
	SD = 0.35	3.94		
	n = 7		(k = 2)	
Unit 7	M = 5.88	18.00	2.50	10.09
	SD = 0.99	6.07	0.71	4.40
	n = 53			
Overall	M = 48.50	119.24		
	SD = 1.85	32.68		

Note. The variable k denotes the number of learners out of 8 requiring the 5 review problems.

* Students did not require any review problems.

spent on the text and exercises was 1 hour and 59 minutes. This was 37 minutes more than their high-aptitude counterpart.

In the High-Aptitude Program-Control with neither a Mastery Criterion nor Advisement Group, the students answered incorrectly 1.5 exercises or fewer in each unit. The students' worst performance was in Unit 1, where they answered only 75% of the exercises correctly, and their best performance was in Unit 2, where they answered 96% of the exercises correctly (Table 12). For the entire lesson, the students in this group answered correctly 48 exercises out of 53. They spent an average time of approximately 1 hour and 41 minutes to complete the entire lesson.

In the Low-Aptitude Program-Control with neither a Mastery Criterion nor Advisement Group, the students' worst performance was in Unit 1, where they answered only 52% of the exercises correctly, and their best performance was in Unit 3, where they answered 86% of the problems correctly (Table 13). For the entire lesson, this group answered an average of 41 exercises out of 53, whereas their high-aptitude counterpart answered an average of 48 exercises out of 53. This group also spent about 2 hours in learning time on this program, which was about 19 minutes more than their high-aptitude counterpart.

Table 12

Number of Exercises, Time on Text and Exercises, Number of Review Problems, Time on Review Problems, Means, and Standard Deviations, for the High-Aptitude Program-Control with neither a Mastery Criterion nor Advisement Group in the 2 x 3 Factorial Design Experiment

	Exercises	t(min) Text and Exercises
Unit 1	n = 6 M = 4.50 SD = 0.92	13.35 2.91
Unit 2	n = 7 M = 6.75 SD = 0.71	8.14 1.75
Unit 3	n = 8 M = 7.38 SD = 1.25	12.16 3.05
Unit 4	n = 6 M = 5.13 SD = 1.25	13.35 3.05
Unit 5	n = 11 M = 10.25 SD = 1.04	23.68 2.80
Unit 6	n = 8 M = 7.63 SD = 0.52	14.56 1.61
Unit 7	n = 7 M = 6.38 SD = 0.92	15.63 2.64
Overall	n = 53 M = 48.00 SD = 5.24	100.87 14.25

Note. The variable n denotes the number of exercises.

Table 13

Number of Exercises, Time on Text and Exercises, Number of Review Problems, Time on Review Problems, Means, and Standard Deviations, for the Low-Aptitude Program-Control with neither a Mastery Criterion nor Advisement Group in the 2 x 3 Factorial Design Experiment

	Exercises	t(min) Text and Exercises
Unit 1	n = 6 M = 3.11 SD = 1.27	13.97 2.26
Unit 2	n = 7 M = 5.33 SD = 1.22	9.19 3.04
Unit 3	n = 8 M = 6.89 SD = 0.78	15.80 5.48
Unit 4	n = 6 M = 4.67 SD = 0.87	16.72 3.30
Unit 5	n = 11 M = 8.89 SD = 1.62	27.86 6.76
Unit 6	n = 8 M = 6.67 SD = 1.22	17.64 3.95
Unit 7	n = 7 M = 5.33 SD = 1.32	19.02 4.30
Overall	n = 53 M = 40.89 SD = 5.49	120.20 19.23

Note. The variable n denotes the number of exercises.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study was concerned with the writing and evaluation of a CAI lesson in statistics, teaching concepts on the normal distribution family and standard scores. The student participants in this study were 59 graduate students matriculating in the College of Education at Louisiana State University during the summer and fall semesters of 1985. The evaluation of this program was essentially conducted in two parts. One part was a small scale pilot test which included a pretest, a posttest, student evaluations, and expert evaluations. The other portion consisted of a 2 x 3 factorial design experiment. One factor, quantitative aptitude, consisted of two levels: low-aptitude and high-aptitude. Low-aptitude and high-aptitude were determined by the students' median score on the quantitative portion of the Graduate Record Examination (GRE). The other factor, management strategy, consisted of three levels: learner-control, program-control with a mastery criterion and advisement, and program-control with neither a mastery criterion nor advisement. The students were randomly assigned to these three levels.

Summary

The following findings pertain to the CAI lesson investigated in this study. The null hypothesis that there would be no significant difference between pretest and posttest mean scores during the pilot test was rejected at the .01 level of significance, indicating that an increase did occur with regard to academic achievement as a result of the CAI lesson. Thus the lesson was effective in teaching the concepts of the normal distribution and standard scores.

The student participants indicated that this CAI lesson was easy to use, effectively covered all of its objectives, that color was effectively utilized, that the graphics helped to reinforce the concepts discussed, and that feedback was effectively used. The students also appreciated the real-life examples, exercises, and review problems contained in this lesson. The student participants did offer a few suggestions which were useful in revising this courseware. The learners were helpful in pointing out typing errors and some grammatical errors. Some of the students indicated that certain units in this courseware contained too many similar exercises. The researcher's program was subsequently revised in order to eliminate some of these exercises.

The expert evaluators agreed that the content of this CAI lesson was accurate, had educational value, and that this

lesson achieved its defined purpose. They particularly felt that the graphics were effectively employed and that color was appropriately utilized. They believed that teachers and students should easily be able to employ this software program.

The following findings pertain to the 2 x 3 factorial design experiment conducted in this study. The high-aptitude learners had a significantly higher posttest score than the low aptitude learners at the .05 level of significance. The null hypothesis of no significant difference in posttest scores for the treatment factor was not rejected at the .05 level of significance. Also, the null hypothesis of no significant difference in posttest scores for the interaction of aptitude and treatment was not rejected at the .05 level of significance. The independent t-test indicated that the mean posttest score of the high-aptitude learner-control students was significantly higher than the mean posttest score of the low-aptitude learner-control students at the .05 level of significance.

The mean on-line total time for high-aptitude learners was significantly lower than the mean on-line total time for low-aptitude learners at the .05 level of significance. There was no significant difference with regard to the mean on-line total time for the three treatment groups.

Furthermore, there was no significant interaction between the treatment factor and the aptitude factor relative to the mean on-line total time. The independent t-test did not indicate that a significant difference in on-line total time existed between the learner-control management strategy and one of the program-control management strategies at any aptitude level at the .05 level of significance.

Conclusions

The following conclusions were drawn on the basis of the data collected in this study.

1. **The mean of the posttest scores for the group of participants in the pilot test study was significantly higher than the mean of their pretest scores.**

This conclusion indicated that the microcomputer with its graphical, computational, and other capabilities can be effectively utilized to teach the concepts of the normal distribution and standard scores, provided that proper CAI programming guidelines are followed. The microcomputer effectively generated attractive graphs, performed numerical computations, clarified key concepts, promoted active student participation, improved student attitudes toward the use of computers in the learning situation, and individualized instruction. These findings were consistent with the reasons for using CAI which were given in the literature (Anderson,

1984; Collis, 1983; Skavaril, 1974; Splittgerber, 1979; Wassertheil, 1979).

Stockburger (1982) found that the computer could be effectively used to test the ability of students to estimate either the area below a raw-score under a normal curve with a given mean and standard deviation or the raw-score given the area, mean, and standard deviation. However, Stockburger did not use the graphical capabilities of the computer to teach these concepts. The researcher's courseware program utilized graphics in teaching these concepts which helped to illuminate the concepts discussed.

2. High-aptitude learner-control students had a significantly higher posttest mean score than low-aptitude learner-control students in the 2 x 3 factorial design experiment.

This conclusion was much stronger than that of Fry (1972) who concluded that a learner high in both aptitude and inquisitiveness should be placed in a learner-control instruction treatment. The researcher found that students high in aptitude only can be assigned to a learner-control instruction treatment. This conclusion was further consistent with the findings of Fry (1972), who found that low-aptitude students learned less under a high degree of learner-control and learned more under an "expert type" of instruction. The researcher's finding was inconsistent with that of Johansen and Tennyson (1984) who concluded that

learners can manage their own instruction and develop responsibility for their learning.

3. The data collected in this study indicated a trend of assigning low-aptitude students to a program-control management strategy.

This finding was consistent with the review of the literature done by Tennyson, Christensen, and Park (1984) who found that using a program-control management strategy to keep learners on task before giving them full learner-control options will result in better overall performance. This conclusion was inconsistent with that of Johansen and Tennyson (1984) who found that learners can manage their own instruction.

4. There was no significant difference in on-line total time among the three treatment groups. The high-aptitude learners on-line total time was significantly less than their low-aptitude counterpart. There was no significant difference in on-line total time between the learner-control management strategy and one of the program control management strategies at any level.

Tennyson and Buttrey (1980) found that learners under a program-control with advisement strategy spent the same amount of on-line time as learners did under a program-control without advisement strategy. They also found that students in a learner-control strategy given advisement would master the objective in less time than in a program-control adaptive system. In the present study, the researcher concluded that there was no significant difference in on-line

time among the three treatment groups in either a learner-control strategy, a program-control with a mastery criterion and advisement strategy, or a program-control with neither a mastery criterion nor advisement strategy.

5. Gagne's cognitive theory of learning was effectively utilized in the development of this courseware.

Gagne's nine events of instruction (Gagne', Wager, & Rojas, 1981) were effectively employed in the design of the instruction contained in this courseware. The student participants indicated that this courseware covered all of its objectives, that color and graphics were effectively employed, and that feedback was effectively used. The students also liked the real-life examples, exercises, and review problems given in this courseware. These are just some of the external instructional events used to support the internal learning processes as outlined by Gagne'.

Recommendations

Based on the data collected in this study, the researcher makes the following recommendations. Primary and supplementary CAI should be used in the teaching of concepts on the normal distribution family and standard scores. A learner-control management strategy is recommended for high-aptitude learners and a program-control management strategy is recommended for low-aptitude learners when

teaching statistics by means of CAI. The researcher recommends that the learners be given a pretest, a posttest, and be permitted to utilize this courseware over an extended period of time rather than as a single block of instruction. Additionally, use of the cognitive theory of learning in the development of CAI as advocated by Gagne' (1977) is recommended.

The researcher further recommends the consideration of using a larger sample size and larger cell sizes when performing research experiments of this type. The collection of demographic data, such as gender and age, is also recommended in order to determine if these variables are influenced by the management strategies used in courseware development in any way. A study of the participants' attitudes in studies similar to the researcher's is recommended in order to ascertain which management strategy the learners prefer most.

The researcher recommends a study be conducted to see if this CAI courseware is effective as or superior to traditional instructional methods as claimed by Aiken and Braun (1980), and Dence (1980). This courseware package can be used over a long period of time and in this sense it is quite an economical package, when compared to the traditional methods of instruction. A study similar to the researcher's

should be conducted in other subject areas, such as mathematics and physics, and then compare these findings with the conclusions of this study. The researcher also recommends revising the difficulty level of this courseware package and examining the effectiveness of the software with undergraduate students.

Based upon the results of this study, it appears that it is useful to teach graduate students in education statistics by means of CAI. Furthermore, the microcomputer appears to be a useful medium through which this task can be accomplished. The results of this study also indicate that developers of CAI should consider appropriate management strategies for learners in their courseware design.

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APPENDIX A

LEARNER-CONTROL VERSION OF NORSTAN

```
10 'Unit 1
20 COMMON NAMS,NOS
30 KEY OFF
40 SCREEN 0,1: COLOR 15,1,11: CLS
50 LOCATE 7,25: PRINT"The Normal Distribution Family"
60 LOCATE 9,39: PRINT"and"
70 LOCATE 11,32: PRINT"Standard Scores"
80 LOCATE 13,39: PRINT"by"
90 LOCATE 15,32: PRINT"Preston Dinkins"
100 LOCATE 23,58: PRINT"Press the enter key."
110 A$ = INKEY$: IF A$ = "" THEN 110
120 SCREEN 0,1: COLOR 15,1,11: CLS
130 LOCATE 1,35: PRINT"Screen ii"
140 LOCATE 5,1
150 PRINT"           Type in your complete name (e.g., Mary J. Doe) and"
160 PRINT""
170 INPUT"      press the enter key.";NAMS
180 PRINT""
190 PRINT""
200 PRINT"           Type in your student number (e.g., 438-96-8209) and"
210 PRINT""
220 INPUT"      press the enter key.";NOS
230 'screen 20
240 CLS:LOCATE 1,35: PRINT"Screen iii"
250 LOCATE 3,36
260 PRINT"Contents"
270 LOCATE 5,1
280 PRINT"          Unit 1    The Normal Curve."
290 PRINT"          Unit 2    The Unit Normal Curve."
300 PRINT"          Unit 3    z-Scores."
310 PRINT"          Unit 4    Area Under a Normal Curve Lying Below or Above"
320 PRINT"                    a Given Observation."
330 PRINT"          Unit 5    Part 1. Area Under a Normal Curve Lying Between"
340 PRINT"                    Two Observations."
350 PRINT"                    Part 2. Area Under a Normal Curve Relative to"
360 PRINT"                    the Curve's Standard Deviation."
370 PRINT"          Unit 6    Total Area Under a Normal Curve Lying Below One"
380 PRINT"                    Observation and Above a Second Observation."
390 PRINT"          Unit 7    Standard Scores.
400 LOCATE 23,58: PRINT"Press the enter key."
410 AS=INKEYS: IF AS="" THEN 410
420 SCREEN 0,1: COLOR 15,1,11:CLS
430 LOCATE 10,37
440 PRINT"Unit 1"
450 LOCATE 12,32
460 PRINT"The Normal Curve"
470 LOCATE 23,58: PRINT"Press the enter key."
480 AS=INKEYS:IF AS="" THEN 480
490 SCREEN 0,1: COLOR 15,1,11: CLS
500 LOCATE 1,32: PRINT"Unit 1:  Screen iv"
510 LOCATE 5,1
520 TIMES = "00:00:00"
530 R=0: P=0
540 PRINT"      Objectives:  At the end of this unit, the student should be"
550 PRINT""
560 PRINT"                   able to:
570 PRINT""
580 PRINT"                   1. Give the distinguishing characteristics"
590 PRINT""
600 PRINT"                      of a normal distribution."
610 PRINT""
620 PRINT"                   2. Tell what effect increasing the magnitude of the
"
630 PRINT""
640 PRINT"                      standard deviation or the mean has on the shape
of"
```

```
650 PRINT""
660 PRINT"                        a normal curve."
670 PRINT""
680 PRINT"                    3. Determine the points of inflection of a normal c
urve."
690 LOCATE 23,58: PRINT"Press the enter key."
700 A$ = INKEY$: IF A$="" GOTO 700
710 'screen 1
720 GOTO 950
730 SCREEN 2:CLS
740 S=100
750 A=240
760 PI=3.141593
770 XC=320:YC=100
780 LINE (0,YC+2)-(639,YC+2),1
790 LINE(639,0)-(639,101),1
800 'DRAW GRAPH
810 X1=-3:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
820 X2=-2.8:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
830 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
840 FOR X=-2.8 TO 3.2 STEP .2
850 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
860 LINE - (XC+S*X,YC+Y),1
870 NEXT X
880 LOCATE 13,1
890 PRINT "x"
900 LOCATE 14,40
910 PRINT"m"
920 LOCATE 1,79
930 PRINT "y"
940 RETURN
950 GOSUB 730
960 PRINT"Unit 1:  Screen 1"
970 LOCATE 16,1
980 PRINT"              The graph of a normal distribution is a bell-shaped"
990 PRINT""
1000 PRINT"         curve as shown above. Notice that the highest point on this"

1010 PRINT""
1020 PRINT"         curve occurs at the mean m of the distribution."
1030 LOCATE 23,58:PRINT"Press the enter key."
1040 A$=INKEY$: IF A$="", GOTO 1040
1050 IF J17=1 GOTO 9330
1060 IF J12=1 GOTO 1320
1070 IF J11 = 1 GOTO 1320
1080 IF I11=1 THEN  1320
1090 'screen 2
1100 SCREEN 0,1: COLOR 15,1,11:CLS
1110 LOCATE 1,32:PRINT"Unit 1:  Screen 2"
1120 LOCATE 6,1
1130 PRINT"              A normal distribution is one which can be approximated"

1140 PRINT""
1150 PRINT"         by an equation of the form:
1160 PRINT""
1170 PRINT"                        y = N/[sqr(2*pi)*s]*exp[-(X-m)^2/2*s^2],"
1180 PRINT""
1190 PRINT"         where N is a parameter determined by the size of the normal
"
1200 PRINT""
1210 PRINT"         distribution, sqr = square root, * = multiplication, pi = 3
.141593,
1220 PRINT""
1230 PRINT"         exp = 2.71828, m = the mean of the normal distribution, s =

1240 PRINT""
1250 PRINT"         the standard deviation of the normal distribution, and ^ ="
```

```
1260 PRINT""
1270 PRINT"          exponent. You will not need to memorize this equation."
1280 LOCATE 23,58
1290 PRINT"Press the enter key."
1300 A$=INKEY$: IF A$="" THEN 1300
1310 'screen 3
1320 GOSUB 730
1330 LOCATE 1,1
1340 PRINT"Unit 1:  Screen 3"
1350 LOCATE 17,1
1360 PRINT "              A normal distribution is symmetric about the mean m an
d has "
1370 PRINT""
1380 PRINT "          only one mode. The mean, the median, and the mode of a give
n normal"
1390 PRINT""
1400 PRINT "          distribution are all equal.
1410 LOCATE 23,58
1420 PRINT"Press the enter key."
1430 A$=INKEY$: IF A$="" GOTO 1430
1440 IF J16=1 GOTO 2180
1450 IF J12 = 1 GOTO 7300
1460 IF J11 = 1 GOTO 6820
1470 IF I12=1 GOTO 1860
1480 'screen 4
1490 SCREEN 0,1: COLOR 15,1,11:CLS
1500 LOCATE 1,32:PRINT"Unit 1:  Screen 4"
1510 LOCATE 7,1
1520 PRINT"       Exercise 1.  A normal distribution has a mean of 10 and a stan
dard"
1530 PRINT""
1540 PRINT"                    deviation of 40. The highest point on the graph o
f"
1550 PRINT""
1560 PRINT"                    this distribution occurs when x = ?"
1570 PRINT""
1580 PRINT"                           a.  the median of the distribution"
1590 PRINT"                           b.  the mode of the distribution"
1600 PRINT"                           c.  10"
1610 PRINT"                           d.  all of the above"
1620 PRINT"                           e.  40"
1630 PRINT""
1640 INPUT"                    Type a, b, c, d, or e, and press the enter key";
B$
1650 IF I11 = 0 THEN A11$ = B$
1660 IF I11 = 1 THEN B11$ = B$
1670 IF B$ = "a" OR B$ ="A" OR B$ = "b" OR B$ = "B" OR B$ ="c" OR B$ = "C" OR B$
 = "d" OR B$ = "D" OR B$ = "e" OR B$ = "E" THEN 1710 ELSE 1680
1680 LOCATE 19,1
1690 PRINT"
  "
1700 LOCATE 19,1: GOTO 1640
1710 PRINT""
1720 IF B$="d" OR B$ = "D" THEN PRINT"                    Your response is corre
ct." ELSE 1740
1730 R11=1: GOTO 1930
1740 IF I11=1 THEN GOTO 1810
1750 PRINT"                    Your response is incorrect. Press the enter key f
or"
1760 PRINT""
1770 PRINT"                    further explanation."
1780 A$=INKEY$: IF A$="" GOTO 1780
1790 I11=1: R=R+1
1800 GOTO 710
```

```
1810 W11=1: PRINT""
1820 PRINT"                    Your response is incorrect. The correct answer is
 d."
1830 LOCATE 23,58: PRINT"Press the enter key."
1840 A$ = INKEY$: IF A$ = "" GOTO 1840
1850 'screen 5
1860 SCREEN 0,1:COLOR 15,1,11:CLS
1870 LOCATE 1,32:PRINT"Unit 1: Screen 5"
1880 LOCATE 7,1
1890 PRINT"      Exercise 2.  The mean of a normal curve determines the:"
1900 PRINT""
1910 PRINT"                          a.  position of the curve"
1920 PRINT"                          b.  size of the curve"
1930 PRINT"                          c.  shape of the curve"
1940 PRINT"                          d.  standard deviation of the curve"
1950 PRINT"                          e.  none of the above"
1960 PRINT""
1970 INPUT"                    Type a, b, c, d, or e, and press the enter key"; B
$
1980 IF I12=0 THEN A12$ = B$
1990 IF I12=1 THEN B12$ = B$
2000 IF B$ = "a" OR B$ ="A" OR B$ = "b" OR B$ = "B" OR B$ ="c" OR B$ = "C" OR B$
 = "d" OR B$ = "D" OR B$ = "e" OR B$ = "E" THEN 2040 ELSE 2010
2010 LOCATE 15,1
2020 PRINT"
   "
2030 LOCATE 15,1: GOTO 1970
2040 PRINT""
2050 IF B$="a" OR B$ = "A" THEN PRINT"                  Your response is correc
t." ELSE 2070
2060 R12=1: GOTO 2160
2070 IF I12=1 THEN GOTO 2140
2080 PRINT"                    Your response is incorrect. Press the enter key fo
r"
2090 PRINT""
2100 PRINT"                    further explanation."
2110 A$=INKEY$: IF A$="" GOTO 2110
2120 I12=1: R=R+1
2130 GOTO 1310
2140 W12=1: PRINT""
2150 PRINT"                    Your response is incorrect. The correct answer is
a."
2160 LOCATE 23,58: PRINT"Press the enter key."
2170 A$ = INKEY$: IF A$ = "" GOTO 2170
2180 'screen 6
2190 GOSUB 730:LOCATE 1,1:PRINT"Unit 1:  Screen 6"
2200 LOCATE 12,4:PRINT"tail":LOCATE 12,72:PRINT"tail"
2210 LOCATE 16,1
2220 PRINT"            The tails of a normal curve approach the horizontal axis"

2230 PRINT""
2240 PRINT "       as the tails deviate from the mean m, but the tails never qui
te"
2250 PRINT""
2260 PRINT "       touch the horizontal axis. The horizontal axis is said to be"

2270 PRINT""
2280 PRINT "       the asymptote of the graph."
2290 LOCATE 23,58
2300 PRINT"Press the enter key."
2310 A$=INKEY$: IF A$="" THEN 2310
2320 IF J18=1 GOTO 9750
2330 IF J16=1 GOTO 8910
2340 IF J13 = 1 GOTO 7720
2350 'screen 7
2360 SCREEN 0,1: COLOR 15,1,11: CLS
2370 LOCATE 1,32: PRINT"Unit 1:  Screen 7"
```

```
2380 LOCATE 7,1
2390 PRINT"               The normal distribution family can be represented by"
2400 PRINT""
2410 PRINT"          a family of curves. There is a different normal curve for"
2420 PRINT""
2430 PRINT"          each distinct pair of mean and standard deviation. Press"
2440 PRINT""
2450 PRINT"          the enter key for an illustration of this fact."
2460 LOCATE 23,58: PRINT"Press the enter key."
2470 AS=INKEYS: IF AS="" GOTO 2470
2480 'screen 8
2490 CLS
2500 SCREEN 2: LOCATE 1,31:PRINT"Unit 1:  Screen 8"
2510 M=50: S=7
2520 GOSUB 2540
2530 GOTO 2690
2540 T=10
2550 A=600
2560 PI=3.141593
2570 XC=-300:YC=100
2580 LINE (0,YC+2)-(639,YC+2),1
2590 LINE(639,0)-(639,101),1
2600 'DRAW GRAPH
2610 X1=-3*S+M:Y1=-A*1/(S*SQR(2*PI))*EXP(-(((X1-M)/S)^2)/2)
2620 X2=-3*S+M+.1:Y2=-A*1/(S*SQR(2*PI))*EXP(-(((X2-M)/S)^2)/2)
2630 LINE(XC+T*X1,YC+Y1)-(XC+T*X2,YC+Y2),1
2640 FOR X=-3*S+M+.2 TO 3*S+M STEP .2
2650 Y=-A*1/(S*SQR(2*PI))*EXP(-(((X-M)/S)^2)/2)
2660 LINE - (XC+T*X,YC+Y),1
2670 NEXT X
2680 RETURN
2690 LOCATE 13,1
2700 PRINT "x"
2710 LOCATE 1,79
2720 PRINT "y"
2730 LOCATE 3,1: PRINT"s = standard deviation"
2740 LOCATE 4,1: PRINT"m = mean"
2750 LOCATE 11,9: PRINT"s = 7"
2760 LOCATE 14,24: PRINT"m = 50"
2770 M=70 : S=5
2780 GOSUB 2540
2790 LOCATE 9,39: PRINT"s = 5"
2800 LOCATE 14,48: PRINT"m = 70"
2810 M=80: S=3
2820 GOSUB 2540
2830 LOCATE 5,55: PRINT"s = 3"
2840 LOCATE 14,61: PRINT"m = 80"
2850 LOCATE 17,1
2860 PRINT"       Example 1.  Notice that there is a different normal curve for "

2870 PRINT""
2880 PRINT"                   each different pair of mean and standard deviation.
"
2890 LOCATE 23,58: PRINT"Press the enter key."
2900 AS=INKEYS: IF AS="" GOTO 2930
2910 'screen 9
2920 SCREEN 0,1: COLOR 15,1,11: CLS
2930 LOCATE 1,31:PRINT"Unit 1: Screen 9":LOCATE 7,1
2940 PRINT"               If the mean of a normal curve is allowed to vary and th
e"
2950 PRINT""
2960 PRINT"          standard deviation is held fixed, the resulting graphs will
"
2970 PRINT""
2980 PRINT"          have the same shape as the original graph. For an illustrat
```

```
ion"
2990 PRINT""
3000 PRINT"          of this fact, press the enter key."
3010 LOCATE 23,58: PRINT"Press the enter key."
3020 AS=INKEYS: IF AS="" GOTO 3020
3030 'screen 10
3040 SCREEN 2: CLS: LOCATE 1,36:PRINT"Unit 1: Screen 10"
3050 T=10
3060 A=600
3070 PI=3.141593
3080 XC=-300:YC=100
3090 LINE (0,YC+2)-(639,YC+2),1
3100 M = 50: S = 5
3110 GOSUB 3130
3120 GOTO 3220
3130 'DRAW GRAPH
3140 X1=-3*S+M:Y1=-A*1/(S*SQR(2*PI))*EXP(-(((X1-M)/S)^2)/2)
3150 X2=-3*S+M+.1:Y2=-A*1/(S*SQR(2*PI))*EXP(-(((X2-M)/S)^2)/2)
3160 LINE(XC+T*X1,YC+Y1)-(XC+T*X2,YC+Y2),1
3170 FOR X=-3*S+M+.2 TO 3*S+M STEP .2
3180 Y=-A*1/(S*SQR(2*PI))*EXP(-(((X-M)/S)^2)/2)
3190 LINE - (XC+T*X,YC+Y),1
3200 NEXT X
3210 RETURN
3220 LOCATE 13,1
3230 PRINT "x"
3240 FOR X = 100 TO 600 STEP 20
3250 LINE (X,130) - (X,102)
3260 NEXT X
3270 LOCATE 14,1
3280 PRINT"            40          50          60          70          80
    90"
3290 LOCATE 16,1
3300 PRINT"      Example 2.  The normal distribution above has a mean of 50 and
a"
3310 PRINT"                  standard deviation of 5. Let us hold the standard"
3320 PRINT"                  deviation constant at 5 and vary the value of the m
ean."
3330 PRINT""
3340 INPUT"      Type in the number 65 (for the mean) and press the enter key.";
MS
3350 IF MS <> "65" GOTO 3360 ELSE 3400
3360 LOCATE 20,1
3370 PRINT"
  "
3380 LOCATE 20,1
3390 GOTO 3340
3400 M = 65: GOSUB 3130
3410 INPUT"      Type in the number 74 (for the mean) and press the enter key.";
MS
3420 IF MS <> "74" GOTO 3430 ELSE 3470
3430 LOCATE 21,1
3440 PRINT"
   "
3450 LOCATE 21,1
3460 GOTO 3410
3470 M = 74: GOSUB 3130
3480 LOCATE 23,58: PRINT"Press the enter key."
3490 AS=INKEYS: IF AS="" GOTO 3490
3500 IF I14=1 GOTO 4640
3510 'screen 11
3520 SCREEN 0,1: COLOR 15,1,11: CLS
3530 LOCATE 1,32:PRINT"Unit 1:  Screen 11"
3540 LOCATE 6,1
3550 PRINT"                    Let us now hold the mean fixed and allow the "
3560 PRINT""
3570 PRINT"              standard deviation to vary. As the standard deviation"
```

```
3580 PRINT""
3590 PRINT"              increases, the spread of the normal distributions"
3600 PRINT""
3610 PRINT"              becomes flatter."
3620 LOCATE 23,58
3630 PRINT"Press the enter key."
3640 AS=INKEYS: IF AS="" GOTO 3640
3650 'screen 12
3660 SCREEN 2: CLS
3670 LOCATE 1,32:PRINT"Unit 1: Screen 12"
3680 T=10
3690 A=440
3700 PI=3.141593
3710 XC=-485:YC=100
3720 LINE (0,YC+2)-(639,YC+2),1
3730 M = 80: S=3
3740 GOSUB 3760
3750 GOTO 3850
3760 'DRAW GRAPH
3770 X1=-3*S+M:Y1=-A*1/(S*SQR(2*PI))*EXP(-(((X1-M)/S)^2)/2)
3780 X2=-3*S+M+.1:Y2=-A*1/(S*SQR(2*PI))*EXP(-(((X2-M)/S)^2)/2)
3790 LINE(XC+T*X1,YC+Y1)-(XC+T*X2,YC+Y2),1
3800 FOR X=-3*S+M+.2 TO 3*S+M STEP .2
3810 Y=-A*1/(S*SQR(2*PI))*EXP(-(((X-M)/S)^2)/2)
3820 LINE - (XC+T*X,YC+Y),1
3830 NEXT X
3840 RETURN
3850 LOCATE 5,1:PRINT"s = standard deviation"
3860 LOCATE 14,1
3870 PRINT"                  62      68      74      80      86      92      98 "
3880 FOR X=105 TO 525 STEP 30 : LINE (X,102) - (X,104)
3890 NEXT X
3900 LINE (332,48) - (365,40)
3910 LOCATE 5,48: PRINT "s = 3"
3920 LOCATE 16,1
3930 PRINT"      Example 3.  The above graph has a mean of 80 and a standard"
3940 PRINT"                  deviation of 3. We will hold the mean constant"
3950 PRINT"                  and allow the standard deviation to vary.
3960 PRINT""
3970 INPUT"                  Type in the number 5 and press the enter key."; SS
3980 IF SS<>"5" GOTO 3990 ELSE 4030
3990 LOCATE 20,1
4000 PRINT"
"
4010 LOCATE 20,1
4020 GOTO 3970
4030 S=5: GOSUB 3760
4040 LINE (332,67) - (363,57)
4050 LOCATE 7,47:PRINT"s = 5"
4060 LOCATE 21,1
4070 INPUT"                  Type in the number 7 and press the enter key."; SS
4080 IF SS<>"7" GOTO 4090 ELSE 4130
4090 LOCATE 21,1
4100 PRINT"
"
4110 LOCATE 21,1
4120 GOTO 4070
4130 S=7: GOSUB 3760
4140 LINE (450,95) - (483,89)
4150 LOCATE 11,62: PRINT"s = 7"
4160 LOCATE 23,58: PRINT"Press the enter key."
4170 AS=INKEYS: IF AS="" GOTO 4170
4180 IF J19=1 GOTO 10130
4190 IF J14=1 GOTO 8100
4200 IF I15=1 GOTO 5250
```

```
4210 LOCATE 15,1
4220 PRINT"
   "
4230 PRINT"
"
4240 PRINT"
  "
4250 PRINT"
"
4260 PRINT"
"
4270 PRINT"
"
4280 PRINT"
"
4290 PRINT"
"
4300 PRINT"
          "
4310 PRINT"                                                                    "
4320 LOCATE 1,1:
4330 PRINT"                                                                    "
4340 LOCATE 1,1
4350 LOCATE 1,32:PRINT"Unit 1:  Screen 13"
4360 LOCATE 14,1
4370 PRINT"      Exercise 3.  If the mean of a normal curve is held fixed and th
e"
4380 PRINT"                   standard deviation is allowed to increase, the res
ulting"
4390 PRINT"                   shapes of the normal curves become more pointed."
4400 PRINT""
4410 PRINT"                   Type t if true or f if false and press the"
4420 INPUT"                   enter key. "; BS
4430 PRINT""
4440 IF I13=0 THEN A13$ = BS
4450 IF I13=1 THEN B13$ = BS
4460 IF BS="t" OR BS="T" OR BS = "f" OR BS = "F" THEN 4520 ELSE 4470
4470 LOCATE 18,1
4480 PRINT"
   "
4490 PRINT"
   "
4500 LOCATE 18,1
4510 GOTO 4410
4520 IF BS="f" OR BS = "F" THEN PRINT"                    Your response is correc
t." ELSE 4540
4530 R13=1: GOTO 4600
4540 IF I13=1 GOTO 4580
4550 PRINT"                   Incorrect. Press the enter key for further explana
tion."
4560 AS=INKEYS: IF AS="" GOTO 4560
4570 I13=1: R=R+1: GOTO 3520
4580 W13=1
4590 PRINT"                   Incorrect. The correct answer is f."
4600 LOCATE 23,58
4610 PRINT"Press the enter key."
4620 AS=INKEYS: IF AS="" GOTO 4620
4630 'screen 14
4640 SCREEN 0,1: COLOR 15,1,11:CLS
4650 LOCATE 1,32:PRINT"Unit 1:  Screen 14"
4660 LOCATE 3,1
4670 PRINT"      Exercise 4.  One normal distribution has a mean of 50 and a"
4680 PRINT""
4690 PRINT"                   standard deviation of 10. A second normal "
4700 PRINT""
4710 PRINT"                   distribution has a mean of 80 and a standard"
```

```
4720 PRINT""
4730 PRINT"                    deviation of 10. If the two distributions are"
4740 PRINT""
4750 PRINT"                    approximated by the same normal distribution"
4760 PRINT""
4770 PRINT"                    formula, then:"
4780 PRINT""
4790 PRINT"                      a.  the second graph lies to the right of the fi
rst"
4800 PRINT"                      b.  the graphs have the same shape"
4810 PRINT"                      c.  the second graph lies to the left of the fir
st"
4820 PRINT"                      d.  the graphs coincide"
4830 PRINT"                      e.  a and b"
4840 PRINT""
4850 INPUT"                    Type a, b, c, d, or e and press the enter key";BS
4860 IF I14=0 THEN A14$ = BS
4870 IF I14=1 THEN B14$ = BS
4880 IF BS = "a" OR BS ="A" OR BS = "b" OR BS = "B" OR BS ="c" OR BS = "C" OR BS
 = "d" OR BS = "D" OR BS = "e" OR BS = "E" THEN 4930 ELSE 4890
4890 LOCATE 21,1
4900 PRINT"
   "
4910 LOCATE 21,1
4920 GOTO 4850
4930 PRINT""
4940 IF BS="e" OR BS="E" THEN PRINT"                  Your response is correct.
" ELSE 4960
4950 R14=1: GOTO 5010
4960 IF I14=1 GOTO 5000
4970 PRINT"                    Incorrect. Press the enter key for further explana
tion."
4980 A$=INKEY$: IF A$="" GOTO 4980
4990 I14=1: R=R+1: GOTO 2920
5000 W14=1: PRINT"                   Incorrect. The correct answer is e."
5010 LOCATE 23,58
5020 PRINT"Press the enter key."
5030 A$=INKEY$: IF A$="" GOTO 5030
5040 'screen 15
5050 SCREEN 0,1: COLOR 15,1,11:CLS
5060 LOCATE 1,32:PRINT"Unit 1:  Screen 15"
5070 LOCATE 3,1
5080 PRINT"      Exercise 5.  One normal distribution has a mean of 80 and a"
5090 PRINT""
5100 PRINT"                    standard deviation of 10. A second normal "
5110 PRINT""
5120 PRINT"                    distribution has a mean of 80 and a standard"
5130 PRINT""
5140 PRINT"                    deviation of 7. If the two distributions are "
5150 PRINT""
5160 PRINT"                    approximated by the same normal distribution "
5170 PRINT""
5180 PRINT"                    formula, then the first distribution has a graph"
5190 PRINT""
5200 PRINT"                    that is flatter than the second."
5210 PRINT""
5220 PRINT"                    Type in t if true or f if false and press the"
5230 PRINT""
5240 INPUT"                    enter key.  ";B$
5250 IF I15=0 THEN A15$ = B$
5260 IF I15=1 THEN B15$ = B$
5270 IF B$="t" OR B$="T" OR B$ = "f" OR B$ = "F" THEN 5330 ELSE 5280
5280 LOCATE 17,1
5290 PRINT"
   "
```

```
5300 PRINT"
   "
5310 PRINT"
   "
5320 LOCATE 17,1: GOTO 5220
5330 PRINT""
5340 IF BS="t" OR BS= "T" THEN PRINT"                    Your response is correct
." ELSE 5360
5350 R15=1: GOTO 5410
5360 IF I15=1 GOTO 5400
5370 PRINT"                    Incorrect. Press the enter key for further explana
tion."
5380 AS=INKEYS: IF AS="" GOTO 5380
5390 I15=1: R=R+1: GOTO 3520
5400 W15=1: PRINT"                    Incorrect. The correct answer is t."
5410 LOCATE 23,58
5420 PRINT"Press the enter key."
5430 AS=INKEYS: IF AS="" GOTO 5430
5440 'screen 16
5450 SCREEN 0,1:COLOR 15,1,11: CLS
5460 LOCATE 1,32:PRINT"Unit 1:  Screen 16"
5470 LOCATE 7,1
5480 PRINT "                    On each side of the mean of a normal curve, there
"
5490 PRINT""
5500 PRINT "               are points where the direction of the curve changes fr
om"
5510 PRINT""
5520 PRINT "               turning down to turning up. These points are called"
5530 PRINT""
5540 PRINT "               inflection points. The inflection points are located"
5550 PRINT""
5560 PRINT "               exactly one standard deviation from the mean either"
5570 PRINT""
5580 PRINT "               way. The next screen will illustrate this concept."
5590 COLOR 15,6,11
5600 LOCATE 13,15: PRINT"inflection points"
5610 COLOR 15,1,11
5620 LOCATE 23,58: PRINT"Press the enter key."
5630 AS=INKEYS: IF AS="" GOTO 5630
5640 'screen 17
5650 SCREEN 2: CLS: PRINT"Unit 1:  Screen 17"
5660 LOCATE 2,1:PRINT"s = standard deviation"
5670 S=100
5680 A=240
5690 PI = 3.141593
5700 XC = 320: YC=100
5710 LINE (0,YC+2)-(639,YC+2),1
5720 LINE(639,0)-(639,101),1
5730 'draw axes
5740 LINE (0,YC+2)-(639,YC+2),1
5750 LINE (639,0)-(639,101),1
5760 FOR X=20 TO 620 STEP 20
5770 LINE(X,YC+2) -(X,YC+4),1
5780 NEXT X
5790 LOCATE 1,78
5800 FOR Y = 0 TO 75 STEP 25
5810 LINE (636,Y)- (639,Y),1
5820 NEXT Y
5830 LOCATE 14,2
5840 PRINT "-3s"
5850 LOCATE 14,14
5860 PRINT "-2s"
5870 LOCATE 14,27
5880 PRINT "-1s"
5890 LOCATE 14,39
5900 PRINT "mean"
```

```
5910 LOCATE 14,52
5920 PRINT "+1s"
5930 LOCATE 14,65
5940 PRINT "+2s"
5950 LOCATE 14,77
5960 PRINT "+3s"
5970 'draw graph
5980 X1=-3.5:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
5990 X2=-3.4:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
6000 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
6010 FOR X=-3.4 TO 3.5 STEP .2
6020 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
6030 LINE -(XC+S*X,YC+Y),1
6040 NEXT X
6050 LOCATE 6,28: PRINT"*"
6060 LOCATE 6,53: PRINT"*"
6070 LOCATE 17,1
6080 PRINT"      Example 5.  The points of inflection are indicated by an *"
6090 PRINT""
6100 PRINT"                  on the above graph."
6110 LOCATE 23,58: PRINT"Press the enter key."
6120 AS=INKEYS: IF AS="" GOTO 6120
6130 'screen 18
6140 SCREEN 0,1: COLOR 15,1,11:CLS
6150 LOCATE 1,32:PRINT"Unit 1:  Screen 18"
6160 LOCATE 7,1
6170 PRINT"      Example 6.  Given a normal distribution with mean m = 70"
6180 PRINT""
6190 PRINT"                  and standard deviation s = 5, the points of"
6200 PRINT""
6210 PRINT"                  inflection occur at x = m - s = 70 - 5 = 65 and"
6220 PRINT""
6230 PRINT"                  x = m + s = 70 + 5 = 75."
6240 LOCATE 23,58: PRINT"Press the enter key."
6250 AS=INKEYS: IF AS="" GOTO 6250
6260 IF J110=1 GOTO 10570
6270 IF J15=1 GOTO 9540
6280 'screen 19
6290 CLS
6300 LOCATE 1,32:PRINT"Unit 1:  Screen 19"
6310 LOCATE 5,1
6320 PRINT"      Exercise 6.  Given a normal distribution with mean m = 93"
6330 PRINT""
6340 PRINT"                  and standard deviation s = 6, the points of"
6350 PRINT""
6360 PRINT"                  inflection occur at x = ?"
6370 PRINT""
6380 PRINT"                        a.  6 and 93"
6390 PRINT"                        b. 87 and 93"
6400 PRINT"                        c. 87 and 99"
6410 PRINT"                        d. 93 and 99"
6420 PRINT"                        e. none of the above"
6430 PRINT""
6440 INPUT"                  Type a, b, c, d, or e and press the enter key";BS
6450 IF I16=0 THEN A16$ = BS
6460 IF I16=1 THEN B16$ = BS
6470 IF BS="a" OR BS="A" OR BS="b" OR BS="B" OR BS = "c" OR BS = "C" OR BS = "d"
 OR BS = "D" OR BS = "e" OR BS = "E" THEN 6510 ELSE 6480
6480 LOCATE 17,1
6490 PRINT"
  "
6500 LOCATE 17,1: GOTO 6440
6510 PRINT""
6520 IF BS="c" OR BS="C" THEN PRINT"                  Your response is correct.
" ELSE 6540
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6530 R16=1: GOTO 6590
6540 IF I16=1 GOTO 6580
6550 PRINT"                    Incorrect. Press the enter key for further explana
tion."
6560 A$=INKEY$: IF A$="" GOTO 6560
6570 I16=1: R=R+1: GOTO 5440
6580 W16=1: PRINT"                    Incorrect. The correct answer is c."
6590 LOCATE 23,58
6600 PRINT"Press the enter key."
6610 A$=INKEY$: IF A$="" GOTO 6610
6620 R1 = R11+R12+R13+R14+R15+R16
6630 W1 = W11+W12+W13+W14+W15+W16
6640 FIRST1 = R1+W1-R
6650 'screen 20
6660 T1$=TIME$
6670 TIME$ = "00:00:00"
6680 SCREEN 0,1: COLOR 15,1,11: CLS
6690 CLS: LOCATE 1,32:PRINT"Unit 1:  Screen 20"
6700 LOCATE 5,1
6710 PRINT"               This concludes the discussion for Unit 1:  The Normal"

6720 PRINT""
6730 PRINT"          Curve. You worked correctly";FIRST1"exercise(s) out of 6."
6740 PRINT""
6750 PRINT"          There are 10 review problems for this unit.  Would you "
6760 PRINT ""
6770 PRINT"          like to work some review problems ? Type y if yes or n if"
6780 PRINT""
6790 INPUT"          no and press the enter key.";Q1$
6800 IF Q1$ = "y" OR Q1$ ="Y" OR Q1$ ="n" OR Q1$ ="N" THEN 6810 ELSE LOCATE 13,1
:PRINT"
     ": LOCATE 13,1: GOTO 6790
6810 IF Q1$ = "y" OR Q1$ ="Y" THEN GOTO 6820 ELSE 10910
6820 'screen 21
6830 SCREEN 0,1: COLOR 15,1,11: CLS
6840 LOCATE 1,32: PRINT"Unit 1:  Screen 21"
6850 LOCATE 5,1: K1=1
6860 PRINT"      Problem 1.  Which of the following is not a characteristic of"
6870 PRINT""
6880 PRINT"                  a normal distribution ?
6890 PRINT""
6900 PRINT"                        a. has a bell-shaped graph."
6910 PRINT"                        b. has only one mode."
6920 PRINT"                        c. is symmetric about the mean."
6930 PRINT"                        d. the mean and the median are unequal."
6940 PRINT"                        e. the mode and the median are equal."
6950 PRINT""
6960 INPUT"                  Type a, b, c, d or e, and press the enter key.";B$
6970 IF J11=0 THEN C11$ = B$
6980 IF J11=1 THEN D11$ = B$
6990 PRINT""
7000 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 7060 ELSE 7010
7010 LOCATE 15,1
7020 PRINT"
  "
7030 PRINT"
  "
7040 LOCATE 15,1
7050 GOTO 6960
7060 IF B$="d" OR B$="D" THEN 7070 ELSE 7100
7070 P11=1
7080 PRINT"                  Your response is correct."
7090 GOTO 7200
7100 IF J11=1 GOTO 7160
7110 PRINT"                  Your response is incorrect. Press the enter key for
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7120 PRINT""
7130 PRINT"                    further information."
7140 A$=INKEY$: IF A$="" GOTO 7140
7150 J11=1: P=P+1: GOTO 710
7160 Q11 = 1
7170 PRINT"                    Your response is incorrect. The correct response is
"
7180 PRINT""
7190 PRINT"                    d."
7200 LOCATE 23,58: PRINT"Press the enter key."
7210 A$=INKEY$: IF A$="" GOTO 7210
7220 GOSUB 7240
7230 IF Q1$ ="y" OR Q1$ ="Y" THEN GOTO 7300 ELSE 10910
7240 CLS: LOCATE 5,1
7250 PRINT"              Would you like to work another review problem ? Type"
7260 PRINT""
7270 INPUT"         y if yes or n if no and press the enter key.";Q1$
7280 IF Q1$ = "y" OR Q1$ = "Y" OR Q1$ = "n" OR Q1$ = "N" THEN 7290 ELSE LOCATE 7
,1: PRINT"
   ": LOCATE 7,1 :GOTO 7270
7290 RETURN
7300 'screen 22
7310 SCREEN 0,1: COLOR 15,1,11: CLS
7320 LOCATE 1,32: PRINT"Unit 1:  Screen 22"
7330 LOCATE 7,1: K1=2
7340 PRINT"      Problem 2.  The highest point on the graph of a normal curve"
7350 PRINT""
7360 PRINT"                    occurs at the ?
7370 PRINT""
7380 PRINT"                           a. mean"
7390 PRINT"                           b. points of inflection"
7400 PRINT"                           c. mode"
7410 PRINT"                           d. standard deviation."
7420 PRINT"                           e. a and c"
7430 PRINT""
7440 INPUT"                    Type a, b, c, d or e, and press the enter key.";B$
7450 IF J12=0 THEN C12$ = B$
7460 IF J12=1 THEN D12$ = B$
7470 PRINT""
7480 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ ="e" OR B$ = "E" THEN 7540 ELSE 7490
7490 LOCATE 17,1
7500 PRINT"
  "
7510 PRINT"
  "
7520 LOCATE 17,1
7530 GOTO 7440
7540 IF B$="e" OR B$="E" THEN 7550 ELSE 7580
7550 P12=1
7560 PRINT"                    Your response is correct."
7570 GOTO 7680
7580 IF J12=1 GOTO 7640
7590 PRINT"                    Your response is incorrect. Press the enter key for
"
7600 PRINT""
7610 PRINT"                    further information."
7620 A$=INKEY$: IF A$="" GOTO 7620
7630 J12=1: P=P+1: GOTO 710
7640 Q12 = 1
7650 PRINT"                    Your response is incorrect. The correct response is
"
7660 PRINT""
7670 PRINT"                    e."
7680 LOCATE 23,58: PRINT"Press the enter key."
7690 A$=INKEY$: IF A$="" GOTO 7690
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7700 GOSUB 7240
7710 IF Q1$ ="y" OR Q1$ ="Y" THEN GOTO 7720 ELSE 10910
7720 'screen 23
7730 SCREEN 0,1: COLOR 15,1,11: CLS
7740 LOCATE 1,32:PRINT"Unit 1:  Screen 23"
7750 LOCATE 7,1: K1=3
7760 PRINT"       Problem 3.  The tails of a normal curve are asymptotic to the"
7770 PRINT""
7780 PRINT"                   horizontal axis."
7790 PRINT""
7800 PRINT"                   Type t if true or f if false and press the enter"
7810 PRINT""
7820 INPUT"                   key.";B$
7830 IF J13=0 THEN C13$ = B$
7840 IF J13=1 THEN D13$ = B$
7850 PRINT""
7860 IF B$="t" OR B$="T" OR B$="f" OR B$="F" THEN 7930 ELSE 7870
7870 LOCATE 11,1
7880 PRINT"
"
7890 PRINT"
 "
7900 PRINT"
 "
7910 LOCATE 11,1
7920 GOTO 7800
7930 IF B$ = "t" OR B$ = "T" THEN 7940 ELSE 7960
7940 P13 = 1
7950 PRINT"                   Your response is correct." : GOTO 8060
7960 IF J13 = 1 GOTO 8020
7970 PRINT"                   Your response is incorrect. Press the enter key"
7980 PRINT""
7990 PRINT"                   for further information."
8000 A$=INKEY$: IF A$ = "" GOTO 8000
8010 J13=1: P=P+1: GOTO 2180
8020 Q13 = 1
8030 PRINT"                   Your response is incorrect. The correct answer is"
8040 PRINT""
8050 PRINT"                   t."
8060 LOCATE 23,58:PRINT"Press the enter key."
8070 A$=INKEY$: IF A$ = "" GOTO 8070
8080 GOSUB 7240
8090 IF Q1$ ="y" OR Q1$ ="Y" THEN GOTO 8100 ELSE 10910
8100 'screen 24
8110 SCREEN 0,1: COLOR 15,1,11: CLS
8120 LOCATE 1,32:PRINT"Unit 1:  Screen 24"
8130 LOCATE 5,1: K1=4
8140 PRINT"       Problem 4.  One normal curve A has mean 50 and standard"
8150 PRINT""
8160 PRINT"                   deviation 10. Another normal curve B has mean 50"
8170 PRINT""
8180 PRINT"                   and standard deviation 5. If the two curves are"
8190 PRINT""
8200 PRINT"                   approximate  'y the same normal distribution "
8210 PRINT""
8220 PRINT"                   formula, then curve B is flatter than curve A."
8230 PRINT""
8240 PRINT"                   Type t if true or f if false and press the enter"
8250 PRINT""
8260 INPUT"                   key.";B$
8270 IF J14 = 0 THEN C14$ = B$
8280 IF J14 = 1 THEN D14$ = B$
8290 PRINT""
8300 IF B$="t" OR B$="T" OR B$="f" OR B$="F" THEN 8370 ELSE 8310
8310 LOCATE 15,1
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8320 PRINT"
"
8330 PRINT"
  "
8340 PRINT"
  "
8350 LOCATE 15,1
8360 GOTO 8240
8370 IF BS = "f" OR BS = "F" THEN 8380 ELSE 8400
8380 P14 = 1
8390 PRINT"                    Your response is correct." : GOTO 8500
8400 IF J14 = 1 GOTO 8460
8410 PRINT"                    Your response is incorrect. Press the enter key"
8420 PRINT""
8430 PRINT"                    for further information."
8440 AS=INKEYS: IF AS = "" GOTO 8440
8450 J14=1: P=P+1: GOTO 3510
8460 Q14 = 1
8470 PRINT"                    Your response is incorrect. The correct answer is"
8480 PRINT""
8490 PRINT"                    f."
8500 LOCATE 23,58:PRINT"Press the enter key."
8510 AS=INKEYS: IF AS = "" GOTO 8510
8520 GOSUB 7240
8530 IF Q1S ="y" OR Q1S ="Y" THEN GOTO 8540 ELSE 10910
8540 'screen 25
8550 SCREEN 0,1: COLOR 15,1,11: CLS
8560 LOCATE 1,32: PRINT"Unit 1:  Screen 25"
8570 LOCATE 5,1: K1=5
8580 PRINT"       Problem 5.  Given a normal distribution with mean m = 65"
8590 PRINT""
8600 PRINT"                    and standard deviation s = 7, the points of"
8610 PRINT""
8620 PRINT"                    inflection occur at x = ?"
8630 PRINT""
8640 PRINT"                           a.  7 and 65"
8650 PRINT"                           b. 58 and 72"
8660 PRINT"                           c. 58 and 65"
8670 PRINT"                           d. 65 and 72"
8680 PRINT"                           e. none of the above"
8690 PRINT""
8700 INPUT"                    Type a, b, c, d, or e and press the enter key";BS
8710 IF J15=0 THEN C15$ = BS
8720 IF J15=1 THEN C15$ = BS
8730 IF BS="a" OR BS="A" OR BS="b" OR BS="B" OR BS = "c" OR BS = "C" OR BS = "d"
 OR BS = "D" OR BS = "e" OR BS = "E" THEN 8770 ELSE 8740
8740 LOCATE 17,1
8750 PRINT"
  "
8760 LOCATE 17,1: GOTO 8700
8770 PRINT""
8780 IF BS="b" OR BS="B" THEN PRINT"                    Your response is correct.
" ELSE 8830
8790 P15=1: GOTO 8860
8800 IF J15=1 GOTO 8850
8810 PRINT"                    Incorrect. Press the enter key for further explana
tion."
8820 AS=INKEYS: IF AS="" GOTO 8820
8830 IF J110=1 GOTO 10570
8840 J15=1: P=P+1: GOTO 5440
8850 Q15=1: PRINT"                    Incorrect. The correct answer is b."
8860 LOCATE 23,58
8870 PRINT"Press the enter key."
8880 AS=INKEYS: IF AS="" GOTO 8880
8890 GOSUB 7240
8900 IF Q1S ="y" OR Q1S ="Y" THEN GOTO 8910 ELSE 10910
```

```
8910 'screen 26
8920 SCREEN 0,1: COLOR 15,1,11: CLS
8930 LOCATE 1,32: PRINT"Unit 1:  Screen 26"
8940 LOCATE 5,1: K1=6
8950 PRINT"      Problem 6.  Which of the following is a characteristic of"
8960 PRINT""
8970 PRINT"                  a normal distribution ?
8980 PRINT""
8990 PRINT"                        a. symmetrical"
9000 PRINT"                        b. unimodal"
9010 PRINT"                        c. asymptotic to the horizontal axis"
9020 PRINT"                        d. mode and the mean are equal"
9030 PRINT"                        e. all of the above"
9040 PRINT""
9050 INPUT"                  Type a, b, c, d or e, and press the enter key.";B$
9060 IF J16=0 THEN C16$ = B$
9070 IF J16=1 THEN D16$ = B$
9080 PRINT""
9090 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 9150 ELSE 9100
9100 LOCATE 15,1
9110 PRINT"
  "
9120 PRINT"
  "
9130 LOCATE 15,1
9140 GOTO 9050
9150 IF B$="e" OR B$="E" THEN 9160 ELSE 9190
9160 P16=1
9170 PRINT"                  Your response is correct."
9180 GOTO 9290
9190 IF J16=1 GOTO 9250
9200 PRINT"                  Your response is incorrect. Press the enter key for
"
9210 PRINT""
9220 PRINT"                  further information."
9230 A$=INKEY$: IF A$="" GOTO 9230
9240 J16=1: P=P+1: GOTO 1310
9250 Q16 = 1
9260 PRINT"                  Your response is incorrect. The correct response is
"
9270 PRINT""
9280 PRINT"                  e."
9290 LOCATE 23,58: PRINT"Press the enter key."
9300 A$=INKEY$: IF A$="" GOTO 9300
9310 GOSUB 7240
9320 IF Q1$ ="y" OR Q1$ ="Y" THEN GOTO 9330 ELSE 10910
9330 'screen 27
9340 SCREEN 0,1: COLOR 15,1,11: CLS
9350 LOCATE 1,32: PRINT"Unit 1:  Screen 27"
9360 LOCATE 7,1: K1=7
9370 PRINT"      Problem 7.  The highest point on the graph of a normal curve"
9380 PRINT""
9390 PRINT"                  with mean = 65 and standard deviation = 3 occurs at
 x = ?"
9400 PRINT""
9410 PRINT"                        a.  0"
9420 PRINT"                        b.  3"
9430 PRINT"                        c. 62"
9440 PRINT"                        d. 65"
9450 PRINT"                        e. 68"
9460 PRINT""
9470 INPUT"                  Type a, b, c, d or e, and press the enter key.";B$
9480 IF J17=0 THEN C17$ = B$
9490 IF J17=1 THEN D17$ = B$
9500 PRINT""
9510 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ ="e" OR B$ = "E" THEN 9570 ELSE 9520
```

```
9520 LOCATE 17,1
9530 PRINT"
  "
9540 PRINT"
  "
9550 LOCATE 17,1
9560 GOTO 9470
9570 IF BS="d" OR BS="D" THEN 9580 ELSE 9610
9580 P17=1
9590 PRINT"                    Your response is correct."
9600 GOTO 9710
9610 IF J17=1 GOTO 9670
9620 PRINT"                    Your response is incorrect. Press the enter key for
"
9630 PRINT""
9640 PRINT"                    further information."
9650 AS=INKEYS: IF AS="" GOTO 9650
9660 J17=1: P=P+1: GOTO 710
9670 Q17 = 1
9680 PRINT"                    Your response is incorrect. The correct response is
"
9690 PRINT""
9700 PRINT"                    d."
9710 LOCATE 23,58: PRINT"Press the enter key."
9720 AS=INKEYS: IF AS="" GOTO 9720
9730 GOSUB 7240
9740 IF Q1S ="y" OR Q1S ="Y" THEN GOTO 9750 ELSE 10910
9750 'screen 28
9760 SCREEN 0,1: COLOR 15,1,11: CLS
9770 LOCATE 1,32:PRINT"Unit 1:  Screen 28"
9780 LOCATE 7,1:K1=8
9790 PRINT"      Problem 8.  The tails of a normal curve will eventually touch"
9800 PRINT""
9810 PRINT"                    the horizontal axis."
9820 PRINT""
9830 PRINT"                    Type t if true or f if false and press the enter"
9840 PRINT""
9850 INPUT"                    key.";B$
9860 IF J18=0 THEN C18$ = B$
9870 IF J18=1 THEN D18$ = B$
9880 PRINT""
9890 IF B$="t" OR B$="T" OR B$ "f" OR B$="F" THEN 9960 ELSE 9900
9900 LOCATE 11,1
9910 PRINT"
"
9920 PRINT"
  "
9930 PRINT"
  "
9940 LOCATE 11,1
9950 GOTO 9830
9960 IF B$ = "f" OR B$ = "F" THEN 9970 ELSE 9990
9970 P18 = 1
9980 PRINT"                   Your response is correct." : GOTO 10090
9990 IF J18 = 1 GOTO 10050
10000 PRINT"                   Your response is incorrect. Press the enter key"
10010 PRINT""
10020 PRINT"                   for further information."
10030 AS=INKEYS: IF AS = "" GOTO 10030
10040 J18=1: P=P+1: GOTO 2190
10050 Q18 = 1
10060 PRINT"                   Your response is incorrect. The correct answer is"

10070 PRINT""
```

```
10080 PRINT"                    f."
10090 LOCATE 23,58:PRINT"Press the enter key."
10100 AS=INKEYS: IF AS = "" GOTO 10100
10110 GOSUB 7240
10120 IF Q1S ="y" OR Q1S ="Y" THEN GOTO 10130 ELSE 10910
10130 'screen 29
10140 SCREEN 0,1: COLOR 15,1,11: CLS
10150 LOCATE 1,32:PRINT"Unit 1:  Screen 29"
10160 LOCATE 5,1:K1=9
10170 PRINT"       Problem 9.  One normal curve A has mean 62 and standard"
10180 PRINT""
10190 PRINT"                    deviation 3. Another normal curve B has mean 62"
10200 PRINT""
10210 PRINT"                    and standard deviation 4. If the two curves are"
10220 PRINT""
10230 PRINT"                    approximated by the same normal distribution"
10240 PRINT""
10250 PRINT"                    formula, then curve A is flatter than curve B."
10260 PRINT""
10270 PRINT"                    Type t if true or f if false and press the enter"
10280 PRINT""
10290 INPUT"                    key.";BS
10300 IF J19 = 0 THEN C19$ = BS
10310 IF J19 = 1 THEN D19S = BS
10320 PRINT""
10330 IF BS="t" OR BS="T" OR BS="f" OR BS="F" THEN 10400 ELSE 10340
10340 LOCATE 15,1
10350 PRINT"
 "
10360 PRINT"
   "
10370 PRINT"
   "
10380 LOCATE 15,1
10390 GOTO 10270
10400 IF BS = "f" OR BS = "F" THEN 10410 ELSE 10430
10410 P19 = 1
10420 PRINT"                    Your response is correct." : GOTO 10530
10430 IF J19 = 1 GOTO 10490
10440 PRINT"                    Your response is incorrect. Press the enter key"
10450 PRINT""
10460 PRINT"                    for further information."
10470 AS=INKEYS: IF AS = "" GOTO 10470
10480 J19=1: P=P+1: GOTO 3510
10490 Q19 = 1
10500 PRINT"                    Your response is incorrect. The correct answer is"

10510 PRINT""
10520 PRINT"                    f."
10530 LOCATE 23,58:PRINT"Press the enter key."
10540 AS=INKEYS: IF AS = "" GOTO 10540
10550 GOSUB 7240
10560 IF Q1S ="y" OR Q1S ="Y" THEN GOTO 10570 ELSE 10910
10570 'screen 30
10580 SCREEN 0,1: COLOR 15,1,11: CLS
10590 LOCATE 1,32: PRINT"Unit 1:  Screen 30"
10600 LOCATE 5,1: K1=10
10610 PRINT"       Problem 10.  Given a normal distribution with mean = 91"
10620 PRINT""
10630 PRINT"                    and standard deviation s = 5, the points of"
10640 PRINT""
10650 PRINT"                    inflection occur at x = ?"
10660 PRINT""
10670 PRINT"                           a.  5 and 91"
10680 PRINT"                           b. 86 and 91"
10690 PRINT"                           c. 86 and 96"
10700 PRINT"                           d. 91 and 72"
10710 PRINT"                           e. none of the above"
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10720 PRINT""
10730 INPUT"                    Type a, b, c, d, or e and press the enter key";B$
10740 IF J110=0 THEN C110$ = B$
10750 IF J110=1 THEN D110$ = B$
10760 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$ = "c" OR B$ = "C" OR B$ = "d
" OR B$ = "D" OR B$ = "e" OR B$ = "E" THEN 10800 ELSE 10770
10770 LOCATE 17,1
10780 PRINT"
   "
10790 LOCATE 17,1: GOTO 10730
10800 PRINT""
10810 IF B$="c" OR B$="C" THEN PRINT"                    Your response is correct
." ELSE 10830
10820 P110=1: GOTO 10880
10830 IF J110=1 GOTO 10870
10840 PRINT"                  Incorrect. Press the enter key for further explan
ation."
10850 A$=INKEY$: IF A$="" GOTO 10850
10860 J110=1: P=P+1: GOTO 5440
10870 Q110=1: PRINT"                    Incorrect. The correct answer is c."
10880 LOCATE 23,58
10890 PRINT"Press the enter key."
10900 A$=INKEY$: IF A$="" GOTO 10900
10910 'screen 26
10920 CLS: LOCATE 1,32: PRINT"Unit 1:  Screen 26"
10930 LOCATE 8,1
10940 PRINT"                Turn the printer on and press the enter key."
10950 A$ = INKEY$: IF A$ = "" GOTO 10950
10960 IF K1=0 GOTO 11120
10970 P1=P11+P12+P13+P14+P15+P16+P17+P18+P19+P110
10980 Q1=Q11+Q12+Q13+Q14+Q15+Q16+Q17+Q18+Q19+Q110
10990 SEC1 = P1 + Q1 - P
11000 PRINT""
11010 PRINT"                The number of correct exercises is";FIRST1
11020 PRINT""
11030 PRINT"                The number of incorrect exercises is";6-FIRST1
11040 PRINT""
11050 PRINT"                The number of correct exercises after remediation i
s";R-W1
11060 PRINT""
11070 PRINT"                The number of correct problems is";SEC1
11080 PRINT""
11090 PRINT"                The number of incorrect problems is";K1-SEC1
11100 PRINT""
11110 PRINT"                The number of correct problems after remediation is
";P-Q1
11120 LPRINT"                      Unit 1:  The Normal Curve"
11130 LPRINT""
11140 LPRINT""
11150 LPRINT"                ";NAM$,NO$,TI$
11160 LPRINT""
11170 LPRINT"                The number of correct exercises is";FIRST1
11180 LPRINT""
11190 LPRINT"                The number of incorrect exercises is";6-FIRST1
11200 LPRINT""
11210 LPRINT"                The number of correct exercises after remediation
is";R-W1
11220 IF K1=0 GOTO 11290
11230 LPRINT"                          ";TIME$
11240 LPRINT"                The number of correct problems is";SEC1
11250 LPRINT""
11260 LPRINT"                The number of incorrect problems is";K1-SEC1
11270 LPRINT""
```

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11280 LPRINT"                    The number of correct problems after remediation i
s";P-Q1
11290 LPRINT""
11300 LPRINT""
11310 IF I11=1 GOTO 11340
11320 LPRINT"   Exercise 1 response was correct.",A11$:GOTO 11360
11330 LPRINT""
11340 LPRINT"   Exercise 1 response was incorrect.",A11$,B11$
11350 LPRINT""
11360 LPRINT"": IF I12=1 GOTO 11390
11370 LPRINT"   Exercise 2 response was correct.",A12$:GOTO 11410
11380 LPRINT""
11390 LPRINT"   Exercise 2 response was incorrect.",A12$,B12$
11400 LPRINT""
11410 LPRINT"": IF I13=1 GOTO 11440
11420 LPRINT"   Exercise 3 response was correct.",A13$:GOTO 11460
11430 LPRINT""
11440 LPRINT"   Exercise 3 response was incorrect.",A13$,B13$
11450 LPRINT""
11460 LPRINT"": IF I14=1 GOTO 11490
11470 LPRINT"   Exercise 4 response was correct.",A14$:GOTO 11510
11480 LPRINT""
11490 LPRINT"   Exercise 4 response was incorrect.",A14$,B14$
11500 LPRINT""
11510 LPRINT"": IF I15=1 GOTO 11540
11520 LPRINT"   Exercise 5 response was correct.",A15$: GOTO 11560
11530 LPRINT""
11540 LPRINT"   Exercise 5 response was incorrect.",A15$,B15$
11550 LPRINT""
11560 LPRINT"": IF I16=1 GOTO 11590
11570 LPRINT"   Exercise 6 response was correct.",A16$: GOTO 11610
11580 LPRINT""
11590 LPRINT"   Exercise 6 response was incorrect.",A16$,B16$
11600 LPRINT""
11610 IF K1<1 GOTO 12210
11620 LPRINT"": IF J11=1 GOTO 11650
11630 LPRINT"   Problem 1 response was correct.",C11$: GOTO 11670
11640 LPRINT""
11650 LPRINT"   Problem 1 response was incorrect.",C11$,D11$
11660 LPRINT""
11670 IF K1<2 GOTO 12210
11680 LPRINT"": IF J12=1 GOTO 11710
11690 LPRINT"   Problem 2 response was correct.",C12$: GOTO 11730
11700 LPRINT""
11710 LPRINT"   Problem 2 response was incorrect.",C12$,D12$
11720 LPRINT""
11730 IF K1<3 GOTO 12210
11740 LPRINT"": IF J13=1 GOTO 11770
11750 LPRINT"   Problem 3 response was correct.",C13$: GOTO 11790
11760 LPRINT""
11770 LPRINT"   Problem 3 response was incorrect.",C13 ,D13$
11780 LPRINT""
11790 IF K1<4 GOTO 12210
11800 LPRINT"": IF J14=1 GOTO 11830
11810 LPRINT"   Problem 4 response was correct.",C14$: GOTO 11850
11820 LPRINT""
11830 LPRINT"   Problem 4 response was incorrect.",C14$,D14$
11840 LPRINT""
11850 IF K1<5 GOTO 12210
11860 LPRINT"": IF J15=1 GOTO 11890
11870 LPRINT"   Problem 5 response was correct.",C15$: GOTO 11910
11880 LPRINT""
11890 LPRINT"   Problem 5 response was incorrect.",C15$,D15$
11900 LPRINT""
11910 IF K1<6 GOTO 12210
11920 LPRINT"": IF J16=1 GOTO 11950
11930 LPRINT"   Problem 6 response was correct.",C16$: GOTO 11970
```

```
11940 LPRINT""
11950 LPRINT"   Problem 6 response was incorrect.",C16$,D16$
11960 LPRINT""
11970 IF K1<7 GOTO 12210
11980 LPRINT"": IF J17=1 GOTO 12010
11990 LPRINT"   Problem 7 response was correct.",C17$: GOTO 12030
12000 LPRINT""
12010 LPRINT"   Problem 7 response was incorrect.",C17$,D17$
12020 LPRINT""
12030 IF K1<8 GOTO 12210
12040 LPRINT"": IF J18=1 GOTO 12070
12050 LPRINT"   Problem 8 response was correct.",C18$: GOTO 12090
12060 LPRINT""
12070 LPRINT"   Problem 8 response was incorrect.",C18$,D18$
12080 LPRINT""
12090 IF K1<9 GOTO 12210
12100 LPRINT"": IF J19=1 GOTO 12130
12110 LPRINT"   Problem 9 response was correct.",C19$: GOTO 12150
12120 LPRINT""
12130 LPRINT"   Problem 9 response was incorrect.",C19$,D19$
12140 LPRINT""
12150 IF K1<10 GOTO 12210
12160 LPRINT"": IF J110=1 GOTO 12190
12170 LPRINT"   Problem 10 response was correct.",C110$:GOTO 12210
12180 LPRINT""
12190 LPRINT"   Problem 10 response was incorrect.",C110$,D110$
12200 LPRINT""
12210 CLS: CHAIN"unit2"
```

```
10 COMMON NAMS,NOS
20 ' Unit 2
30 R=0
40 TIME$ = "00:00:00"
50 KEY OFF
60 SCREEN 0,1: COLOR 15,1,15: CLS
70 LOCATE 10,37
80 PRINT"Unit 2"
90 LOCATE 12,26
100 PRINT"The Unit Normal Distribution"
110 PRINT
120 PRINT
130 LOCATE 23,58: PRINT"Press the enter key."
140 AS=INKEYS: IF AS="" GOTO 140
150 SCREEN 0,1:COLOR 15,1,15:CLS
160 LOCATE 1,32: PRINT"Unit 2:  Screen ii"
170 LOCATE 5,1
180 PRINT"          Objectives:  At the end of Unit 2, the student should be"
190 PRINT""
200 PRINT"                       able to:"
210 PRINT""
220 PRINT"                       1. Give the distinguishing characteristics of"
230 PRINT"
240 PRINT"                          the unit normal distribution."
250 PRINT""
260 PRINT"                       2. Give the points of inflection of the unit"
270 PRINT""
280 PRINT"                          normal c rve."
290 PRINT""
300 PRINT"                       3. Approximate the ordinate at a given z-value"
310 PRINT""
320 PRINT"                          using a table of ordinates."
330 LOCATE 23,58: PRINT"Press the enter key."
340 AS=INKEYS: IF AS="" GOTO 340
350 'screen 1
360 GOSUB 390
370 GOTO 810
380 SCREEN 2:CLS
390 S=100
400 A=240
410 PI=3.141593
420 XC=320:YC=100
430 SCREEN 2: CLS
440 LINE (0,YC+2)-(639,YC+2),1
450 LINE (639,0)-(639,181),1
460 FOR X=20 TO 620 STEP 20
470 LINE(X,YC+2) -(X,YC+4),1
480 NEXT X
490 LOCATE 1,78
500 PRINT ".4"
510 LOCATE 7,78
520 PRINT".2"
530 FOR Y = 0 TO 75 STEP 25
540 LINE (636,Y) - (639,Y),1
550 NEXT Y
560 LOCATE 13,1:PRINT"z"
570 LOCATE 14,2
580 PRINT "-3"
590 LOCATE 14,15
600 PRINT "-2"
610 LOCATE 14,27
620 PRINT "-1"
630 LOCATE 14,41
640 PRINT "0"
650 LOCATE 14,53
```

```
660 PRINT "1"
670 LOCATE 14,66
680 PRINT "2"
690 LOCATE 14,78
700 PRINT "3"
710 'draw graph
720 X1=-3!:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
730 X2=-2.8:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
740 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
750 FOR X=-2.8 TO 3.2 STEP .2
760 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
770 LINE -(XC+S*X,YC+Y),1
780 NEXT X
790 LOCATE 17,1
800 RETURN
810 LOCATE 1,1: PRINT"Unit 2:  Screen 1"
820 LOCATE 12,2:PRINT"Tail": LOCATE 12,74:PRINT"Tail"
830 LOCATE 17,1
840 PRINT"          One member of the normal distribution family is the unit"
850 PRINT""
860 PRINT"      normal curve or the z-distribution. This curve has mean 0 and"
870 PRINT""
880 PRINT"      standard deviation 1. The total area under this curve is 1."
890 PRINT""
900 LOCATE 23,58:PRINT"Press the enter key."
910 AS=INKEYS:  IF AS="" THEN 910
920 IF J29=1 GOTO 7940
930 IF J28=1 GOTO 7630
940 IF J26=1 GOTO 6920
950 IF J23=1 GOTO 5870
960 IF J21=1 GOTO  '20
970 IF I22=1 GOTO 1700
980 ' screen 2
990 GOSUB 380
1000 LOCATE 1,1: PRINT"Unit 2:  Screen 2"
1010 LOCATE 17,1
1020 PRINT"       Exercise 1.  For what value of z along the horizontal axis "
1030 PRINT"                    does the highest point occur on the unit normal cu
rve ?"
1040 INPUT"                    Type in your response and press the enter key.";Q1
$
1050 IF I21 = 0 THEN A21$ = Q1$
1060 IF I21 = 1 THEN B21$ = Q1$
1070 IF Q1$ ="0" GOTO 1080 ELSE 1130
1080 PRINT""
1090 PRINT"                    You are correct.": R21 = 1
1100 LOCATE 23, 58:  PRINT"Press the enter key."
1110 AS = INKEYS: IF AS="" GOTO 1110
1120 GOTO 1370
1130 IF I21=1 GOTO 1200
1140 PRINT""
1150 PRINT"                    Your response is incorrect. Press the enter key fo
r"
1160 PRINT"                    further explanation."
1170 AS = INKEYS: IF AS = "" GOTO 1170
1180 I21 = 1: R=R+1
1190 GOTO 1260
1200 PRINT ""
1210 PRINT"                    Your response is incorrect. The correct answer is
0."
1220 W21 = 1
1230 LOCATE 23,58: PRINT"Press the enter key."
1240 AS=INKEY$: IF AS = "" GOTO 1240
1250 GOTO 1370
1260 SCREEN 0,1:COLOR 15,1,15:CLS
```

```
1270 LOCATE 1,32: PRINT"Unit 2:  Screen 2A"
1280 LOCATE 7,1
1290 PRINT"           The highest point on the graph of a normal curve occurs"
1300 PRINT""
1310 PRINT"      at the mean. If the mean is X = 50, then the highest point"
1320 PRINT""
1330 PRINT"      on the curve occurs at X = 50."
1340 LOCATE 23,58:  PRINT"Press the enter key."
1350 A$ = INKEY$:  IF A$ = "" GOTO 1350
1360 GOTO 980
1370 'screen 3
1380 GOSUB 380
1390 LOCATE 1,1: PRINT"Unit 2:  Screen 3"
1400 LOCATE 15,1
1410 PRINT"Exercise 2.  The points of inflection of the unit normal curve occur
at z = ?"
1420 PRINT"                                a. -2 and +2"
1430 PRINT"                                b. -1 and  0"
1440 PRINT"                                c.  0 and +1"
1450 PRINT"                                d. -1 and +1"
1460 PRINT""
1470 INPUT"             Type a, b, c, or d and press the enter key.";Q2$
1480 IF I22=0 THEN A22$ = Q2$
1490 IF I22=1 THEN B22$ = Q2$
1500 IF Q2$="a" OR Q2$="A" OR Q2$="b" OR Q2$="B" OR Q2$="c" OR Q2$="C" OR Q2$="d
" OR Q2$="D"GOTO 1540 ELSE 1510
1510 LOCATE 21,1
1520 PRINT"                                                                    "
1530 LOCATE 21,1: GOTO 1470
1540 IF Q2$="d" OR Q2$="D" GOTO 1550 ELSE 1590
1550 PRINT"             Your response is correct.": R22=1
1560 LOCATE 23,58: PRINT"Press the enter key."
1570 A$=INKEY$:  IF A$="" GOTO 1570
1580 GOTO 1870
1590 IF I22=1 GOTO 1650
1600 PRINT"             Your response is incorrect. Press the enter key for "
1610 PRINT"             further explanation."
1620 A$ = INKEY$: IF A$ ="" GOTO 1620
1630 I22=1: R=R+1
1640 GOTO 350
1650 PRINT"             Your response is incorrect. The correct answer is d."
1660 W22 = 1
1670 LOCATE 23,58: PRINT"Press the enter key."
1680 A$=INKEY$:  IF A$="" GOTO 1680
1690 GOTO 1960
1700 SCREEN 0,1:COLOR 15,1,15:CLS
1710 LOCATE 1,32: PRINT"Unit 2:  Screen 3A"
1720 LOCATE 5,1
1730 PRINT"           The points of inflection of a normal curve are located"
1740 PRINT""
1750 PRINT"      one standard deviation from the mean either way. If the mean m"

1760 PRINT""
1770 PRINT"      equals 50 and the standard deviation s equals 5, then the point
s"
1780 PRINT""
1790 PRINT"      of inflection occur at m - s = 50 - 5 = 45 and m + s ="
1800 PRINT""
1810 PRINT"      50 + 5 = 55."
1820 LOCATE 23,58:  PRINT"Press the enter key."
1830 A$=INKEY$: IF A$ ="" GOTO 1830
1840 IF J24=1 GOTO 6180
1850 GOTO 1370
1860 'screen 4
```

```
1870 GOSUB 380
1880 LOCATE 1,1: PRINT"Unit 2:  Screen 4"
1890 LOCATE 12,4:PRINT"tail":LOCATE 12,72:PRINT"tail"
1900 LOCATE 15,1
1910 PRINT"  Exercise 3.  The two tails of the unit normal distribution:"
1920 PRINT"                                a. approach the median."
1930 PRINT"                                b. approach the mode."
1940 PRINT"                                c. approach the vertical axis."
1950 PRINT"                                d. are asymptotic to the horizontal axi
s"
1960 PRINT""
1970 INPUT"                Type a, b, c, or d for your response and press the ent
er key";Q3$
1980 IF I23=0 THEN A23$ = Q3$
1990 IF I23=1 THEN B23$ = Q3$
2000 IF Q3$="a" OR Q3$="A" OR Q3$="b" OR Q3$="B" OR Q3$ = "c" OR Q3$ = "C" OR Q3
$ = "d" OR Q3$ ="D" GOTO 2050 ELSE 2010
2010 LOCATE 21,1
2020 PRINT"
            "
2030 LOCATE 21,1
2040 GOTO 1970
2050 IF Q3$="d" OR Q3$="D" GOTO 2060 ELSE 2100
2060 PRINT"                Your response is correct.": R23 =1
2070 LOCATE 23,58: PRINT"Press the enter key."
2080 AS=INKEY$: IF AS = "" GOTO 2080
2090 GOTO 2300
2100 IF I23=1 GOTO 2160
2110 PRINT"                Your response is incorrect. Press the enter key"
2120 PRINT"                for further explanation."
2130 AS=INKEY$: IF AS = "" GOTO 2130
2140 I23=1: R=R+1: GOTO 2210
2150 PRINT""
2160 PRINT"                Your response is incorrect. The correct answer is d."
2170 W23 = 1
2180 LOCATE 23,58: PRINT"Press the enter key."
2190 AS=INKEY$: IF AS = "" GOTO 2190
2200 GOTO 2300
2210 SCREEN 0,1:COLOR 15,1,15:CLS
2220 LOCATE 1,32: PRINT"Unit 2:  Screen 4A"
2230 LOCATE 7,1
2240 PRINT"           As the tails of a normal curve move away from the mean"
2250 PRINT""
2260 PRINT"      the tails will always approach the horizontal axis."
2270 LOCATE 23,58: PRINT"Press the enter  ey."
2280 AS=INKEY$: IF AS="" GOTO 2280
2290 GOTO 1870
2300 'screen 5
2310 SCREEN 0,1:COLOR 15,1,15:CLS
2320 LOCATE 1,32: PRINT"Unit 2:  Screen 5"
2330 LOCATE 7,1
2340 PRINT"              When sketching the unit normal curve, it is important"
2350 PRINT""
2360 PRINT"         to know the ordinate u (the height of the curve) at a given"

2370 PRINT""
2380 PRINT"         value of z. Table B, Areas and Ordinates of the Unit Normal"

2390 PRINT""
2400 PRINT"         Distribution, in the supplementary materials will be used"
2410 PRINT""
2420 PRINT"         for this purpose."
2430 COLOR 12,1,15
2440 LOCATE 11,22:PRINT"Table B"
2450 COLOR 15,1,15
2460 LOCATE 23,58: PPINT"Press the enter key."
```

```
2470 AS=INKEY$: IF AS="" GOTO 2470
2480 'screen 6
2490 SCREEN 0,1:COLOR 15,1,15:CLS
2500 LOCATE 1,32: PRINT"Unit 2:  Screen 6"
2510 LOCATE 3,1
2520 PRINT"                Suppose that one desires to find the ordinate u at"
2530 PRINT""
2540 PRINT"          a given value of z. The value of z is found in the first"
2550 PRINT""
2560 PRINT"          column of Table B. To the right of this entry in the "
2570 PRINT""
2580 PRINT"          column, titled Ordinate, the ordinate is found. A "
2590 PRINT""
2600 PRINT"          portion of Table B is shown below:"
2610 PRINT""
2620 PRINT"          z          Area Below          Area Above          Ordinate"
2630 PRINT""
2640 PRINT"       -1.04          .1492               .8508               .2323"
2650 PRINT"       -1.03          .1515               .8485               .2347"
2660 PRINT"       -1.02          .1539               .8461               .2371"
2670 PRINT"       -1.01          .1562               .8438               .2396"
2680 PRINT""
2690 PRINT"               The ordinate at z = -1.03 is .2347 and the ordinate"
2700 PRINT""
2710 PRINT"          at z = -1.01 is .2396."
2720 COLOR 15,6,15
2730 LOCATE 13,58:PRINT" Ordinate "
2740 LOCATE 18,9: PRINT"-1.01 " :LOCATE 18,59:PRINT" .2396 "
2750 LOCATE 16,9: PRINT"-1.03 " :LOCATE 16,59:PRINT" .2347 "
2760 COLOR 15,1,15
2770 LOCATE 23,58: PRINT"Press the enter key."
2780 AS=INKEY$: IF AS="" GOTO 2780
2790 IF J210=1 GOTO 8260
2800 IF J27=1 GOTO 7220
2810 IF J25=1 GOTO 6510
2820 IF J22 = 1 GOTO 5490
2830 IF I27=1 GOTO 4530
2840 IF I26=1 GOTO 4140
2850 IF I25=1 GOTO 3750
2860 'screen 7
2870 SCREEN 0,1:COLOR 15,1,15:CLS
2880 LOCATE 1,32: PRINT"Unit 2:  Screen 7"
2890 LOCATE 7,1
2900 PRINT"      Exercise 4.  A portion of Table B is shown below:"
2910 PRINT""
2920 PRINT"                          z      Area Below      Area Above      Ordinate"
2930 PRINT""
2940 PRINT"                        0.56       .7123           .2877           .3410"
2950 PRINT"                        0.57       .7157           .2843           .3391"
2960 PRINT"                        0.58       .7190           .2810           .3372"
2970 PRINT"                        0.59       .7224           .2776           .3352"
2980 PRINT""
2990 PRINT"                        Type in the ordinate (including the decimal point)
"
3000 PRINT""
3010 INPUT"                        at z = 0.58 and press the enter key";Q4$
3020 IF I24=0 THEN A24$ = Q4$
3030 IF I24=1 THEN B24$ = Q4$
3040 IF Q4$ = ".3372" GOTO 3050 ELSE 3080
3050 PRINT""
3060 R24=1: PRINT"                        Your response is correct."
3070 GOTO 3280
3080 IF I24=1 GOTO 3240
3090 PRINT""
```

```
3100 IF Q4$ = "3372" GOTO 3110 ELSE 3190
3110 PRINT"                    Incorrect. You should first type in the decimal"
3120 PRINT""
3130 PRINT"                    point. Press the enter key to continue.": I24=1: R
 = R+1
3140 A$ = INKEY$: IF A$ = "" GOTO 3140
3150 LOCATE 16,1: PRINT"
                       "
3160 LOCATE 18,1: PRINT"
                       "
3170 LOCATE 20,1: PRINT"
                       "
3180 LOCATE 22,1: PRINT"
                      ": LOCATE 16,1 : GOTO 2990
3190 PRINT"                    Your response is incorrect. Press the enter key "
3200 PRINT""
3210 PRINT"                    for further explanation."
3220 A$ = INKEY$: IF A$="" GOTO 3220
3230 I24=1: R=R+1: GOTO 2480
3240 PRINT""
3250 W24 = 1: PRINT"                    Your response is incorrect. The correct a
nswer"
3260 PRINT""
3270 PRINT"                    is .3372."
3280 LOCATE 23,58: PRINT"Press the enter key."
3290 A$ = INKEY$: IF A$ = "" GOTO 3290
3300 'screen 8
3310 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32: PRINT"Unit 2:  Screen 8"
3320 LOCATE 7,1
3330 PRINT"                  A graphical illustration of the ordinate at a"
3340 PRINT""
3350 PRINT"              given value of z will now be given."
3360 LOCATE 23,58: PRINT"Press the enter key."
3370 A$ = INKEY$: IF A$ = "" GOTO 3370
3380 'screen 9
3390 GOSUB 380
3400 X=-1.95
3410 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
3420 LINE(XC+S*X,101)-(XC+S*X,101+Y),1
3430 LOCATE 1,1:  PRINT"Unit 2:  Screen 9"
3440 LOCATE 16,1
3450 PRINT"      Example 1.  This is the graph of the unit normal distribution."
3460 PRINT""
3470 PRINT"                    From Table B, the ordinate h of this curve at z = -
1.95"
3480 PRINT""
3490 PRINT"                    is .0596. Notice that the ordinate at z is equal to
 "
3500 PRINT""
3510 PRINT"                    the height of the curve at z."
3520 LOCATE 12,18: PRINT"h"
3530 LOCATE 23,58: PRINT"Press the enter key."
3540 A$=INKEY$: IF A$="" GOTO 3540
3550 'screen 10
3560 GOSUB 380
3570 X=-1!
3580 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
3590 LINE(XC+S*X,101)-(XC+S*X,101+Y),1
3600 X=1!
3610 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
3620 LINE(XC+S*X,101)-(XC+S*X,101+Y),1
3630 LOCATE 1,1: PRINT"Unit 2:  Screen 10"
3640 LOCATE 16,1
3650 PRINT"      Example 2.  This is the graph of the unit normal distribution."
```

```
3660 PRINT""
3670 PRINT"                    From Table B, the height (ordinate) h of this curve
 at"
3680 PRINT""
3690 PRINT"                    z = -1.00 is .2420 and the height at z = 1.00 is al
so"
3700 PRINT""
3710 PRINT"                    .2420."
3720 LOCATE 10,29: PRINT"h": LOCATE 10,54: PRINT"h"
3730 LOCATE 23,58: PRINT"Press the enter key."
3740 A$ = INKEY$: IF A$="" GOTO 3740
3750 'screen 11
3760 GOSUB 380
3770 X=1.25
3780 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
3790 LINE(XC+S*X,101)-(XC+S*X,101+Y),1
3800 LOCATE 11,58: PRINT"h"
3810 LOCATE 1,1: PRINT"Unit 2:  Screen 11"
3820 LOCATE 16,1
3830 PRINT"      Exercise 5.  This is the graph of the unit normal distribution.
"
3840 PRINT""
3850 PRINT"                    Using Table B, type in the ordinate h of the curve
 at"
3860 PRINT""
3870 INPUT"                    z = 1.25 and press the enter key.";Q5$
3880 IF I25 = 0 THEN A25$ = Q5$
3890 IF I25 = 1 THEN B25$ = Q5$
3900 IF Q5$ = ".1826" GOTO 3910 ELSE 3940
3910 PRINT""
3920 R25=1: PRINT"                         Your response is correct."
3930 GOTO 4120
3940 IF I25=1 GOTO 4090
3950 PRINT""
3960 IF Q5$ = "1826" GOTO 3970 ELSE 4050
3970 PRINT"                   Incorrect. You should first type in the decimal"
3980 PRINT"                   point. Press the enter key to continue.":I25=1: R
= R+1
3990 A$ = INKEY$: IF A$ = "" GOTO 3990
4000 LOCATE 18,1: PRINT"
                        "
4010 LOCATE 20,1: PRINT"
                        "
4020 PRINT"
       "
4030 PRINT"
       "
4040 PRINT "
      ":LOCATE 18,1: GOTO 3850
4050 PRINT"                   Your response is incorrect. Press the enter key "
4060 PRINT"                   for further explanation."
4070 A$ = INKEY$: IF A$="" GOTO 4070
4080 I25=1: R=R+1: GOTO 2480
4090 PRINT""
4100 W25 = 1: PRINT"                        Your res onse is incorrect. The correct a
nswer"
4110 PRINT"                   is .1826."
4120 LOCATE 23,58:  PRINT"Press the enter key."
4130 A$ = INKEY$: IF A$="" GOTO 4130
4140 'screen 12
4150 GOSUB 380
4160 X=0
4170 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
4180 LINE(XC+S*X,101)-(XC+S*X,101+Y),1
4190 LOCATE 7,42: PRINT"h"
4200 LOCATE 1,1: PRINT"Unit 2:  Screen 12"
```

```
4210 LOCATE 16,1
4220 PRINT"      Exercise 6.  This is the graph of the unit normal distribution.
"
4230 PRINT""
4240 PRINT"                   Using Table B, type in the height h of the curve a
t"
4250 PRINT""
4260 INPUT"                   z = 0 and press the enter key.";Q6$
4270 IF I26=0 THEN A26$ = Q6$
4280 IF I26=1 THEN B26$ = Q6$
4290 IF Q6$ = ".3989" GOTO 4300 ELSE 4330
4300 PRINT""
4310 R26=1: PRINT"                        Your response is correct."
4320 GOTO 4510
4330 IF I26=1 GOTO 4480
4340 PRINT""
4350 IF Q6$ = "3989" GOTO 4360 ELSE 4440
4360 PRINT"                  Incorrect. You should first type in the decimal"
4370 PRINT"                  point. Press the enter key to continue.":I26=1: R
= R+1
4380 A$=INKEY$: IF A$="" GOTO 4380
4390 LOCATE 18,1: PRINT"
                       "
4400 LOCATE 20,1: PRINT"
                       "
4410 PRINT"
       "
4420 PRINT"
       "
4430 PRINT "
        ":LOCATE 18,1: GOTO 4240
4440 PRINT"                  Your response is incorrect. Press the enter key "
4450 PRINT"                  for further explanation."
4460 A$ = INKEY$: IF A$="" GOTO 4460
4470 I26=1: R=R+1: GOTO 2480
4480 PRINT""
4490 W26 = 1: PRINT"                       Your response is incorrect. The correct a
nswer "
4500 PRINT"                  is .3989."
4510 LOCATE 23,58: PRINT"Press the enter key."
4520 A$=INKEY$: IF A$="" GOTO 4520
4530 'screen 13
4540 GOSUB 380
4550 X=-1.62
4560 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
4570 LINE(XC+S*X,101)-(XC+S*X,101+Y),1
4580 LOCATE 12,22: PRINT"h"
4590 LOCATE 1,1: PRINT"Unit 2:  Screen 13"
4600 LOCATE 16,1
4610 PRINT"      Exercise 7.  This is the graph of the unit normal distribution.
"
4620 PRINT""
4630 PRINT"                  Using Table B, type in the height h of the curve a
t"
4640 PRINT""
4650 INPUT"                  z = -1.62 and press the enter key.";Q7$
4660 IF I27=0 THEN A27$ = Q7$
4670 IF I27=1 THEN B27$ = Q7$
4680 IF Q7$ = ".1074" GOTO 4690 ELSE 4720
4690 PRINT""
4700 R27=1: PRINT"                        Your response is correct."
4710 GOTO 4900
4720 IF I27=1 GOTO 4870
4730 PRINT""
4740 IF Q7$ = "1074" GOTO 4750 ELSE 4830
4750 PRINT"                  Incorrect. You should first type in the decimal"
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```
4760 PRINT"                    point. Press the enter key to continue.":I27=1: R
= R+1
4770 AS = INKEYS: IF AS = "" GOTO 4770
4780 LOCATE 18,1: PRINT"
                    "
4790 LOCATE 20,1: PRINT"
                    "
4800 PRINT"
        "
4810 PRINT"
        "
4820 PRINT "
        ":LOCATE 18,1: GOTO 4630
4830 PRINT"                    Your response is incorrect. Press the enter key "
4840 PRINT"                    for further explanation."
4850 AS = INKEYS: IF AS="" GOTO 4850
4860 I26=0 :I27=1: R=R+1: GOTO 2480
4870 PRINT""
4880 W27 = 1: PRINT"                    Your response is incorrect. The correct a
nswer "
4890 PRINT"                    is .1074."
4900 LOCATE 23,58: PRINT"Press the enter key."
4910 AS=INKEYS: IF AS="" GOTO 4910
4920 R2 = R21+R22+R23+R24+R25+R26+R27
4930 W2 = W21+W22+W23+W24+W25+W26+W27
4940 FIRST2 = R2+W2-R
4950 T2S=TIMES
4960 TIMES="00:00:00"
4970 'screen 14
4980 SCREEN 0,1:COLOR 15,1,15:CLS
4990 LOCATE 1,32:PRINT"Unit 2:  Screen 14"
5000 LOCATE 7,1
5010 PRINT"             This concludes the discussion of Unit 2:  The Unit Norma
l"
5020 PRINT""
5030 PRINT"        Distribution. You worked correctly";FIRST2"exercise(s) out"
5040 PRINT""
5050 PRINT"        of 7. There are 10 review problems for this unit. Would"
5060 PRINT""
5070 PRINT"        you like to work some review problems ? Type y if yes or n"
5080 PRINT""
5090 INPUT"        if no and press the enter key.";Q2S
5100 IF Q2S = "y" OR Q2S = "Y" OR Q2S = "n" OR Q2S = "N" THEN GOTO 5110 ELSE LOC
ATE 15,1: PRINT"
        ": LOCATE 15,1: GOTO 5090
5110 IF Q2S = "y" OR Q2S = "Y" GOTO 5120 ELSE 8610
5120 ' screen 15
5130 SCREEN 0,1:COLOR 15,1,15:CLS
5140 LOCATE 1,32:PRINT"Unit 2:  Screen 15"
5150 LOCATE 7,1:K2=1
5160 PRINT"      Problem 1.  The mean of the unit normal distribution is z = ?"
5170 PRINT""
5180 INPUT"                    (Type answer and press the enter key)";Q2S
5190 IF J21=0 THEN C21S = Q2S
5200 IF J21=1 THEN C21S = Q2S
5210 PRINT""
5220 PRINT""
5230 IF Q2S = "0" GOTO 5240 ELSE 5270
5240 P21 = 1
5250 PRINT"                    Your response is correct."
5260 GOTO 5370
5270 IF J21=1 GOTO 5330
5280 PRINT"                    Your response is incorrect. Press the enter key"
5290 PRINT""
5300 PRINT"                    for further explanation."
5310 AS=INKEYS: IF AS="" GOTO 5310
```

```
5320 J21=1: P=P+1: GOTO 350
5330 Q21=1
5340 PRINT"                    Your response is incorrect. The correct response"
5350 PRINT""
5360 PRINT"                    is z = 0."
5370 LOCATE 23,58
5380 PRINT"Press the enter key."
5390 A$=INKEY$:  IF A$="" GOTO 5390
5400 GOSUB 5420
5410 IF Q2$ = "y" OR Q2$ = "Y" GOTO 5480 ELSE 8610
5420 CLS: LOCATE 5,1
5430 PRINT"             Would you like to work another review problem ?"
5440 PRINT""
5450 INPUT"        Type y if yes or n if no and press the enter key.";Q2$
5460 IF Q2$ = "y" OR Q2$ = "Y" OR Q2$ = "n" OR Q2$ = "N" THEN GOTO 5470 ELSE LOC
ATE 7,1: PRINT"
            ": LOCATE 7,1: GOTO 5450
5470 RETURN
5480 ' screen 16
5490 SCREEN 0,1:COLOR 15,1,15:CLS
5500 LOCATE 1,32:PRINT"Unit 2:  Screen 16"
5510 LOCATE 7,1: K2=2
5520 PRINT"      Problem 2.  The ordinate of the unit normal curve at z = -2.15
is ?"
5530 PRINT""
5540 PRINT"                    Type in your answer (for example, .2345) and"
5550 PRINT""
5560 INPUT"                    press the enter key.";Q2$
5570 IF J22=0 THEN C22$ = Q2$
5580 IF J22=1 THEN D22$ = Q2$
5590 PRINT""
5600 IF Q2$ = ".0396" GOTO 5610 ELSE 5640
5610 P22 = 1
5620 PRINT"                    Your response is correct."
5630 GOTO 5820
5640 IF J22=1 GOTO 5780
5650 IF Q2$ = "0396" OR Q2$ = "396" GOTO 5660 ELSE 5730
5660 PRINT"                     Incorrect. You should first type in the decimal"
5670 PRINT"                     point. Press the enter key to continue.":J22=1: P
= P+1
5680 A$ = INKEY$: IF A$ = "" GOTO 5680
5690 LOCATE 11,1: PRINT"
                    "
5700 PRINT"
          "
5710 PRINT"
          "
5720 PRINT "
          ":LOCATE 11,1: GOTO 5560
5730 PRINT"                    Your response is incorrect. Press the enter key"
5740 PRINT""
5750 PRINT"                    for further explanation."
5760 A$=INKEY$: IF A$="" GOTO 5760
5770 J22=1: P=P+1: GOTO 2480
5780 Q22=1
5790 PRINT"                    Your response is incorrect. The correct response"
5800 PRINT""
5810 PRINT"                    is .0396."
5820 LOCATE 23,58
5830 PRINT"Press the enter key."
5840 A$=INKEY$:  IF A$="" GOTO 5840
5850 GOSUB 5420
5860 IF Q2$ = "y" OR Q2$ = "Y" GOTO 5870 ELSE 8610
5870 ' screen 17
5880 SCREEN 0,1:COLOR 15,1,15:CLS
5890 LOCATE 1,32:PRINT"Unit 2:  Screen 17"
```

```
5900 LOCATE 7,1: K2=3
5910 PRINT"      Problem 3.  The standard deviation of the unit normal"
5920 PRINT""
5930 PRINT"                  distribution equals? (Type answer and press the"
5940 PRINT""
5950 INPUT"                  enter key.)";Q2$
5960 IF J23=0 THEN C23$ = Q2$
5970 IF J23=1 THEN D23$ = Q2$
5980 PRINT""
5990 IF Q2$ = "1" GOTO 6000 ELSE 6030
6000 P23 = 1
6010 PRINT"                  Your response is correct."
6020 GOTO 6130
6030 IF J23=1 GOTO 6090
6040 PRINT"                  Your response is incorrect. Press the enter key"
6050 PRINT""
6060 PRINT"                  for further explanation."
6070 A$=INKEY$: IF A$="" GOTO 6070
6080 J23=1: P=P+1: GOTO 350
6090 Q23=1
6100 PRINT"                  Your response is incorrect. The correct response"
6110 PRINT""
6120 PRINT"                  is z = 1."
6130 LOCATE 23,58
6140 PRINT"Press the enter key."
6150 A$=INKEY$:  IF A$="" GOTO 6150
6160 GOSUB 5420
6170 IF Q2$ = "y" OR Q2$ = "Y" GOTO 6180 ELSE 8610
6180 ' screen 18
6190 SCREEN 0,1:COLOR 15,1,15:CLS
6200 LOCATE 1,32:PRINT"Unit 2:  Screen 18"
6210 LOCATE 7,1: K2=4
6220 PRINT"      Problem 4.  One point of inflection of the unit normal curve"
6230 PRINT""
6240 PRINT"                  occurs at z = +1. The second point of inflection"
6250 PRINT""
6260 PRINT"                  occurs at z = ? (Type answer and  ress the enter"
6270 PRINT""
6280 INPUT"                  key.)";Q2$
6290 IF J24=0 THEN C24$ = Q2$
6300 IF J24=1 THEN D24$ = Q2$
6310 PRINT""
6320 IF Q2$ ="-1" GOTO 6330 ELSE 6360
6330 P24 = 1
6340 PRINT"                  Your response is correct."
6350 GOTO 6460
6360 IF J24=1 GOTO 6420
6370 PRINT"                  Your response is incorrect. Press the enter key"
6380 PRINT""
6390 PRINT"                  for further explanation."
6400 A$=INKEY$: IF A$="" GOTO 6400
6410 J24=1: P=P+1: GOTO 1700
6420 Q24=1
6430 PRINT"                  Your response is incorrect. The correct response"
6440 PRINT""
6450 PRINT"                  is z = -1."
6460 LOCATE 23,58
6470 PRINT"Press the enter key."
6480 A$=INKEY$:  IF A$="" GOTO 6480
6490 GOSUB 5420
6500 IF Q2$ = "y" OR Q2$ = "Y" GOTO 6510 ELSE 8610
6510 ' screen 19
6520 SCREEN 0,1:COLOR 15,1,15:CLS
6530 LOCATE 1,32:PRINT"Unit 2:  Screen 19"
6540 LOCATE 7,1: K2=5
6550 PRINT"      Problem 5.  The height of the unit normal curve at z = 1.32 is
```

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2"
6560 PRINT""
6570 PRINT"                    Type in your answer (e.g., .3416) and press the"
6580 PRINT""
6590 INPUT"                    enter key.";Q2$
6600 IF J25=0 THEN C25$ = Q2$
6610 IF J25=1 THEN D25$ = Q2$
6620 PRINT""
6630 IF Q2$ = ".1669" GOTO 6640 ELSE 6670
6640 P25 = 1
6650 PRINT"                    Your response is correct."
6660 GOTO 6870
6670 IF J25=1 GOTO 6830
6680 IF Q2$ = "1669" GOTO 6690 ELSE 6780
6690 PRINT"                     Incorrect. You should first type in the decimal"
6700 PRINT""
6710 PRINT"                     point. Press the enter key to continue.":J25=1: P
= P+1
6720 A$ = INKEY$: IF A$ = "" GOTO 6720
6730 LOCATE 11,1: PRINT"
                    "
6740 PRINT"
          "
6750 PRINT"
          "
6760 PRINT"
          "
6770 PRINT "
        ":LOCATE 11,1: GOTO 6590
6780 PRINT"                    Your response is incorrect. Press the enter key"
6790 PRINT""
6800 PRINT"                    for further explanation."
6810 A$=INKEY$: IF A$="" GOTO 6810
6820 J25=1: P=P+1: GOTO 2490
6830 Q25=1
6840 PRINT"                    Your response is incorrect. The correct response"
6850 PRINT""
6860 PRINT"                    is .1669."
6870 LOCATE 23,58
6880 PRINT"Press the enter key."
6890 A$=INKEY$:  IF A$="" GOTO 6890
6900 GOSUB  42
  1  IF Q2$ = "y" OR Q2$ = "Y" GOTO 6920 ELSE 8610
6920 ' screen 20
6930 SCREEN 0,1:COLOR 15,1,15:CLS
6940 LOCATE 1,32:PRINT"Unit 2:  Screen 20"
6950 LOCATE 7,1: K2=6
6960 PRINT"       Problem 6.  The median of the unit normal distribution is z = ?
"
6970 PRINT""
6980 INPUT"                    (Type answer and press the enter key)";Q2$
6990 IF J26=0 THEN C26$ = Q2$
7000 IF J26=1 THEN D26$ = Q2$
7010 PRINT""
7020 PRINT""
7030 IF Q2$ = "6" GOTO 7040 ELSE 7070
7040 P26 = 1
7050 PRINT"                    Your response is correct."
7060 GOTO 7170
7070 IF J26=1 GOTO 7130
7080 PRINT"                    Your response is incorrect. Press the enter key"
7090 PRINT""
7100 PRINT"                    for further explanation."
7110 A$=INKEY$: IF A$="" GOTO 7110
7120 J26=1: P=P+1: GOTO 350
7130 Q26=1
```

```
7140 PRINT"                    Your response is incorrect. The correct response"
7150 PRINT""
7160 PRINT"                    is z = 0."
7170 LOCATE 23,58
7180 PRINT"Press the enter key."
7190 AS=INKEYS:  IF AS="" GOTO 7190
7200 GOSUB 5420
7210 IF Q2S = "y" OR Q2S = "Y" GOTO 7220 ELSE 8610
7220 ' screen 21
7230 SCREEN 0,1:COLOR 15,1,15:CLS
7240 LOCATE 1,32:PRINT"Unit 2:  Screen 21"
7250 LOCATE 7,1: K2=7
7260 PRINT"      Problem 7.  The ordinate of the unit normal curve at z = 1.77 i
s ?"
7270 PRINT""
7280 PRINT"                    Type in your answer (for example, .2345) and"
7290 PRINT""
7300 INPUT"                    press the enter key.";Q2S
7310 IF J27=0 THEN C27S = Q2S
7320 IF J27=1 THEN D27S = Q2S
7330 PRINT""
7340 IF Q2S = ".0833" GOTO 7350 ELSE 7380
7350 P27 = 1
7360 PRINT"                    Your response is correct."
7370 GOTO 7580
7380 IF J27=1 GOTO 7540
7390 IF Q2S = "0833" GOTO 7400 ELSE 7490
7400 PRINT"                    Incorrect. You should first type in the decimal"
7410 PRINT""
7420 PRINT"                    point. Press the enter key to continue.":J27=1: P =
 P+1
7430 AS = INKEYS: IF AS = "" GOTO 7430
7440 LOCATE 11,1: PRINT"
                    "
7450 PRINT"
       "
7460 PRINT"
     "
7470 PRINT"
       "
7480 PRINT "
        ":LOCATE 11,1: GOTO 7300
7490 PRINT"                    Your response is incorrect. Press the enter key"
7500 PRINT""
7510 PRINT"                    for further explanation."
7520 AS=INKEYS: IF AS="" GOTO 7520
7530 J27=1: P=P+1: GOTO 2480
7540 Q27=1
7550 PRINT"                    Your response is incorrect. The correct response"
7560 PRINT""
7570 PRINT"                    is .0833."
7580 LOCATE 23,58
7590 PRINT"Press the enter key."
7600 AS=INKEYS:  IF AS="" GOTO 7600
7610 GOSUB 5420
7620 IF Q2S = "y" OR Q2S = "Y" GOTO 7630 ELSE 8610
7630 ' screen 22
7640 SCREEN 0,1:COLOR 15,1,15:CLS
7650 LOCATE 1,32:PRINT"Unit 2:  Screen 22"
7660 LOCATE 7,1: K2=8
7670 PRINT"      Problem 8.  The unit normal curve is symmetric about "
7680 PRINT""
7690 PRINT"                    z = ? (Type in your answer and press the"
7700 PRINT""
7710 INPUT"                    enter key.)";Q2S
7720 IF J28=0 THEN C28S = Q2S
```

```
7730 IF J28=1 THEN D28$ = Q2$
7740 PRINT""
7750 IF Q2$ = "0" GOTO 7760 ELSE 7790
7760 P28 = 1
7770 PRINT"                    Your response is correct."
7780 GOTO 7890
7790 IF J28=1 GOTO 7850
7800 PRINT"                    Your response is incorrect. Press the enter key"
7810 PRINT""
7820 PRINT"                    for further explanation."
7830 A$=INKEY$: IF A$="" GOTO 7830
7840 J28=1: P=P+1: GOTO 350
7850 Q28=1
7860 PRINT"                    Your response is incorrect. The correct response"
7870 PRINT""
7880 PRINT"                    is z = 0."
7890 LOCATE 23,58
7900 PRINT"Press the enter key."
7910 A$=INKEY$:  IF A$="" GOTO 7910
7920 GOSUB 5420
7930 IF Q2$ = "y" OR Q2$ = "Y" GOTO 7940 ELSE 8610
7940 ' screen 23
7950 SCREEN 0,1:COLOR 15,1,15:CLS
7960 LOCATE 1,32:PRINT"Unit 2:  Screen 23"
7970 LOCATE 7,1: K2=9
7980 PRINT"      Problem 9.  The tails of the unit normal curve are asymptotic"
7990 PRINT""
8000 PRINT"                    to the vertical axis. (Type t if true or f if "
8010 PRINT""
8020 INPUT"                    and press the enter key.)";Q2$
8030 PRINT""
8040 IF J29=0 THEN C29$ = Q2$
8050 IF J29=1 THEN D29$ = Q2$
8060 PRINT""
8070 IF Q2$ ="f" OR Q2$ = "F" GOTO 8080 ELSE 8110
8080 P29 = 1
8090 PRINT"                    Your response is correct."
8100 GOTO 8210
8110 IF J29=1 GOTO 8170
8120 PRINT"                    Your response is incorrect. Press the enter key"
8130 PRINT""
8140 PRINT"                    for further explanation."
8150 A$=INKEY$: IF A$="" GOTO 8150
8160 J29=1: P=P+1: GOTO 350
8170 Q29=1
8180 PRINT"                    Your response is incorrect. The correct response"
8190 PRINT""
8200 PRINT"                    is f."
8210 LOCATE 23,58
8220 PRINT"Press the enter key."
8230 A$=INKEY$:  IF A$="" GOTO 8230
8240 GOSUB 5420
8250 IF Q2$ = "y" OR Q2$ = "Y" GOTO 8260 ELSE 8610
8260 ' screen 24
8270 SCREEN 0,1:COLOR 15,1,15:CLS
8280 LOCATE 1,32:PRINT"Unit 2:  Screen 24"
8290 LOCATE 7,1: K2=10
8300 PRINT"      Problem 10.  The height of the unit normal curve at z = -0.63 is
 ?"
8310 PRINT""
8320 INPUT"                    (Type in your answer and press the enter key.)";Q2$
8330 IF J210=0 THEN C210$ = Q2$
8340 IF J210=1 THEN D210$ = Q2$
8350 PRINT""
8360 IF Q2$ = ".3271" GOTO 8370 ELSE 8400
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```
8370 P210 = 1
8380 PRINT"                    Your response is correct."
8390 GOTO 8580
8400 IF J210=1 GOTO 8540
8410 IF Q2$ = "3271" GOTO 8420 ELSE 8490
8420 PRINT"                     Incorrect. You should first type in the decimal"
8430 PRINT"                     point. Press the enter key to continue.":J210=1: P
 = P+1
8440 A$ = INKEY$: IF A$ = "" GOTO 8440
8450 LOCATE 9,1: PRINT"
                    "
8460 PRINT"
          "
8470 PRINT"
          "
8480 PRINT "
          ":LOCATE 9,1: GOTO 8320
8490 PRINT"                    Your response is incorrect. Press the enter key"
8500 PRINT""
8510 PRINT"                    for further explanation."
8520 A$=INKEY$: IF A$="" GOTO 8520
8530 J210=1: P=P+1: GOTO 2490
8540 Q210=1
8550 PRINT"                    Your response is incorrect. The correct response"
8560 PRINT""
8570 PRINT"                    is .3271."
8580 LOCATE 23,58
8590 PRINT"Press the enter key."
8600 A$=INKEY$:  IF A$="" GOTO 8600
8610 'screen 20
8620 CLS: LOCATE 1,32: PRINT"Unit 2:  Screen 20"
8630 LOCATE 8,1
8640 PRINT"                    Turn the printer on and press the enter key."
8650 A$ = INKEY$: IF A$ = "" GOTO 8650
8660 IF K2 = 0 GOTO 8820
8670 P2 = P21+P22+P23+P24+P25+P26+P27+P28+P29+P210
8680 Q2 = Q21+Q22 Q23+Q24+Q25+Q26+Q27+Q28+Q29+Q210
8690 SEC2 = P2+Q2-P
8700 PRINT""
8710 PRINT"                  The number of correct exercises is";FIRST2
8720 PRINT""
8730 PRINT"                  The number of incorrect exercises is";7-FIRST2
8740 PRINT""
8750 PRINT"                  The number of correct exercises after remediation is
";R-W2
8760 PRINT""
8770 PRINT"                  The number of correct problems is";SEC2
8780 PRINT""
8790 PRINT"                  The number of incorrect problems is";K2-SEC2
8800 PRINT""
8810 PRINT"                  The number of correct exercises after remediation is
";P-Q2
8820 LPRINT"                       Unit 2:  The Unit Normal Distribution "
8830 LPRINT""
8840 LPRINT""
8850 LPRINT"                  ";NAM$,"";NO$"";T2$
8860 LPRINT""
8870 LPRINT"                  The number of correct exercises is";FIRST2
8880 LPRINT""
8890 LPRINT"                  The number of incorrect exercises is";7-FIPST2"
8900 LPRINT""
8910 LPRINT"                  The number of correct exercises after remediation i
s";R-W2
8920 IF K2=0 GOTO 8990
8930 LPRINT"                                ";TIMES
8940 LPRINT"                  The number of correct problems is";SEC2
```

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8950 LPRINT""
8960 LPRINT"                    The number of incorrect problems is";K2-SEC2"
8970 LPRINT""
8980 LPRINT"                    The number of correct problemss after remediation i
s";P-Q2
8990 LPRINT""
9000 IF I21=1 GOTO 9030
9010 LPRINT"   Exercise 1 response was correct.",A21S:GOTO 9050
9020 LPRINT""
9030 LPRINT"   Exercise 1 response was incorrect.",A21S,B21S
9040 LPRINT""
9050 LPRINT"": IF I22=1 GOTO 9080
9060 LPRINT"   Exercise 2 response was correct.",A22S:GOTO 9100
9070 LPRINT""
9080 LPRINT"   Exercise 2 response was incorrect.",A22 ,B22$
9090 LPRINT""
9100 LPRINT"": IF I23=1 GOTO 9130
9110 LPRINT"   Exercise 3 response was correct.",A23S:GOTO 9150
9120 LPRINT""
9130 LPRINT"   Exercise 3 response was incorrect.",A23S,B23$
9140 LPRINT""
9150 LPRINT"": IF I24=1 GOTO 9180
9160 LPRINT"   Exercise 4 response was correct.",A24$:GOTO 9200
9170 LPRINT""
9180 LPRINT"   Exercise 4 response was incorrect.",A24S,B24$
9190 LPRINT""
9200 LPRINT"": IF I25=1 GOTO 9230
9210 LPRINT"   Exercise 5 response was correct.",A25S: GOTO 9250
9220 LPRINT""
9230 LPRINT"   Exercise 5 response was incorrect.",A25S,B25$
9240 LPRINT""
9250 LPRINT"": IF I26=1 GOTO 9280
9260 LPRINT"   Exercise 6 response was correct.",A26S: GOTO 9300
9270 LPRINT""
9280 LPRINT"   Exercise 6 response was incorrect.",A26S,B26S
9290 LPRINT""
9300 LPRINT"": IF I27=1 GOTO 9330
9310 LPRINT"   Exercise 7 response was correct.",A27S: GOTO 9350
9320 LPRINT""
9330 LPRINT"   Exercise 7 response was incorrect.",A27S,B27$
9340 LPRINT""
9350 IF K2<1 GOTO 9950
9360 LPRINT"": IF J21=1 GOTO 9390
9370 LPRINT"   Problem 1 response was correct.",C21S: GOTO 9410
9380 LPRINT""
9390 LPRINT"   Problem 1 response was incorrect.",C21S,D21S
9400 LPRINT""
9410 IF K2<2 GOTO 9950
9420 LPRINT"": IF J22=1 GOTO 9450
9430 LPRINT"   Problem 2 response was correct.",C22S: GOTO 9470
9440 LPRINT""
9450 LPRINT"   Problem 2 response was incorrect.",C22S,D22S
9460 LPRINT""
9470 IF K2<3 GOTO 9950
9480 LPRINT: IF J23=1 GOTO 9510
9490 LPRINT"   Problem 3 response was correct.",C23S: GOTO 9530
9500 LPRINT""
9510 LPRINT"   Problem 3 response was incorrect.",C23S,D23S
9520 LPRINT""
9530 IF K2<4 GOTO 9950
9540 LPRINT"": IF J24=1 GOTO 9570
9550 LPRINT"   Problem 4 response was correct.",C24S: GOTO 9590
9560 LPRINT""
9570 LPRINT"   Problem 4 response was incorrect.",C24S,D24S
9580 LPRINT""
9590 IF K2<5 GOTO 9950
```

```
9630 LPRINT"": IF J25=1 GOTO 9630
9610 LPRINT"   Problem 5 response was correct.",C25$: GOTO 9650
9620 LPRINT""
9630 LPRINT"   Problem 5 response was incorrect.",C25$,D25$
9640 LPRINT""
9650 IF K2<6 GOTO 9950
9660 LPRINT"": IF J26=1 GOTO 9690
9670 LPRINT"   Problem 6 response was correct.",C26$: GOTO 9710
9680 LPRINT""
9690 LPRINT"   Problem 6 response was incorrect.",C26$,D26$
9700 LPRINT""
9710 IF K2<7 GOTO 9950
9720 LPRINT"": IF J27=1 GOTO 9750
9730 LPRINT"   Problem 7 response was correct.",C27$: GOTO 9770
9740 LPRINT""
9750 LPRINT"   Problem 7 response was incorrect.",C27$,D27$
9760 LPRINT""
9770 IF K2<8 GOTO 9950
9780 LPRINT"": IF J28=1 GOTO 9810
9790 LPRINT"   Problem 8 response was correct.",C28$: GOTO 9830
9800 LPRINT""
9810 LPRINT"   Problem 8 response was incorrect.",C28$,D28$
9820 LPRINT""
9830 IF K2<9 GOTO 9950
9840 LPRINT"": IF J29=1 GOTO 9870
9850 LPRINT"   Problem 9 response was correct.",C29$: GOTO 9890
9860 LPRINT""
9870 LPRINT"   Problem 9 response was incorrect.",C29$,D29$
9880 LPRINT""
9890 IF K2<10 GOTO 9950
9900 LPRINT"": IF J210=1 GOTO 9930
9910 LPRINT"   Problem 10 response was correct.",C210$: GOTO 9950
9920 LPRINT""
9930 LPRINT"   Problem 10 response was incorrect.",C210$,D210$
9940 LPRINT""
9950 CLS: CHAIN "unit3"
```

```
10 COMMON NAM$,NOS
20 R=0
30 'Unit 3: z-scores
40 KEY OFF
50 TIME$ = "00:00:00"
60 SCREEN 0,1: COLOR 15,1,7: CLS
70 LOCATE 10,37
80 PRINT"Unit 3"
90 LOCATE 12,36: PRINT"z-Scores"
100 PRINT
110 PRINT
120 PRINT
130 LOCATE 23,58: PRINT"Press the enter key."
140 A$=INKEY$: IF A$ ="" GOTO 140
150 SCREEN 0,1: COLOR 15,1,7: CLS
160 LOCATE 1,32 :PRINT"Unit 3:  Screen ii"
170 LOCATE 7,1
180 PRINT"      Objectives:  At the end of Unit 3:  z-Scores, the student should
"
190 PRINT""
200 PRINT"                   be able to perform the following objectives."
210 PRINT""
220 PRINT"                   1. The student should be able to define the term "
230 PRINT""
240 PRINT"                      z-score."
250 PRINT""
260 PRINT"                   2. The student should be able to transform a raw-"
270 PRINT""
280 PRINT"                      score into an equivalent z-score."
290 PRINT""
300 PRINT"                   3. The student should be able to transform a z-scor
e"
310 PRINT""
320 PRINT"                      into its equivalent raw-score."
330 LOCATE 23,58: PRINT"Press the enter key."
340 A$ = INKEY$: IF A$ ="" GOTO 340
350 SCREEN 0,1: COLOR 15,1,7:CLS
360 LOCATE 1,32: PRINT"Unit 3:  Screen 1"
370 LOCATE 7,1
380 PRINT"            If an observation or score is expressed in terms of the "
390 PRINT""
400 PRINT"       number of standard deviations it deviates from the mean, the "
410 PRINT""
420 PRINT"       resulting score is called a z-score. An observation that has a
430 PRINT"
440 PRINT"       z-score of -2 is 2 standard deviations below the mean of the"
450 PRINT""
460 PRINT"       observation's population. A raw-score having a z-score of +1.5"

470 PRINT""
480 PRINT"       is 1.5 standard deviations above the mean of its population."
490 COLOR 15,6,7
500 LOCATE 7,13
510 PRINT"If an observation or score is expressed in terms of the "
520 LOCATE 9,8
530 PRINT"number of standard deviations it deviates from the mean, the "
540 LOCATE 11,8
550 PRINT"resulting score is called a z-score"
560 COLOR 15,1,7
570 LOCATE 23,58: PRINT"Press the enter key."
580 A$=INKEY$: IF A$="" GOTO 570
590 IF J37=1 GOTO 8300
600 IF J32=1 GOTO 6320
610 IF J31=1 GOTO 5790
```

```
620 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 2"
630 LOCATE 3,1
640 PRINT"                    Suppose that we are given a normal population of"
650 PRINT""
660 PRINT"                scores. The z-score for any observation in this populat
ion "
670 PRINT""
680 PRINT"                is given by the following formula:"
690 PRINT""
700 PRINT"                                   z = (X - m)/s,"
710 PRINT""
720 PRINT"                where X is the raw-score or the observation value,"
730 PRINT""
740 PRINT"                m is the mean of the given population, and s is the "
750 PRINT""
760 PRINT"                standard deviation of the population. Another "
770 PRINT""
780 PRINT"                formula for a z-score is:
790 PRINT""
800 PRINT"                         z = deviation/(standard deviation),"
810 PRINT""
820 PRINT"               where the deviation = X - m."
830 COLOR 15,6,7
840 LOCATE 9,35
850 PRINT" z = (X - m)/s,"
860 LOCATE 19,25
870 PRINT" z = deviation/(standard deviation)"
880 COLOR 15,1,7
890 LOCATE 23,58: PRINT"Press the enter key."
900 A$ = INKEY$: IF A$="" GOTO 900
910 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 3"
920 LOCATE 3,1
930 PRINT"       z-Score Scale      ----+----+----+----+----+----+----+----"
940 PRINT"                             -3   -2   -1    0   +1   +2   +3"
950 PRINT""
960 PRINT"       Raw-Score Scale    ----+----+----+----+----+----+----+----"
970 PRINT"                             47   52   57   62   67   72   77"
980 PRINT""
990 PRINT"       Example 1.  A test has a mean of 62 and a standard deviation"
1000 PRINT""
1010 PRINT"                  of 5. Determine the z-score for the raw-score "
1020 PRINT""
1030 PRINT"                  of 72."
1040 PRINT""
1050 PRINT""
1060 PRINT"        Solution.  X - m = 72 - 62 = 10 and s = 5. Therefore, z ="
1070 PRINT""
1080 PRINT"                  (X -m)/s = 10/5 = +2. Note that the raw-score"
1090 PRINT""
1100 PRINT"                  of 72 is 2 standard deviations above the mean"
1110 PRINT""
1120 PRINT"                  of the test scores."
1130 COLOR 12,1,7
1140 LOCATE 4,45:PRINT"0": LOCATE 7,45: PRINT"62"
1150 COLOR 15,1,7
1160 LOCATE 23,58: PRINT"Press the enter key."
1170 A$ = INKEY$: IF A$ = "" GOTO 1170
1180 IF J39=1 GOTO 9180
1190 IF J34=1 GOTO 7190
1200 LOCATE 23,58: PRINT"Press the enter key."
1210 IF I34 = 1 GOTO 2930
1220 IF I33 = 1 GOTO 2540
1230 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 3"
1240 LOCATE 3,1
1250 PRINT"       z-Score Scale      ----+----+----+----+----+----+----+----"
1260 PRINT"                             -3   -2   -1    0   +1   +2   +3"
```

```
1270 PRINT""
1280 PRINT"      Raw-Score Scale    ----+----+----+----+----+----+----+----"
1290 PRINT"                              35   50   65   80   95  110  125"
1300 PRINT""
1310 PRINT"      Example 2.  If the mean of a raw-score distribution is 80"
1320 PRINT""
1330 PRINT"                  and the standard deviation is 15, what is the"
1340 PRINT""
1350 PRINT"                  z-score for the raw-score of 65 ?"
1360 PRINT""
1370 PRINT""
1380 PRINT"       Solution.  X - m = 65 - 80 = -15 and s = 15. Therefore z ="
1390 PRINT""
1400 PRINT"                  z = (X - m)/s = -15/15 = -1. Note that a "
1410 PRINT""
1420 PRINT"                  raw-score of 65 is 1 standard deviation below "
1430 PRINT""
1440 PRINT"                  the mean of the raw-scores."
1450 COLOR 12,1,7
1460 LOCATE 4,45:PRINT"0": LOCATE 7,45: PRINT"80"
1470 COLOR 15,1,7
1480 LOCATE 23,58: PRINT"Press the enter key."
1490 A$=INKEY$: IF A$= "" GOTO 1490
1500 IF I38=1 GOTO 5180
1510 IF I32 = 1 GOTO 2130
1520 IF I31 = 1 GOTO 1720
1530 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 5"
1540 LOCATE 5,1
1550 PRINT"      Example 3.  What is the z-score of the mean of any normal"
1560 PRINT""
1570 PRINT"                  population of raw-scores ?"
1580 PRINT""
1590 PRINT"       Solution.  The mean does not deviate from itself. Since"
1600 PRINT""
1610 PRINT"                  a z-score = deviation/(standard deviation), the"
1620 PRINT""
1630 PRINT"                  z-score of the mean of any normal population is 0."

1640 PRINT""
1650 PRINT"                  Alternatively, z = (X -m)/s = (m - m)/s = 0/s = 0."

1660 LOCATE 23,58: PRINT"Press the enter key."
1670 A$=INKEY$: IF A$ = "" GOTO 1670
1680 IF J38=1 GOTO 8740
1690 IF J36=1 GOTO 7870
1700 IF J33=1 GOTO 6750
1710 IF I35=1 GOTO 3320
1720 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 6"
1730 LOCATE 4,1
1740 PRINT"      Exercise 1.  A raw-score distribution has a mean of 80 and a"
1750 PRINT""
1760 PRINT"                  standard deviation of 12. The raw-score of 63"
1770 PRINT""
1780 PRINT"                  expressed as a z-score is ?"
1790 PRINT""
1800 PRINT"                         a.  -1.42"
1810 PRINT"                         b.  -1.47"
1820 PRINT"                         c.  +0.64"
1830 PRINT"                         d.  +1.42"
1840 PRINT"                         e. +13.00"
1850 PRINT""
1860 PRINT"                  Type a, b, c, d or e for your answer and press the
"
1870 PRINT""
1880 INPUT"                  enter key.";B$
1890 IF I31=0 THEN A31$ = B$
```

```
1930 IF I31=1 THEN B31$ = B$
1910 IF B$="a" OR B$="A" OR B ~"b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 1980 ELSE 1920
1920 LOCATE 16,1
1930 PRINT"
   "
1940 PRINT"
   "
1950 PRINT"
   "
1960 LOCATE 16,1
1970 GOTO 1860
1980 IF B$="a" OR B$="A" THEN 1990 ELSE 2010
1990 PRINT""
2000 R31=1: PRINT"                    Your response is correct.": GOTO 2110
2010 IF I31=1 GOTO 2080
2020 PRINT""
2030 PRINT"                   Your response is incorrect. Press the enter key"
2040 PRINT""
2050 PRINT"                   for further explanation."
2060 A$=INKEY$: IF A$="" GOTO 2060
2070 I31=1: R = R + 1 :GOTO 1230
2080 PRINT""
2090 W31=1
2100 PRINT"                   Your response is incorrect. The correct response i
s a."
2110 LOCATE 23,58: PRINT"Press the enter key."
2120 A$=INKEY$: IF A$="" GOTO 2120
2130 CLS: LOCATE 1,32:PRINT"Unit 3:  Screen 7"
2140 LOCATE 5,1
2150 PRINT"      Exercise 2.  A negative z-score indicates that the "
2160 PRINT""
2170 PRINT"                   corresponding raw-score _________ the mean."
2180 PRINT ""
2190 PRINT"                        a. lies above"
2200 PRINT""
2210 PRINT"                        b. falls below"
2220 PRINT""
2230 PRINT"                        c. is equal to"
2240 PRINT""
2250 PRINT"                        d. none of the above"
2260 PRINT""
2270 PRINT"                   Type a, b, c, or d for your answer and press the"
2280 PRINT""
2290 INPUT"                   enter key.";B$
2300 IF I32=0 THEN A32$ = B$
2310 IF I32=1 THEN B32$ = B$
2320 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" THEN 2390 ELSE 2330
2330 LOCATE 17,1
2340 PRINT"
   "
2350 PRINT"
   "
2360 PRINT"
   "
2370 LOCATE 17,1
2380 GOTO 2270
2390 IF B$="b" OR B$="B" THEN 2400 ELSE 2420
2400 PRINT""
2410 R32=1: PRINT"                    Your response is correct.": GOTO 2520
2420 IF I32=1 GOTO 2490
2430 PRINT""
2440 PRINT"                  Your response is incorrect. Press the enter key"
2450 PRINT""
2460 PRINT"                  for further explanation."
```

```
2470 AS=INKEYS: IF AS="" GOTO 2470
2480 I32=1: R=R+1: GOTO 1230
2490 PRINT""
2500 W32=1
2510 PRINT"                    Your response is incorrect. The correct response i
s b."
2520 LOCATE 23,58: PRINT"Press the enter key."
2530 AS=INKEYS: IF AS="" GOTO 2530
2540 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 8"
2550 LOCATE 5,1
2560 PRINT"      Exercise 3.  If X = 140 with mean = 110 and standard deviation"
2570 PRINT""
2580 PRINT"                   = 14, X expressed as a z-score is ?"
2590 PRINT""
2600 PRINT"                           a. -2.14"
2610 PRINT"                           b. +1.14"
2620 PRINT"                           c. +2.14"
2630 PRINT"                           d. +30"
2640 PRINT"                           e.  none of the above."
2650 PRINT""
2660 PRINT"                   Type a, b, c, d, or e for your answer and press th
e"
2670 PRINT""
2680 INPUT"                   enter key.";B$
2690 IF I33=0 THEN A33$ = B$
2700 IF I33=1 THEN B33$ = B$
2710 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 2780 ELSE 2720
2720 LOCATE 15,1
2730 PRINT"
   "
2740 PRINT"
   "
2750 PRINT"
   "
2760 LOCATE 15,1
2770 GOTO 2660
2780 IF B$="c" OR B$="C" THEN 2790 ELSE 2810
2790 PRINT""
2800 R33=1: PRINT"                    Your response is correct.": GOTO 2910
2810 IF I33=1 GOTO 2880
2820 PRINT""
2830 PRINT"                   Your response is incorrect. Press the enter key"
2840 PRINT""
2850 PRINT"                   for further explanation."
2860 AS=INKEYS: IF AS="" GOTO 2860
2870 I33=1: R=R+1: GOTO 910
2880 PRINT""
2890 W33=1
2900 PRINT"                   Your response is incorrect. The correct response i
s c."
2910 LOCATE 23,58: PRINT"Press the enter key."
2920 AS=INKEYS: IF AS="" GOTO 2920
2930 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 9"
2940 LOCATE 5,1
2950 PRINT"      Exercise 4.  If X = 176, the mean = 163, and the standard"
2960 PRINT""
2970 PRINT"                  deviation = 26, X expressed as a z-score is ?"
2980 PRINT""
2990 PRINT"                           a. -0.50"
3000 PRINT"                           b. +0.50"
3010 PRINT"                           c. +0.78"
3020 PRINT"                           d. +0.92"
3030 PRINT"                           e.  none of the above"
3040 PRINT""
```

```
3050 PRINT"                    Type a, b, c, d or e for your answer and press the
"
3060 PRINT""
3070 INPUT"                    enter key.";B$
3080 IF I34=0 THEN A34$ = B$
3090 IF I34=1 THEN B34$ = B$
3100 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 3170 ELSE 3110
3110 LOCATE 15,1
3120 PRINT"
   "
3130 PRINT"
   "
3140 PRINT"
   "
3150 LOCATE 15,1
3160 GOTO 3050
3170 IF B$="b" OR B$="B" THEN 3180 ELSE 3200
3180 PRINT""
3190 R34=1: PRINT"                    Your response is correct.": GOTO 3300
3200 IF I34=1 GOTO 3270
3210 PRINT""
3220 PRINT"                    Your response is incorrect. Press the enter key"
3230 PRINT""
3240 PRINT"                    for further explanation."
3250 A$=INKEY$: IF A$="" GOTO 3250
3260 I34=1: R=R+1: GOTO 910
3270 PRINT""
3280 W34=1
3290 PRINT"                    Your response is incorrect. The correct response i
s b."
3300 LOCATE 23,58: PRINT"Press the enter key."
3310 A$=INKEY$: IF A$="" GOTO 3310
3320 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 10"
3330 LOCATE 5,1
3340 PRINT"      Exercise 5.  The z-score of the mean of any normal population"
3350 PRINT ""
3360 PRINT"                    is ?"
3370 PRINT""
3380 PRINT"                           a.  -1.00"
3390 PRINT"                           b.  -0.50"
3400 PRINT"                           c.   0
3410 PRINT"                           d.  +0.50"
3420 PRINT"                           e.  +1.00"
3430 PRINT""
3440 PRINT"                    Type a, b, c, d or e for your answer and press the
"
3450 PRINT""
3460 INPUT"                    enter key.";B$
3470 IF I35=0 THEN A35$ = B$
3480 IF I35=1 THEN B35$ = B$
3490 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 3570 ELSE 3510
3500 IF I35=1 THEN B35$ = B$
3510 LOCATE 15,1
3520 PRINT"
   "
3530 PRINT"
   "
3540 PRINT"
   "
3550 LOCATE 15,1
3560 GOTO 3440
3570 IF B$="c" OR B$="C" THEN 3580 ELSE 3600
3580 PRINT""
3590 R35=1: PRINT"                    Your response is correct.": GOTO 3700
```

```
3600 IF I35=1 GOTO 3670
3610 PRINT""
3620 PRINT"                    Your response is incorrect. Press the enter key"
3630 PRINT""
3640 PRINT"                    for further explanation."
3650 AS=INKEYS: IF AS="" GOTO 3650
3660 I35=1: R=R+1: GOTO 1530
3670 PRINT""
3680 W35=1
3690 PRINT"                    Your response is incorrect. The correct response i
s c."
3700 LOCATE 23,58: PRINT"Press the enter key."
3710 AS=INKEYS: IF AS="" GOTO 3710
3720 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 11"
3730 LOCATE 5,1
3740 PRINT"              We will now study how to transform a z-score into its
3750 PRINT""
3760 PRINT"         corresponding raw-score. Solving the form la z = (X - m)/s"
3770 PRINT""
3780 PRINT"         for X, we get:"
3790 PRINT""
3800 PRINT"                              X = m + zs."
3810 PRINT""
3820 PRINT"         Given the values of m, z, and s, we can now obtain X, "
3830 PRINT""
3840 PRINT"         the raw-score. X can be obtained by adding the mean to the"
3850 PRINT ""
3860 PRINT"         the product of the z-score and the standard deviation."
3870 COLOR 15,6,7
3880 LOCATE 11,28: PRINT" X = m + zs."
3890 COLOR 15,1,7
3900 LOCATE 23,58: PRINT"Press the enter key."
3910 AS=INKEYS: IF AS = "" GOTO 3910
3920 CLS
3930 LOCATE 1,32:PRINT"Unit 3:  Screen 12"
3940 LOCATE 5,1
3950 PRINT"      Example 4.  The mean and standard deviation of a population "
3960 PRINT""
3970 PRINT"                  are 100 and 15, respectively. If the z-score is +2,
"
3980 PRINT""
3990 PRINT"                  what is the corresponding observation?"
4000 PRINT""
4010 PRINT"       Solution.  X = m + zs"
4020 PRINT""
4030 PRINT"                    = 100 + 2(15)"
4040 PRINT""
4050 PRINT"                    = 100 + 30"
4060 PRINT""
4070 PRINT"                    = 130."
4080 PRINT""
4090 PRINT"                  Recall that multiplication precedes addition when"
4100 PRINT ""
4110 PRINT"                  simplifying an algebraic expression."
4120 LOCATE 23,58: PRINT"Press the enter key."
4130 AS=INKEYS: IF AS = "" GOTO 4130
4140 CLS: LOCATE 1,1
4150 PRINT"                           Unit 3: Screen 13"
4160 LOCATE 7,1
4170 PRINT"      Example 5.  The mean and standard deviation of a population of"

4180 PRINT""
4190 PRINT"                  scores are 50 and 10, respectively. If the z-score
4200 PRINT""
4210 PRINT"                  is -1.5, what is the corresponding raw score?"
4220 PRINT ""
```

```
4230 PRINT ""
4240 PRINT"       Solution.  X = m + zs"
4250 PRINT""
4260 PRINT"                    = 50 + (-1.5)(10)"
4270 PRINT""
4280 PRINT"                    = 50 - 15"
4290 PRINT""
4300 PRINT"                    = 35."
4310 LOCATE 23,58: PRINT"Press the enter key."
4320 AS=INKEYS: IF AS = "" GOTO 4320
4330 IF J310=1 GOTO ^520
4340 IF J35=1 GOTO 7530
4350 IF I37=1 GOTO 4770
4360 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 14"
4370 LOCATE 5,1
4380 PRINT"      Exercise 6.  The mean and standard deviation of a population"
4390 PRINT""
4400 PRINT"                   are 80 and 12, respectively. If the z-score is 0,"

4410 PRINT""
4420 PRINT"                   what is the corresponding raw-score ?"
4430 PRINT""
4440 PRINT"                          a. -6.67"
4450 PRINT"                          b. 50%"
4460 PRINT"                          c. 12"
4470 PRINT"                          d. 68"
4480 PRINT"                          e. 80"
4490 PRINT""
4500 PRINT"                   Type a, b, c, d, or e for your answer and press th
e"
4510 PRINT""
4520 INPUT"                   enter key.";B$
4530 IF I36=0 THEN A36$ = B$
4540 IF I36=1 THEN B36$ = B$
4550 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ = "E" THEN 4620 ELSE 4560
4560 LOCATE 17,1
4570 PRINT"
   "
4580 PRINT"
   "
4590 PRINT"
   "
4600 LOCATE 17,1
4610 GOTO 4500
4620 IF B$="e" OR B$="E" THEN 4630 ELSE 4650
4630 PRINT""
4640 R36=1: PRINT"                          Your response is correct.": GOTO 4750
4650 IF I36=1 GOTO 4720
4660 PRINT""
4670 PRINT"                   Your response is incorrect. Press the enter key"
4680 PRINT""
4690 PRINT"                   for further explanation."
4700 AS=INKEYS: IF AS="" GOTO 4700
4710 I36=1: R=R+1:GOTO 3720
4720 PRINT""
4730 W36=1
4740 PRINT"                   Your response is incorrect. The correct response i
s e."
4750 LOCATE 23,58: PRINT"Press the enter key."
4760 AS=INKEYS: IF AS="" GOTO 4760
4770 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 15"
4780 LOCATE 5,1
4790 PRINT"      Exercise 7.  The mean and standard deviation of a group of test
"
4800 PRINT""
```

```
4810 PRINT"                    scores are 62 and 5, respectively. If the z-score"

4820 PRINT""
4830 PRINT"                    is -2.4, what is the corresponding raw-score ?"
4840 PRINT""
4850 PRINT"                              a. -57"
4860 PRINT"                              b.  50"
4870 PRINT"                              c.  57"
4880 PRINT"                              d.  67"
4890 PRINT"                              e.  74"
4900 PRINT""
4910 PRINT"                    Type a, b, c, d or e for your answer and press the
"
4920 PRINT""
4930 INPUT"                    enter key.";B$
4940 IF I37=0 THEN A37$ = B$
4950 IF I37=1 THEN B37$ = B$
4960 IF B$="a" OR B$="A" OR B$="b" OR B$="B" OR B$="c" OR B$="C" OR B$="d" OR B$
="D" OR B$ = "e" OR B$ ="E" THEN 5030 ELSE 4970
4970 LOCATE 17,1
4980 PRINT"
   "
4990 PRINT"
   "
5000 PRINT"
   "
5010 LOCATE 17,1
5020 GOTO 4910
5030 IF B$="b" OR B$="B" THEN 5040 ELSE 5060
5040 PRINT""
5050 R37=1: PRINT"                    Your response is correct.": GOTO 5160
5060 IF I37=1 GOTO 5130
5070 PRINT""
5080 PRINT"                    Your response is incorrect. Press the enter key"
5090 PRINT""
5100 PRINT"                    for further explanation."
5110 A$=INKEY$: IF A$="" GOTO 5110
5120 I37=1: R=R+1: GOTO 3720
5130 PRINT""
5140 W37=1
5150 PRINT"                    Your response is incorrect. The correct response i
s b."
5160 LOCATE 23,58: PRINT"Press the enter key."
5170 A$=INKEY$: IF A$="" GOTO 5170
5180 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 16"
5190 LOCATE 5,1
5200 PRINT"      Exercise 8.  The mean and standard deviation of a group of test
"
5210 PRINT""
5220 PRINT"                    scores are 90 and 4, respectivelv. What is the "
5230 PRINT""
5240 PRINT"                    z-score of 80?"
5250 PRINT""
5260 PRINT"                            a. -10.00"
5270 PRINT"                            b.  -2.50"
5280 PRINT"                            c.  +2.50"
5290 PRINT"                            d. +10.00"
5300 PRINT"                            e.  none of the above"
5310 PRINT""
5320 PRINT"                    Type a, b, c, d, or e for your answer and press th
e"
5330 PRINT""
5340 INPUT"                    enter key.";B$
5350 IF I38=0 THEN A38$ = B$
5360 IF I38=1 THEN B38$ = B$
```

```
5370 IF BS="a" OR BS="A" OR BS="b" OR BS="B" OR BS="c" OR BS="C" OR BS="d" OR BS
="D" OR BS = "e" OR BS = "E" THEN 5440 ELSE 5380
5380 LOCATE 17,1
5390 PRINT"
   "
5400 PRINT"
   "
5410 PRINT"
   "
5420 LOCATE 17,1
5430 GOTO 5320
5440 IF BS="b" OR BS="B" THEN 5450 ELSE 5470
5450 PRINT""
5460 R38=1: PRINT"                    Your response is correct.": GOTO 5570
5470 IF I38=1 GOTO 5540
5480 PRINT""
5490 PRINT"                    Your response is incorrect. Press the enter key"
5500 PRINT""
5510 PRINT"                    for further explanation."
5520 AS=INKEYS: IF AS="" GOTO 5520
5530 I38=1: R=R+1: GOTO 1230
5540 PRINT""
5550 W38=1
5560 PRINT"                    Your response is incorrect. The correct response i
s b."
5570 LOCATE 23,58: PRINT"Press the enter key."
5580 AS=INKEYS: IF AS="" GOTO 5580
5590 R3 = R31+R32+R33+R34+R35+R36+R37+R38
5600 W3 = W31+W32+W33+W34+W35+W36+W37+W38
5610 FIRST3 = R3+W3-R
5620 T3S = TIMES
5630 TIMES = "00:00:00"
5640 'screen 17
5650 SCREEN 0,1: COLOR 15,1,7: CLS
5660 LOCATE 1,32: PRINT"Unit 3:  Screen 17"
5670 LOCATE 7,1
5680 PRINT"                This concludes our discussion of Unit 3:  z-Scores."

5690 PRINT""
5700 PRINT"            You worked correctly";FIRST3"exercise(s) out of 8. There"

5710 PRINT""
5720 PRINT"            are 10 review problems for this unit. Would you like"
5730 PRINT""
5740 PRINT"            to work some review problems? Type y if yes or n if no"
5750 PRINT""
5760 INPUT"            and press the enter key.";Q3S
5770 IF Q3S = "y" OR Q3S = "Y" OR Q3S = "n" OR Q3S = "N" GOTO 5780 ELSE LOCATE 1
5,1: PRINT"
       ": LOCATE 15,1: GOTO 5760
5780 IF Q3S = "y" OR Q3S = "Y" GOTO 5790 ELSE 9840
5790 'screen 18
5800 CLS:LOCATE 1,32: PRINT"Unit 3:  Screen 18"
5810 LOCATE 3,1: K3=1
5820 PRINT"      Problem 1.  If an observation or raw-score is expressed in"
5830 PRINT""
5840 PRINT"                  terms of the number of standard deviations it"
5850 PRINT""
5860 PRINT"                  deviates from the mean, the resulting value is"
5870 PRINT""
5880 PRINT"                  called?"
5890 PRINT""
5900 PRINT"                              a. the mean."
5910 PRINT"                              b. the standard deviation."
5920 PRINT"                              c. the median."
5930 PRINT"                              d. a z-score."
5940 PRINT""
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5950 PRINT"                    Type a, b, c, or d for your answer and press the"
5960 PRINT""
5970 INPUT"                    enter key.";Q3$
5980 IF J31=0 THEN C31$ = Q3$
5990 IF J31=1 THEN D31$ = Q3$
6000 PRINT""
6010 IF Q3$="a" OR Q3$="A" OR Q3$="b" OR Q3$="B" OR Q3$="c" OR Q3$="C" OR Q3$="d
" OR Q3$="D" THEN 6080 ELSE 6020
6020 LOCATE 16,1
6030 PRINT"
  "
6040 PRINT"
  "
6050 PRINT"
  "
6060 LOCATE 16,1
6070 GOTO 5950
6080 IF Q3$="d" OR Q3$="D" GOTO 6090 ELSE 6120
6090 P31=1
6100 PRINT"                    Your response is correct."
6110 GOTO 6220
6120 IF J31=1 GOTO 6180
6130 PRINT"                    Your response is incorrect. Press the enter key"
6140 PRINT""
6150 PRINT"                    for further explanation."
6160 A$=INKEY$: IF A$="" GOTO 6160
6170 J31=1: P=P+1: GOTO 350
6180 Q31=1
6190 PRINT"                    Your response is incorrect. The correct answer is"
6200 PRINT""
6210 PRINT"                    is d."
6220 LOCATE 23,58: PRINT"Press the enter key."
6230 A$=INKEY$: IF A$="" GOTO 6230
6240 GOSUB 6260
6250 IF Q3$ = "y" OR Q3$ = "Y" GOTO 6320 ELSE 9840
6260 CLS: LOCATE 5,1
6270 PRINT"             Would you like to work another review problem? Type y"
6280 PRINT""
6290 INPUT"        if yes or n if no and press the enter key.";Q3$
6300 IF Q3$ = "y" OR Q3$ = "Y" OR Q3$ = "n" OR Q3$ = "N" THEN 6310 ELSE LOCATE 7
,1: PRINT"
       ": LOCATE 7,1: GOTO 6290
6310 RETURN
6320 'screen 19
6330 CLS:LOCATE 1,32: PRINT"Unit 3:  Screen 19"
6340 LOCATE 7,1: K3=2
6350 PRINT"      Problem 2.  A z-score of 1 indicates that the corresponding"
6360 PRINT""
6370 PRINT"                    raw-score _____________  the mean."
6380 PRINT""
6390 PRINT"                         a. lies 1 standard deviation below "
6400 PRINT"                         b. lies 1 standard deviation above"
6410 PRINT"                         c. is equal to."
6420 PRINT"                         d. none of the above."
6430 PRINT""
6440 PRINT"                    Type a, b, c, or d for your answer and press the"
6450 PRINT""
6460 INPUT"                    enter key.";Q3$
6470 IF J32=0 THEN C32$ = Q3$
6480 IF J32=1 THEN D32$ = Q3$
6490 PRINT""
6500 IF Q3$="a" OR Q3$="A" OR Q3$="b" OR Q3$="B" OR Q3$="c" OR Q3$="C" OR Q3$="d
" OR Q3$="D" THEN 6570 ELSE 6510
6510 LOCATE 16,1
6520 PRINT"
  "
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6530 PRINT"
  "
6540 PRINT"
  "
6550 LOCATE 16,1
6560 GOTO 6440
6570 IF Q3S="b" OR Q3S="B" GOTO 6580 ELSE 6610
6580 P32=1
6590 PRINT"                    Your response is correct."
6600 GOTO 6710
6610 IF J32=1 GOTO 6670
6620 PRINT"                    Your response is incorrect. Press the enter key"
6630 PRINT""
6640 PRINT"                    for further explanation."
6650 AS=INKEYS: IF AS="" GOTO 6650
6660 J32= 1: P=P+1: GOTO 350
6670 Q32=1
6680 PRINT"                    Your response is incorrect. The correct answer is"
6690 PRINT""
6700 PRINT"                    is b."
6710 LOCATE 23,58: PRINT"Press the enter key."
6720 AS=INKEYS: IF AS="" GOTO 6720
6730 GOSUB 6260
6740 IF Q3S = "y" OR Q3S = "Y" GOTO 6750 ELSE 9840
6750 'screen 20
6760 CLS:LOCATE 1,32: PRINT"Unit 3:  Screen 20"
6770 LOCATE 5,1:K3=3
6780 PRINT"      Problem 3.  The z-score of the mode for any normal population "

6790 PRINT""
6800 PRINT"                    with mean 50 and standard deviation of 5 is ?"
6810 PRINT""
6820 PRINT"                         a.  -1.00"
6830 PRINT"                         b.  +1.00
6840 PRINT"                         c.  +5.00"
6850 PRINT"                         d. +50.00"
6860 PRINT"                         e.  none of the above"
6870 PRINT""
6880 PRINT"                    Type a, b, c, d, or e for your answer and press the
"
6890 PRINT""
6900 INPUT"                    enter key.";Q3S
6910 IF J33=0 THEN C 3S = Q3S
6920 IF J33=1 THEN D33S = Q3S
6930 PRINT""
6940 IF Q3S="a" OR Q3S="A" OR Q3S="b" OR Q3S="B" OR Q3S="c" OR Q3S="C" OR Q3S="d
" OR Q3S="D" OR Q3S = "e" OR Q3S = "E" THEN 7010 ELSE 6950
6950 LOCATE 15,1
6960 PRINT"
  "
6970 PRINT"
  "
6980 PRINT"
  "
6990 LOCATE 15,1
7000 GOTO 6880
7010 IF Q3S="e" OR Q3S="E" GOTO 7020 ELSE 7050
7020 P33=1
7030 PRINT"                    Your response is correct."
7040 GOTO 7150
7050 IF J33=1 GOTO 7110
7060 PRINT"                    Your response is incorrect. Press the enter key"
7070 PRINT""
7080 PRINT"                    for further explanation."
7090 AS=INKEYS: IF AS="" GOTO 7090
7100 J33= 1: P=P+1: GOTO 1530
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7110 Q33=1
7120 PRINT"                    Your response is incorrect. The correct answer is"
7130 PRINT""
7140 PRINT"                    is e."
7150 LOCATE 23,58: PRINT"Press the enter key."
7160 AS=INKEYS: IF AS="" GOTO 7160
7170 GOSUB 6260
7180 IF Q3$ = "y" OR Q3$ = "Y" GOTO 7190 ELSE 9840
7190 'screen 21
7200 SCREEN 0,1: COLOR 15,1,7: CLS
7210 LOCATE 1,32: PRINT"Unit 3:  Screen 21"
7220 LOCATE 5,1:K3=4
7230 PRINT"      Problem 4.  A raw-score distribution is normally distributed"
7240 PRINT""
7250 PRINT"                    with a mean of 50 and a standard deviation of 10."
7260 PRINT""
7270 PRINT"                    What is the z-score for the raw-score of 70 ?"
7280 PRINT""
7290 PRINT"                    Type in your answer (e.g., 1.87) and press the"
7300 PRINT""
7310 INPUT"                    enter key.";Q3$
7320 IF J34=0 THEN C34$ = Q3$
7330 IF J34=1 THEN D34$ = Q3$
7340 PRINT""
7350 IF Q3$ ="2" OR Q3$ = "+2" OR Q3$ = "2.00" OR Q3$ = "2.0" OR Q3$ = "+2.0" OR
 Q3$ = "+2.00" THEN 7360 ELSE 7390
7360 P34 = 1
7370 PRINT"                    Your response is correct."
7380 GOTO 7490
7390 IF J34=1 GOTO 7450
7400 PRINT"                    Your response is incorrect. Press the enter key."
7410 PRINT""
7420 PRINT"                    for further explanation."
7430 AS = INKEYS: IF AS="" GOTO 7430
7440 J34=1: P=P+1: GOTO 910
7450 Q34=1
7460 PRINT"                    Your response is incorrect. The correct answer is"
7470 PRINT""
7480 PRINT"                    2."
7490 LOCATE 23,58:PRINT"Press the enter key."
7500 AS = INKEYS: IF AS="" GOTO 7500
7510 GOSUB 6260
7520 IF Q3$ = "y" OR Q3$ = "Y" GOTO 7530 ELSE 9840
7530 'screen 22
7540 SCREEN 0,1: COLOR 15,1,7: CLS
7550 LOCATE 1,32: PRINT"Unit 3:  Screen 22"
7560 LOCATE 5,1:K3=5
7570 PRINT"      Problem 5.  The z-score of an observation taken from a normal"
7580 PRINT""
7590 PRINT"                    distribution with mean m = 50 and standard"
7600 PRINT""
7610 PRINT"                    deviation of 10 is -2. What is the corresponding"
7620 PRINT""
7630 PRINT"                    raw-score X ?"
7640 PRINT""
7650 INPUT"                    Type in your answer and press the enter key.";Q3$
7660 IF J35=0 THEN C35$ = Q3$
7670 IF J35=1 THEN D35$ = Q3$
7680 PRINT""
7690 IF Q3$ = "30" THEN 7700 ELSE 7730
7700 P35 = 1
7710 PRINT"                    Your response is correct."
7720 GOTO 7830
7730 IF J35=1 GOTO 7790
7740 PRINT"                    Your response is incorrect. Press the enter key"
7750 PRINT""
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7760 PRINT"                    for further explanation."
7770 A$ = INKEY$: IF A$="" GOTO 7770
7780 J35=1: P=P+1: GOTO 4140
7790 Q35=1
7800 PRINT"                    Your response is incorrect. The correct answer is"
7810 PRINT""
7820 PRINT"                    30."
7830 LOCATE 23,58:PRINT"Press the enter key."
7840 A$ = INKEY$: IF A$="" GOTO 7840
7850 GOSUB 6260
7860 IF Q3$ = "y" OR Q3$ = "Y" GOTO 7870 ELSE 9840
7870 'screen 23
7880 CLS:LOCATE 1,32: PRINT"Unit 3:  Screen 23"
7890 LOCATE 5,1:K3=6
7900 PRINT"       Problem 6.  A normal population has mean 72 and standard"
7910 PRINT""
7920 PRINT"                    deviation of 5. The z-score of its mean equals ?"
7930 PRINT""
7940 PRINT"                              a. -1 "
7950 PRINT"                              b.  0 "
7960 PRINT"                              c. +0.5"
7970 PRINT"                              d. +1 "
7980 PRINT""
7990 PRINT"                    Type a, b, c, or d for your answer and press the"
8000 PRINT""
8010 INPUT"                    enter key.";Q3$
8020 IF J36=0 THEN C36$ = Q3$
8030 IF J36=1 THEN D36$ = Q3$
8040 PRINT""
8050 IF Q3$="a" OR Q3$="A" OR Q3$="b" OR Q3$="B" OR Q3$="c" OR Q3$="C" OR Q3$="d
" OR Q3$="D" THEN 8120 ELSE 8060
8060 LOCATE 14,1
8070 PRINT"
  "
8080 PRINT"
  "
8090 PRINT"
  "
8100 LOCATE 14,1
8110 GOTO 7990
8120 IF Q3$="b" OR Q3$="B" GOTO 8130 ELSE 8160
8130 P36=1
8140 PRINT"                    Your response is correct."
8150 GOTO 8260
8160 IF J36=1 GOTO 8220
8170 PRINT"                    Your response is incorrect. Press the enter key"
8180 PRINT""
8190 PRINT"                    for further explanation."
8200 A$=INKEY$: IF A$="" GOTO 8200
8210 J36=1: P=P+1: GOTO 1530
8220 Q36=1
8230 PRINT"                    Your response is incorrect. The correct answer is"
8240 PRINT""
8250 PRINT"                    is b."
8260 LOCATE 23,58: PRINT"Press the enter key."
8270 A$=INKEY$: IF A$="" GOTO 8270
8280 GOSUB 6260
8290 IF Q3$ = "y" OR Q3$ = "Y" GOTO 8300 ELSE 9840
8300 'screen 24
8310 CLS:LOCATE 1,32: PRINT"Unit 3:  Screen 24"
8320 LOCATE 5,1:K3=7
8330 PRINT"       Problem 7.  A z-score of -2.5 indicates that the corresponding
8340 PRINT""
8350 PRINT"                    raw-score _____  the mean."
8360 PRINT""
8370 PRINT"                         a. lies below"
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8380 PRINT"                        b. lies above"
8390 PRINT"                        c. lies 2.5 standard deviations from"
8400 PRINT"                        d. a and c"
8410 PRINT"                        e. b and c"
8420 PRINT""
8430 PRINT"                    Type a, b, c, d or e for your answer and press the"
"
8440 PRINT""
8450 INPUT"                    enter key.";Q3$
8460 IF J37=0 THEN C37$ = Q3$
8470 IF J37=1 THEN D37$ = Q3$
8480 PRINT""
8490 IF Q3$="a" OR Q3$="A" OR Q3$="b" OR Q3$="B" OR Q3$="c" OR Q3$="C" OR Q3$="d
" OR Q3$="D" OR Q3$="e" OR Q3$ = "E" THEN 8560 ELSE 8500
8500 LOCATE 17,1
8510 PRINT"
  "
8520 PRINT"
  "
8530 PRINT"
  "
8540 LOCATE 17,1
8550 GOTO 8430
8560 IF Q3$="d" OR Q3$="D" GOTO 8570 ELSE 8600
8570 P37=1
8580 PRINT"                    Your response is correct."
8590 GOTO 8700
8600 IF J37=1 GOTO 8660
8610 PRINT"                    Your response is incorrect. Press the enter key"
8620 PRINT""
8630 PRINT"                    for further explanation."
8640 A$=INKEY$: IF A$="" GOTO 8640
8650 J37= 1: P=P+1: GOTO 350
8660 Q37=1
8670 PRINT"                    Your response is incorrect. The correct answer is"
8680 PRINT""
8690 PRINT"                    is d."
8700 LOCATE 23,58: PRINT"Press the enter key."
8710 A$=INKEY$: IF A$="" GOTO 8710
8720 GOSUB 6260
8730 IF Q3$ = "y" OR Q3$ = "Y" GOTO 8740 ELSE 9840
8740 'screen 25
8750 CLS:LOCATE 1,32: PRINT"Unit 3:  Screen 25"
8760 LOCATE 5,1:K3=8
8770 PRINT"      Problem 8.  The z-score of the median for any normal population
 "
8780 PRINT""
8790 PRINT"                    with mean 65 and standard deviation of 2 is ?"
8800 PRINT""
8810 PRINT"                         a.  -1.00"
8820 PRINT"                         b.  -0.50
8830 PRINT"                         c.   0"
8840 PRINT"                         d.  +0.50"
8850 PRINT"                         e.  none of the above"
8860 PRINT""
8870 PRINT"                    Type a, b, c, d, or e for your answer and press the
"
8880 PRINT""
8890 INPUT"                    enter key.";Q3$
8900 IF J38=0 THEN C38$ = Q3$
8910 IF J38=1 THEN D38$ = Q3$
8920 PRINT""
8930 IF Q3$="a" OR Q3$="A" OR Q3$="b" OR Q3$="B" OR Q3$="c" OR Q3$="C" OR Q3$="d
" OR Q3$="D" OR Q3$ = "e" OR Q3$ = "E" THEN 9200 ELSE 8940
8940 LOCATE 15,1
8950 PRINT"
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  "
8960 PRINT"
  "
8970 PRINT"
  "
8980 LOCATE 15,1
8990 GOTO 8870
9000 IF Q3$="c" OR Q3$="C" GOTO 9010 ELSE 9040
9010 P38=1
9020 PRINT"                    Your response is correct."
9030 GOTO 9140
9040 IF J38=1 GOTO 9100
9050 PRINT"                    Your response is incorrect. Press the enter key"
9060 PRINT""
9070 PRINT"                    for further explanation."
9080 A$=INKEY$: IF A$="" GOTO 9080
9090 J38= 1: P=P+1: GOTO 1530
9100 Q38=1
9110 PRINT"                    Your response is incorrect. The correct answer is"
9120 PRINT""
9130 PRINT"                    is c."
9140 LOCATE 23,58: PRINT"Press the enter key."
9150 A$=INKEY$: IF A$="" GOTO 9150
9160 GOSUB 6260
9170 IF Q3$ = "y" OR Q3$ = "Y" GOTO 9180 ELSE 9840
9180 'screen 26
9190 SCREEN 0,1: COLOR 15,1,7: CLS
9200 LOCATE 1,32: PRINT"Unit 3:  Screen 26"
9210 LOCATE 5,1: K3=9
9220 PRINT"      Problem 9.  A raw-score distribution is normally distributed"
9230 PRINT""
9240 PRINT"                    with a mean of 74 and a standard deviation of 6."
9250 PRINT""
9260 PRINT"                    What is the z-score for the raw-score of 59 ?"
9270 PRINT""
9280 PRINT"                    Type in your answer (e.g., 1.87) and press the"
9290 PRINT""
9300 INPUT"                    enter key.";Q3$
9310 IF J39=0 THEN C39$ = Q3$
9320 IF J39=1 THEN D39$ = Q3$
9330 PRINT""
9340 IF Q3$ ="-2.5" OR Q3$ = "-2.50" THEN 9350 ELSE 9380
9350 P39 = 1
9360 PRINT"                    Your response is correct."
9370 GOTO 9480
9380 IF J39=1 GOTO 9440
9390 PRINT"                    Your response is incorrect. Press the enter key."
9400 PRINT""
9410 PRINT"                    for further explanation."
9420 A$ = INKEY$: IF A$="" GOTO 9420
9430 J39=1: P=P+1: GOTO 910
9440 Q39=1
9450 PRINT"                    Your response is incorrect. The correct answer is"
9460 PRINT""
9470 PRINT"                    -2.50."
9480 LOCATE 23,58:PRINT"Press the enter key."
9490 A$ = INKEY$: IF A$="" GOTO 9490
9500 GOSUB 6260
9510 IF Q3$ = "y" OR Q3$ ="Y" GOTO 9520 ELSE 9840
9520 'screen 27
9530 SCREEN 0,1: COLOR 15,1,7: CLS
9540 LOCATE 1,32: PRINT"Unit 3:  Screen 27"
9550 LOCATE 5,1: K3=10
9560 PRINT"     Problem 10.  The z-score of an observation taken from a normal"
9570 PRINT""
9580 PRINT"                    distribution with mean m = 72 and standard"
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9590 PRINT""
9600 PRINT"                    deviation of 8 is +2.5. What is the corresponding"
9610 PRINT""
9620 PRINT"                    raw-score X ?"
9630 PRINT""
9640 INPUT"                    Type in your answer and press the enter key.";Q3$
9650 IF J310=0 THEN C310$ = Q3$
9660 IF J310=1 THEN D310$ = Q3$
9670 PRINT""
9680 IF Q3$ = "92" THEN 9690 ELSE 9720
9690 P310 = 1
9700 PRINT"                    Your response is correct."
9710 GOTO 9820
9720 IF J310=1 GOTO 9780
9730 PRINT"                    Your response is incorrect. Press the enter key"
9740 PRINT""
9750 PRINT"                    for further explanation."
9760 A$ = INKEY$: IF A$="" GOTO 9760
9770 J310=1: P=P+1: GOTO 4140
9780 Q310=1
9790 PRINT"                    Your response is incorrect. The correct answer is"
9800 PRINT""
9810 PRINT"                    92."
9820 LOCATE 23,58:PRINT"Press the enter key."
9830 A$ = INKEY$: IF A$="" GOTO 9830
9840 'screen 23
9850 CLS: LOCATE 1,32: PRINT"Unit 3:  Screen 23"
9860 LOCATE 8,1
9870 PRINT"                   Turn the printer on and press the enter key."
9880 A$ = INKEY$: IF A$ = "" GOTO 9880
9890 IF K3=0 GOTO 10050
9900 P3 = P31+P32+P33+P34+P35+P36+P37+P38+P39+P310
9910 Q3 = Q31+Q32+Q33+Q34+Q35+Q36+Q37+Q38+Q39+Q310
9920 SEC3 = P3+Q3-P
9930 PRINT""
9940 PRINT"                  The number of correct exercises is";FIRST3
9950 PRINT""
9960 PRINT"                  The number of incorrect exercises is";8-FIRST3"
9970 PRINT""
9980 PRINT"                  The number of correct exercises after remediation is
";R-W3
9990 PRINT""
10000 PRINT"                  The number of correct problems is";SEC3
10010 PRINT""
10020 PRINT"                  The number of incorrect problems is";K3-SEC3"
10030 PRINT""
10040 PRINT"                  The number of correct problems after remediation is
";P-Q3
10050 LPRINT"                                  Unit 3:  Standard Scores"
10060 LPRINT""
10070 LPRINT""
10080 LPRINT"                  ";NAM$,NO$,T3$
10090 LPRINT""
10100 LPRINT"                  The number of correct exercises is";FIRST3
10110 LPRINT""
10120 LPRINT"                  The number of incorrect exercises is"; 8-FIRST3"
10130 LPRINT""
10140 LPRINT"                  The number of correct exercises after remediation
is";R-W3
10150 IF K3=0 GOTO 10220
10160 LPRINT"                                              ";TIME$
10170 LPRINT"                  The number of correct problems is";SEC3
10180 LPRINT""
10190 LPRINT"                  The number of incorrect problems is"; K3-SEC3"
10200 LPRINT""
10210 LPRINT"                  The number of correct problems after remediation i
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s";P-Q3
10220 IF I31=1 GOTO 10250
10230 LPRINT"   Exercise 1 response was correct.",A31$:GOTO 10270
10240 LPRINT""
10250 LPRINT"   Exercise 1 response was incorrect.",A31$,B31$
10260 LPRINT""
10270 LPRINT"": IF I32=1 GOTO 10300
10280 LPRINT"   Exercise 2 response was correct.",A32$:GOTO 10320
10290 LPRINT""
10300 LPRINT"   Exercise 2 response was incorrect.",A32$,B32$
10310 LPRINT""
10320 LPRINT"": IF I33=1 GOTO 10350
10330 LPRINT"   Exercise 3 response was correct.",A33$:GOTO 10370
10340 LPRINT""
10350 LPRINT"   Exercise 3 response was incorrect.",A33$,B33$
10360 LPRINT""
10370 LPRINT"": IF I34=1 GOTO 10400
10380 LPRINT"   Exercise 4 response was correct.",A34$:GOTO 10420
10390 LPRINT""
10400 LPRINT"   Exercise 4 response was incorrect.",A34$,B34$
10410 LPRINT""
10420 LPRINT"": IF I35=1 GOTO 10450
10430 LPRINT"   Exercise 5 response was correct.",A35$: GOTO 10470
10440 LPRINT""
10450 LPRINT"   Exercise 5 response was incorrect.",A35$,B35$
10460 LPRINT""
10470 LPRINT"": IF I36=1 GOTO 10500
10480 LPRINT"   Exercise 6 response was correct.",A36$: GOTO 10520
10490 LPRINT""
10500 LPRINT"   Exercise 6 response was incorrect.",A36$,B36$
10510 LPRINT""
10520 LPRINT"": IF I37=1 GOTO 10550
10530 LPRINT"   Exercise 7 response was correct.",A37$: GOTO 10570
10540 LPRINT""
10550 LPRINT"   Exercise 7 response was incorrect.",A37$,B37$
10560 LPRINT""
10570 LPRINT"": IF I38=1 GOTO 10600
10580 LPRINT"   Exercise 8 response was correct.",A38$: GOTO 10620
10590 LPRINT""
10600 LPRINT"   Exercise 8 response was incorrect.",A38$,B38$
10610 LPRINT""
10620 IF K3<1 GOTO 11220
10630 LPRINT"": IF J31=1 GOTO 10660
10640 LPRINT"   Problem 1 response was correct.",C31$: GOTO 10680
10650 LPRINT""
10660 LPRINT"   Problem 1 response was incorrect.",C31$,D31$
10670 LPRINT""
10680 IF K3<2 GOTO 11220
10690 LPRINT"": IF J32=1 GOTO 10720
10700 LPRINT"   Problem 2 response was correct.",C32$: GOTO 10740
10710 LPRINT""
10720 LPRINT"   Problem 2 response was incorrect.",C32$,D32$
10730 LPRINT""
10740 IF K3<3 GOTO 11220
10750 LPRINT"": IF J33=1 GOTO 10780
10760 LPRINT"   Problem 3 response was correct.",C33$: GOTO 10800
10770 LPRINT""
10780 LPRINT"   Problem 3 response was incorrect.",C33$,D33$
10790 LPRINT""
10800 IF K3<4 GOTO 11220
10810 LPRINT"": IF J34=1 GOTO 10840
10820 LPRINT"   Problem 4 response was correct.",C34$: GOTO 10860
10830 LPRINT""
10840 LPRINT"   Problem 4 response was incorrect.",C34$,D34$
10850 LPRINT""
10860 IF K3<5 GOTO 11220
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10870 LPRINT"": IF J35=1 GOTO 10900
10880 LPRINT"   Problem 5 response was correct.",C35$: GOTO 10920
10890 LPRINT""
10900 LPRINT"   Problem 5 response was incorrect.",C35$,D35$
10910 LPRINT""
10920 IF K3<6 GOTO 11220
10930 LPRINT"": IF J36=1 GOTO 10960
10940 LPRINT"   Problem 6 response was correct.",C36$: GOTO 10980
10950 LPRINT""
10960 LPRINT"   Problem 6 response was incorrect.",C36$,D36$
10970 LPRINT""
10980 IF K3<7 GOTO 11220
10990 LPRINT"": IF J37=1 GOTO 11020
11000 LPRINT"   Problem 7 response was correct.",C37$: GOTO 11040
11010 LPRINT""
11020 LPRINT"   Problem 7 response was incorrect.",C37$,D37$
11030 LPRINT""
11040 IF K3<8 GOTO 11220
11050 LPRINT"": IF J38=1 GOTO 11080
11060 LPRINT"   Problem 8 response was correct.",C38$: GOTO 11100
11070 LPRINT""
11080 LPRINT"   Problem 8 response was incorrect.",C38$,D38$
11090 LPRINT""
11100 IF K3<9 GOTO 11220
11110 LPRINT"": IF J39=1 GOTO 11140
11120 LPRINT"   Problem 9 response was correct.",C39$: GOTO 11160
11130 LPRINT""
11140 LPRINT"   Problem 9 response was incorrect.",C39$,D39$
11150 LPRINT""
11160 IF K3<10 GOTO 11220
11170 LPRINT"": IF J310=1 GOTO 11200
11180 LPRINT"   Problem 10 response was correct.",C310$: GOTO 11220
11190 LPRINT""
11200 LPRINT"   Problem 10 response was incorrect.",C310$,D310$
11210 LPRINT""
11220 CLS: CHAIN "unit4"
```

```
10 COMMON NAMS,NOS
20 ' Unit 4: Area under a normal curve below or above a given observation
30 R=0
40 TIMES = "00:00:00"
50 KEY OFF
60 SCREEN 0,1:COLOR 15,1,11: CLS
70 LOCATE 7,39: PRINT"Unit 4":LOCATE 10,1
80 PRINT"                          Area Under a Normal Curve Lying Below or"
90 PRINT""
100 PRINT"                                    Above a Given Observation"
110 PRINT
120 PRINT
130 PRINT
140 PRINT
150 LOCATE 23,58: PRINT"Press the enter key."
160 AS = INKEYS: IF AS="" GOTO 160
170 'screen ii
180 SCREEN 0,1: COLOR 15,1,11: CLS
190 LOCATE 1,32:PRINT"Unit 4: Screen ii"
200 LOCATE 5,1
210 PRINT"      Objectives:  At the end of this unit, the student should be"
220 PRINT""
230 PRINT"                   able to:"
240 PRINT""
250 PRINT"                   1. Approximate the proportion of the area under"
260 PRINT""
270 PRINT"                      a normal curve lying below a given observation."
280 PRINT""
290 PRINT"                   2. Approximate the proportion of the area under"
300 PRINT""
310 PRINT"                      a normal curve lying above a given observation."
320 LOCATE 23,58: PRINT"Press the enter key."
330 AS=INKEYS: IF AS = "" GOTO 330
340 'screen 1
350 SCREEN 0,1: COLOR 15,1,11:CLS
360 LOCATE 1,32:PRINT"Unit 4:  Screen 1"
370 LOCATE 6,1
380 PRINT"          In many statistical applications, it is often necessary"
390 PRINT""
400 PRINT"      to know the proportion of the area under a normal curve that"
410 PRINT""
420 PRINT"     falls either below or above a given observation. Because a "
430 PRINT""
440 PRINT"     normal distribution and its corresponding z-score distribution"
450 PRINT""
460 PRINT"     have similar shapes, the z-score of the given observation  "
470 PRINT""
480 PRINT"     is first computed. Table B, Areas and Ordinates of the Unit"
490 PRINT""
500 PRINT"     Normal Distribution, is then used to determine the proportion"
510 PRINT""
520 PRINT"     of area falling above or below the given observation."
530 LOCATE 23,58: PRINT"Press the enter key."
540 AS=INKEYS:  IF AS="" GOTO 540
550 CLS
560 'screen 2
570 LOCATE 1,32:PRINT"Unit 4:  Screen 2"
580 LOCATE 7,1
590 PRINT"          First, we will study how to use Table B and later return"
600 PRINT""
610 PRINT"     to the problem of approximating the area under a normal curve"
620 PRINT""
```

```
630 PRINT"     in general."
640 LOCATE 23,58: PRINT"Press the enter key."
650 AS=INKEYS: IF AS="" GOTO 650
660 'screen 3
670 SCREEN 0,1:COLOR 15,1,11:CLS:LOCATE 1,32: PRINT"Unit 4:  Screen 3"
680 LOCATE 3,1
690 PRINT"          Suppose that one desires to find the area under the unit"
700 PRINT""
710 PRINT"      normal curve below a given z-value. The value of z is found"
720 PRINT""
730 PRINT"      in the first column of Table B. To the right of this entry in"
740 PRINT""
750 PRINT"      the column, titled Area Below, the area below z is found. A"
760 PRINT""
770 PRINT"      portion of Table B is shown below:"
780 PRINT""
790 PRINT""
800 PRINT"              z         Area Below      Area Above     Ordinate"
810 PRINT""
820 PRINT"            -1.04          .1492          .8508          .2323"
830 PRINT"            -1.03          .1515          .8485          .2347"
840 PRINT"            -1.02          .1539          .8461          .2371"
850 PRINT"            -1.01          .1562          .8438          .2396"
860 PRINT"            -1.00          .1582          .8418          .2420"
870 COLOR 15,6,6
880 LOCATE 14,24:PRINT" Area Below "
890 LOCATE 16,12:PRINT" -1.04          .1492   "
900 COLOR 15,1,11
910 LOCATE 22,1
920 PRINT""
930 PRINT"      The area below z = -1.04 is .1492."
940 LOCATE 23,58: PRINT"Press the enter  ey."
950 AS=INKEYS: IF AS="" GOTO 950
960 IF J46 = 1 GOTO 8340
970 IF J41 = 1 GOTO 6250
980 IF I43 =1 GOTO 2450
990 CLS: COLOR 15,1,11:LOCATE 1,32:PRINT"Unit 4:  Screen 4"
1000 LOCATE 5,1
1010 PRINT"                      A portion of Table B is shown below."
1020 PRINT""
1030 PRINT"              z         Area Below      Area Above     Ordinate"
1040 PRINT""
1050 PRINT"            -1.04          .1492          .8508          .2323"
1060 PRINT"            -1.03          .1515          .8485          .2347"
1070 PRINT"            -1.02          .1539          .8461          .2371"
1080 PRINT"            -1.01          .1562          .8438          .2396"
1090 PRINT"            -1.00          .1582          .8418          .2420"
1100 PRINT""
1110 PRINT"  Exercise 1.  Type in the area below z = -1.03 (for example, .1582)"

1120 PRINT""
1130 INPUT"                    and press the enter key.";Q4S
1140 IF I41=0 THEN A41S=Q4S
1150 IF I41=1 THEN B41S=Q4S
1160 PRINT""
1170 IF Q4S=".1515" GOTO 1180 ELSE 1200
1180 R41=1
1190 PRINT"                    Your response is correct.": GOTO 1490
1200 IF I41 = 1 GOTO 1380
1210 IF Q4S<>"1515" GOTO 1260
1220 PRINT"                    Incorrect. You should first type the decimal point."
1230 PRINT"                    Press the enter key."
1240 AS=INKEYS: IF AS="" GOTO 1240
1250 I41=1: R = R+1: GOTO 1410
1260 IF I41 = 1 GOTO 1380
1270 IF Q4S <>".8485" THEN GOTO 1330
```

```
1280 PRINT"                Incorrect. You have selected the area above z = -1.03.
"
1290 PRINT"                Press the enter key."
1300 AS=INKEYS: IF AS="" GOTO 1300
1310 I41 = 1: R = R+1: GOTO 1410
1320 IF I41 = 1 GOTO 1380
1330 PRINT"                Your response is incorrect. Press the enter key for"
1340 PRINT""
1350 PRINT"                further explanation."
1360 AS=INKEYS: IF AS="" GOTO 1360
1370 I41 =1: R=R+1: GOTO 670
1380 W41 = 1
1390 PRINT"                Your response is incorrect. The correct answer is .151
5."
1400 GOTO 1490
1410 LOCATE 15,1
1420 PRINT"
"
1430 PRINT"
"
1440 PRINT"
"
1450 PRINT"
"
1460 PRINT"
"
1470 PRINT"
"
1480 LOCATE 15,1: GOTO 1110
1490 LOCATE 23,58:PRINT"Press the enter key."
1500 AS = INKEYS: IF AS = "" GOTO 1500
1510 SCREEN 0,1: COLOR 15,1,11: CLS
1520 CLS: LOCATE 1,32:PRINT"Unit 4:  Screen 5"
1530 LOCATE 3,1
1540 PRINT"           Suppose that one desires to find the area under the unit"
1550 PRINT""
1560 PRINT"      normal curve above a given z-value. The value of z is found"
1570 PRINT""
1580 PRINT"      in the first column of a unit normal area table. To the right"
1590 PRINT""
1600 PRINT"      of this entry in the column, titled Area Above, the area"
1610 PRINT""
1620 PRINT"      above z is found. A portion of Table B is shown below."
1630 PRINT""
1640 PRINT"                  z         Area Below      Area Above     Ordinate"
1650 PRINT""
1660 PRINT"               -1.04          .1492           .8508          .2323"
1670 PRINT"               -1.03          .1515           .8485          .2347"
1680 PRINT"               -1.02          .1539           .8461          .2371"
1690 PRINT"               -1.01          .1562           .8438          .2396"
1700 PRINT"               -1.00          .1582           .8418          .2420"
1710 COLOR 15,6,11
1720 LOCATE 13,41:PRINT" Area Above "
1730 LOCATE 17,14:PRINT" -1.02 ": LOCATE 17,44:PRINT" .8461 "
1740 COLOR 15,1,11
1750 LOCATE 21,1
1760 PRINT"      The area above z = -1.02 is .8461."
1770 LOCATE 23,58: PRINT"Press the enter key."
1780 AS=INKEYS: IF AS="" GOTO 1780
1790 IF J47=1 GOTO 8640
1800 IF J42=1 GOTO 6610
1810 IF I44=1 GOTO 3030
1820 CLS: LOCATE 1,32: PRINT"Unit 4:  Screen 6"
1830 LOCATE 5,1
```

```
1840 PRINT"                    A portion of Table B is shown below."
1850 PRINT""
1860 PRINT"                 z          Area Below      Area Above     Ordinate"
1870 PRINT""
1880 PRINT"               0.56          .7123           .2877          .3410"
1890 PRINT"               0.57          .7157           .2843          .3391"
1900 PRINT"               0.58          .7190           .2810          .3372"
1910 PRINT"               0.59          .7224           .2776          .3352"
1920 PRINT"               0.60          .7257           .2743          .3332"
1930 PRINT""
1940 PRINT"  Exercise 2.  Type in the area (for example, .4213) above z = 0.58"
1950 PRINT""
1960 INPUT"               and press the enter key.";Q4$
1970 IF I42=0 THEN A42$ = Q4$
1980 IF I42=1 THEN B42$ = Q4$
1990 PRINT""
2000 IF Q4$=".2810" OR Q4$ = ".281" GOTO 2010 ELSE 2030
2010 R42=1
2020 PRINT"               Your response is correct.": GOTO 2350
2030 IF I42 = 1 GOTO 2230
2040 IF Q4$<>"2810" GOTO 2100
2050 PRINT"               Incorrect. You should first type the decimal point."
2060 PRINT""
2070 PRINT"               Press the enter key."
2080 A$=INKEY$: IF A$="" GOTO 2080
2090 I42=1: R=R+1: GOTO 2260
2100 IF I42 = 1 GOTO 2230
2110 IF Q4$ <>".7190" THEN GOTO 2180
2120 PRINT"               Incorrect. You have selected the area below z = -0.58.
"
2130 PRINT""
2140 PRINT"               Press the enter key."
2150 A$=INKEY$: IF A$="" GOTO 2150
2160 I42 = 1: R=R+1: GOTO 2260
2170 IF I42 = 1 GOTO 2230
2180 PRINT"               Your response is incorrect. Press the enter key for"
2190 PRINT""
2200 PRINT"               further explanation."
2210 A$=INKEY$: IF A$="" GOTO 2210
2220 I42 =1: R = R+1: GOTO 1520
2230 W42 = 1
2240 PRINT"               Your response is incorrect. The correct answer is .281
0."
2250 GOTO 2350
2260 LOCATE 15,1
2270 PRINT"
"
2280 PRINT"
"
2290 PRINT"
"
2300 PRINT"
"
2310 PRINT"
"
2320 PRINT"
"
2330 PRINT"
"
2340 LOCATE 15,1: GOTO 1940
2350 LOCATE 23,58:PRINT"Press the enter key."
2360 A$ = INKEY$: IF A$ = "" GOTO 2360
2370 CLS: LOCATE 1,32: PRINT"Unit 4:  Screen 7"
2380 LOCATE 7,1
2390 PRINT"          We will now give a graphical interpretation to what"
2400 PRINT""
```

```
2410 PRINT"      we have studied thus far in this unit."
2420 LOCATE 23,58: PRINT"Press the enter key."
2430 AS=INKEYS: IF AS="" GOTO 2430
2440 CLS
2450 'screen 8
2460 GOSUB 2480
2470 GOTO 2890
2480 SCREEN 2: CLS
2490 S=100
2500 A=240
2510 PI=3.141593
2520 XC=320:YC=100
2530 'draw axes
2540 LINE (0,YC+2)-(639,YC+2),1
2550 LINE (639,0)-(639,101),1
2560 FOR X=20 TO 620 STEP 20
2570 LINE(X,YC+2) -(X,YC+4),1
2580 NEXT X
2590 LOCATE 1,78
2600 PRINT ".4"
2610 LOCATE 7,78
2620 PRINT".2"
2630 FOR Y = 0 TO 75 STEP 25
2640 LINE (636,Y) - (639,Y),1
2650 NEXT Y
2660 LOCATE 14,1
2670 PRINT "z"
2680 LOCATE 14,15
2690 PRINT "-2"
2700 LOCATE 14,27
2710 PRINT "-1"
2720 LOCATE 14,41
2730 PRINT "0"
2740 LOCATE 14,53
2750 PRINT "1"
2760 LOCATE 14,66
2770 PRINT "2"
2780 LOCATE 14,78
2790 PRINT "3"
2800 'draw graph
2810 X1=-3.5:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
2820 X2=-3.4:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
2830 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
2840 FOR X=-3.4 TO 3.5 STEP .2
2850 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
2860 LINE -(XC+S*X,YC+Y),1
2870 NEXT X
2880 RETURN
2890 LOCATE 1,1: PRINT"Unit 4:  Screen 8"
2900 Z1 = -1
2910 Y3=-A*1/SQR(2*PI)*EXP(-(Z1^2)/2)
2920 LINE (XC+S*Z1,101)-(XC+S*Z1,101+Y3)
2930 PAINT (XC+S*Z1-1,(101+101+Y3)/2)
2940 LOCATE 16,1
2950 PRINT"            This is the graph of the unit normal distribution."
2960 PRINT""
2970 PRINT"      The area below z = -1.00 is shaded. From Table B, the area"
2980 PRINT""
2990 PRINT"      of this shaded region is .1587."
3000 LOCATE 23,58: PRINT"Press the enter key."
3010 AS=INKEYS:  IF AS = "" GOTO 3010
3020 IF I43=1 GOTO 3190
3030 'screen 9
3040 GOSUB 2480
```

```
3050 LOCATE 1,1:PRINT"Unit 4:  Screen 9"
3060 Z1 = -1.25
3070 Y3=-A*1/SQR(2*PI)*EXP(-(Z1^2)/2)
3080 LINE (XC+S*Z1,101)-(XC+S*Z1,101+Y3)
3090 PAINT (XC+S*Z1+1,(101+101+Y3)/2)
3100 LOCATE 16,1
3110 PRINT"            This is the graph of the unit normal distribution. The"
3120 PRINT""
3130 PRINT"      area above z = -1.25 is shaded. Using Table B, the area of"
3140 PRINT""
3150 PRINT"      this shaded region is .8944."
3160 LOCATE 23,58: PRINT"Press the enter key."
3170 A$=INKEY$: IF A$="" GOTO 3170
3180 IF I44=1 GOTO 3590
3190 'screen 10
3200 GOSUB 2480
3210 LOCATE 1,1:PRINT"Unit 4:  Screen 10"
3220 Z1 = 0
3230 Y3=-A*1/SQR(2*PI)*EXP(-(Z1^2)/2)
3240 LINE (XC+S*Z1,101)-(XC+S*Z1,101+Y3)
3250 PAINT (XC+S*Z1-1,(101+101+Y3)/2)
3260 LOCATE 16,1
3270 PRINT"      Exercise 3.  The area below z = 0 has been shaded. Using Table
B"
3280 PRINT""
3290 PRINT"                   type in the area (for example, .8643) below z = 0"

3300 PRINT""
3310 INPUT"                   and press the enter key.";Q4$
3320 IF I43=0 THEN A43$ = Q4$
3330 IF I43=1 THEN B43$ = Q4$
3340 PRINT""
3350 IF Q4$=".5000" OR Q4$ = ".5" OR Q4$= ".50" OR Q4$ = ".500" GOTO 3360 ELSE 3
380
3360 R43=1
3370 PRINT"                   Your response is correct.": GOTO 3570
3380 IF I43 = 1 GOTO 3480
3390 IF Q4$="5000" OR  Q4$ = "5" GOTO 3400 ELSE 3440
3400 PRINT"                   Incorrect. You should first type the decimal point
."
3410 PRINT"                   Press the enter key."
3420 A$=INKEY$: IF A$="" GOTO 3420
3430 I43=1: R=R+1: GOTO 3510
3440 PRINT"                   Your response is incorrect. Press the enter key fo
r"
3450 PRINT"                   further explanation."
3460 A$=INKEY$: IF A$="" GOTO 3460
3470 I43 =1: R = R+1: GOTO 670
3480 W43 = 1
3490 PRINT"                  Your response is incorrect. The correct answer is
.5000."
3500 GOTO 3570
3510 LOCATE 20,1
3520 PRINT"
     "
3530 PRINT"
     "
3540 PRINT"
     "
3550 PRINT"
     "
3560 LOCATE 20,1: GOTO 3310
3570 LOCATE 23,58:PRINT"Press the enter key."
3580 A$ = INKEY$: IF A$ = "" GOTO 3580
3590 'screen 11
3600 GOSUB 2480
3610 LOCATE 1,1:PRINT"Unit 4:  Screen 11"
3620 Z = 1.5
3630 Y3=-A*1/SQR(2*PI)*EXP(-(Z^2)/2)
3640 LINE (XC+S*Z,101)-(XC+S*Z,101+Y3)
```

```
3650 PAINT (XC+S*Z+1,(101+101+Y3)/2)
3660 LOCATE 16,1
3670 PRINT"      Exercise 4.  The area above z = 1.50 has been shaded. Using Tab
le B,"
3680 PRINT""
3690 PRINT"                   type in the area (for example, .8643) above z = 1.
50"
3700 PRINT""
3710 INPUT"                   and press the enter key.";Q4$
3720 IF I44=0 THEN A44$ = Q4$
3730 IF I44=1 THEN B44$ = Q4$
3740 PRINT""
3750 IF Q4$=".0668" GOTO 3760 ELSE 3780
3760 R44=1
3770 PRINT"                   Your response is correct.": GOTO 4040
3780 IF I44 = 1 GOTO 3950
3790 IF Q4$<>"0668" GOTO 3850
3800 PRINT"                   Incorrect. You should first type the decimal point
."
3810 PRINT"                   Press the enter key."
3820 AS=INKEYS: IF AS="" GOTO 3820
3830 I44=1: R = R+1: GOTO 3980
3840 IF I44 = 1 GOTO 3950
3850 IF Q4$ <>".9332" THEN GOTO 3910
3860 PRINT"                   Incorrect. You have selected the area below z = 1.
50 ."
3870 PRINT"                   Press the enter key."
3880 AS=INKEYS: IF AS="" GOTO 3880
3890 I44 = 1: R=R+1: GOTO 3980
3900 IF I44 = 1 GOTO 3950
3910 PRINT"                   Your response is incorrect. Press the enter key fo
r"
3920 PRINT"                   further explanation."
3930 AS=INKEYS: IF AS="" GOTO 3930
3940 I44 =1: R = R+1: GOTO 1510
3950 W44 = 1
3960 PRINT"                   Your response is incorrect. The correct answer is
.0668."
3970 GOTO 4040
3980 LOCATE 20,1
3990 PRINT"
   "
4000 PRINT"
   "
4010 PRINT"
   "
4020 PRINT"
   "
4030 LOCATE 20,1: GOTO 3710
4040 LOCATE 23,58:PRINT"Press the enter key."
4050 AS = INKEYS: IF AS = "" GOTO 4050
4060 'screen 13
4070 SCREEN 0,1: COLOR 15,1,11: CLS
4080 LOCATE 1,32: PRINT"Unit 4:  Screen 13"
4090 LOCATE 5,1
4100 PRINT"      Definition:  The percentile rank of a given observation is "
4110 PRINT""
4120 PRINT"                   defined as the percentage of observations in the "

4130 PRINT""
4140 PRINT"                   population of observations that falls below the"
4150 PRINT""
4160 PRINT"                   given observation."
4170 PRINT""
4180 PRINT"       Example 1.  Suppose that 40% of a population of scores falls"
4190 PRINT""
```

```
4200 PRINT"                    below the test score of 85. The percentile rank"
4210 PRINT""
4220 PRINT"                    of 85 is therefore 40."
4230 LOCATE 23,58: PRINT"Press the enter key."
4240 A$ = INKEY$: IF A$ = "" GOTO 4240
4250 'screen 14
4260 SCREEN 0,1: COLOR 15,1,11: CLS
4270 LOCATE 1,32:PRINT"Unit 4:  Screen 14"
4280 LOCATE 3,1
4290 PRINT"       Example 2.  A group of test scores are normally distrib ted"
4300 PRINT""
4310 PRINT"                    with mean of 100 and standard deviation of 15."
4320 PRINT""
4330 PRINT"                    What is the percentile rank for the test score of 1
15 ?
4340 PRINT""
4350 PRINT"        Solution.   The percentile rank of 115 is the percentage of "
4360 PRINT""
4370 PRINT"                    test scores falling below the test score of"
4380 PRINT""
4390 PRINT"                    115. First compute the z-score for the raw-score"
4400 PRINT""
4410 PRINT"                    of 115. Recall that z = (X - m)/s = (115 - 100)/15"

4420 PRINT""
4430 PRINT"                    15/15 = 1.00. From Table B, the proportion of the "

4440 PRINT""
4450 PRINT"                    area below z = 1.00 is .8413. The percentage of the
"
4460 PRINT""
4470 PRINT"                    test scores below 115 is .8413 x 100 = 84.13 ."
4480 LOCATE 23,58: PRINT"Press the enter key."
4490 A$ = INKEY$: IF A$ ="" GOTO 4490
4500 IF J48=1 GOTO 8940
4510 IF J45=1 GOTO 7790
4520 IF J43=1 GOTO 6910
4530 IF I45 = 1 GOTO 4790
4540 ' screen 15
4550 SCREEN 0,1: COLOR 15,1,11: CLS
4560 LOCATE 1,32:PRINT"Unit 4:  Screen 15"
4570 LOCATE 4,1
4580 PRINT"       Example 3.  If men's heights are normally distributed with a"
4590 PRINT""
4600 PRINT"                    mean of 67.02 inches and standard deviation of
4610 PRINT""
4620 PRINT"                    2.56 inches, find the percent of men having a"
4630 PRINT""
4640 PRINT"                    height above 70.86 inches."
4650 PRINT""
4660 PRINT"       Solution.    The z-score for 70.86 inches is given by z ="
4670 PRINT""
4680 PRINT"                    (X - m)/s = (70.86 - 67.02)/2.56 = 3.84/2.56 ="
4690 PRINT""
4700 PRINT"                    1.50. From Table B, the proportion of area above"
4710 PRINT""
4720 PRINT"                    z = 1.50 is .0668. The percent of men having a"
4730 PRINT""
4740 PRINT"                    height above 70.86 inches = .0668 x 100% = 6.68%."
4750 LOCATE 23,58:PRINT"Press the enter key."
4760 A$ = INKEY$: IF A$="" GOTO 4760
4770 IF J49=1 GOTO 9380
4780 IF J44=1 GOTO 7350
4790 'screen 16
4800 SCREEN 0,1: COLOR 15,1,11:CLS
4810 LOCATE 1,32: PRINT"Unit 4:  Screen 16"
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```
4820 LOCATE 3,1
4830 PRINT"      Exercise 5.  If IQs were perfectly normally distributed"
4840 PRINT""
4850 PRINT"                   with a mean of 100 and a standard deviation"
4860 PRINT""
4870 PRINT"                   of 15, the percentile rank of a score of 130"
4880 PRINT""
4890 PRINT"                   is ?"
4900 PRINT""
4910 PRINT"                        a.  2.28"
4920 PRINT"                        b. 52.59"
4930 PRINT"                        c. 84.13"
4940 PRINT"                        d. 97.72"
4950 PRINT"                        e. 99.99"
4960 PRINT""
4970 PRINT"                   Type a, b, c, d or e for your answer and press the
"
4980 PRINT""
4990 INPUT"                   enter key."; Q4$
5000 IF I46=0 THEN A46$=Q4$
5010 IF I46=1 THEN B46$=Q4$
5020 PRINT""
5030 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ = "b" OR Q4$ = "B" OR Q4$ = "c" OR Q4$ ="C"
OR Q4$ = "d" OR Q4$ = "D" OR Q4$ = "e" OR Q4$ ="E" THEN GOTO 5100 ELSE 5040
5040 LOCATE 17,1
5050 PRINT"
   "
5060 PRINT"
   "
5070 PRINT"
   "
5080 LOCATE 17,1
5090 GOTO 4970
5100 IF Q4$ = "d" OR Q4$ = "D" THEN GOTO 5110 ELSE 5160
5110 R46 = 1
5120 PRINT"                   Your response is correct. The z-score for 130 is"
5130 PRINT"                   z = (X - m)/s = (130 - 100)/15 = 2. The area below
"
5140 PRINT"                   z = 2 is .9772 = 97.72%."
5150 GOTO 5240
5160 IF I46 = 1 GOTO 5220 ELSE 5170
5170 PRINT"                   Your response is incorrect. Press the enter key"
5180 PRINT""
5190 PRINT"                   for further explanation."
5200 A$ = INKEY$: IF A$ ="" GOTO 5200
5210 I46 = 1: R=R+1: GOTO 4250
5220 W46 =1
5230 PRINT"                   Your response is incorrect. The correct answer is
d."
5240 LOCATE 23,58: PRINT"Press the enter key."
5250 A$ = INKEY$: IF A$ = "" GOTO 5250
5260 ' screen 17
5270 SCREEN 0,1: COLOR 15,1,11: CLS
5280 LOCATE 1,32:PRINT"Unit 4:  Screen 17"
5290 LOCATE 5,1
5300 PRINT"      Example 4.  Test A scores have a mean of 90 and a standard"
5310 PRINT""
5320 PRINT"                  deviation of 10. Test B scores have a mean of 70"
5330 PRINT""
5340 PRINT"                  and a standard deviation of 5. If John's score was
80"
5350 PRINT""
5360 PRINT"                  on Test A and 75 on Test B, on which test was John'
s"
5370 PRINT""
5380 PRINT"                  relative performance better?"
```

```
5390 PRINT""
5400 PRINT"       Solution.  We need to compute the percentile rank of each of"
5410 PRINT""
5420 PRINT"                  John's test scores and compare the two.
5430 LOCATE 23,58: PRINT"Press the enter key."
5440 A$ = INKEY$: IF A$ = "" GOTO 5440
5450 LOCATE 15,1
5460 PRINT"
     "
5470 LOCATE 17,1
5480 PRINT"
     "
5490 LOCATE 23,1
5500 PRINT"
       "
5510 LOCATE 15,1
5520 PRINT"       Solution.  John's z-score on Test A is z = (X - m)/s = "
5530 PRINT"                  (80 - 90)/10 = -1. From Table B, the percentile "
5540 PRINT"                  rank of z = - 1 is .1587 x 100 = 15.87. John's z-sc
ore"
5550 PRINT"                  on Test B is z = (75 - 70)/5 = 1. The percentile"
5560 PRINT"                  rank of z = 1 is 84.13. Only 15.87% of the students
"
5570 PRINT"                  scored lower than John on Test A whereas 84.13%"
5580 PRINT"                  scored lower than John on Test B. John's relative"
5590 PRINT"                  performance was better on Test B."
5600 LOCATE 23,58: PRINT"Press the enter key."
5610 A$ = INKEY$: IF A$ = "" GOTO 5610
5620 ' screen 18
5630 SCREEN 0,1: COLOR 15,1,11: CLS
5640 LOCATE 1,32:PRINT"Unit 4:  Screen 18"
5650 LOCATE 5,1
5660 PRINT"      Exercise 6.  Which of the following reflects the poorest"
5670 PRINT""
5680 PRINT"                  performance on a test."
5690 PRINT""
5700 PRINT"
5710 PRINT"                       a. z-score of -0.35"
5720 PRINT"                       b. z-score of 0"
5730 PRINT"                       c. 1 standard deviation below the mean"
5740 PRINT"                       d. a percentile rank of 16.11"
5750 PRINT""
5760 PRINT"                  Type in a, b, c, d or e for your answer and press"
5770 PRINT""
5780 INPUT"                  the enter key.";Q4$
5790 IF I47=0 THEN A47$=Q4$
5800 IF I47=1 THEN B47$=Q4$
5810 PRINT""
5820 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR Q
4$="d" OR Q4$="D" OR Q4$ ="e" OR Q4$ ="E" THEN 5890 ELSE 5830
5830 LOCATE 15,1
5840 PRINT"
   "
5850 PRINT"
   "
5860 PRINT"
   "
5870 LOCATE 15,1
5880 GOTO 5760
5890 IF Q4$ ="c" OR Q4$ ="C" THEN 5900 ELSE 5930
5900 R47 = 1
5910 PRINT"                  Your response is correct."
5920 GOTO 6010
5930 IF I47 = 1 GOTO 5990 ELSE 5940
```

```
5940 PRINT"                    Your response is incorrect. Press the enter key fo
r"
5950 PRINT""
5960 PRINT"                    further explanation."
5970 A$ = INKEY$: IF A$ = "" GOTO 5970
5980 I47 = 1: R=R+1: GOTO 5260
5990 W47 =1
6000 PRINT"                    Your response is incorrect. The correct answer is
c."
6010 LOCATE 23,58: PRINT"Press the enter key."
6020 A$ = INKEY$: IF A$ = "" GOTO 6020
6030 R4 = R41+R42+R43+R44+R46+R47
6040 W4 = W41+W42+W43+W44+W46+W47
6050 FIRST4 = R4+W4-R
6060 T4$ = TIME$
6070 TIME$ = "00:00:00"
6080 'screen 19
6090 SCREEN 0,1: COLOR 15,1,11: CLS
6100 LOCATE 1,32: PRINT"Unit 4:  Screen 19"
6110 LOCATE 7,1
6120 PRINT"              This concludes the discussion of Unit 4: The Area Under
a"
6130 PRINT""
6140 PRINT"        Normal Curve Lying Below or Above a Given Observation. You wo
rked"
6150 PRINT""
6160 PRINT"        correctly";FIRST4"exercise(s) out of 6. There are 10 review"
6170 PRINT""
6180 PRINT"        problems for this unit. Would you like to work some review"
6190 PRINT""
6200 PRINT"        problems ? Type y if yes or n if no and press the enter key."

6210 PRINT""
6220 INPUT"        ";Q4$
6230 IF Q4$ = "y" OR Q4$ = "Y" OR Q4$ = "n" OR Q4$ = "N" GOTO 6240 ELSE LOCATE 1
7,1: PRINT"
       ":LOCATE 17,1: GOTO 6220
6240 IF Q4$ = "y" OR Q4$ = "Y" GOTO 6250 ELSE 10350
6250 'screen 20
6260 SCREEN 0,1: COLOR 15,1,11: CLS
6270 LOCATE 1,32: PRINT"Unit 4:  Screen 20"
6280 LOCATE 5,1: K4=1
6290 PRINT"      Problem 1.  What is the area under the unit normal curve"
6300 PRINT""
6310 PRINT"                  below z = 0.62 ? Type in your answer (for"
6320 PRINT""
6330 INPUT"                  example, .4213) and press the enter key.";Q4$
6340 IF J41=0 THEN C41$ = Q4$
6350 IF J41=1 THEN C41$ = Q4$
6360 PRINT""
6370 IF Q4$ = ".7324" GOTO 6380 ELSE 6410
6380 P41 = 1
6390 PRINT"                  Your response is correct."
6400 GOTO 6510
6410 IF J41 = 1 GOTO 6470
6420 PRINT"                  Your response is incorrect. Press the enter key"
6430 PRINT""
6440 PRINT"                  for further explanation."
6450 A$=INKEY$: IF A$="" GOTO 6450
6460 J41 = 1: P=P+1: GOTO 660
6470 Q41 = 1
6480 PRINT"                  Your response is incorrect. The correct answer"
6490 PRINT""
6500 PRINT"                  is .7324."
6510 LOCATE 23,58: PRINT"Press the enter key."
6520 A$=INKEY$: IF A$="" GOTO 6520
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6530 GOSUB 6550
6540 IF Q4$ = "y" OR Q4$ = "Y" GOTO 6610 ELSE 10350
6550 CLS: LOCATE 5,1
6560 PRINT"             Would you like to work another review problem ? Type"
6570 PRINT""
6580 INPUT"        y if yes or n if no and press the enter key.";Q4$
6590 IF Q4$ = "y" OR Q4$ ="Y" OR Q4$ = "n" OR Q4$ = "N" THEN 6600 ELSE LOCATE 7,
1: PRINT"
      ": LOCATE 7,1: GOTO 6580
6600 RETURN
6610 'screen 21
6620 SCREEN 0,1: COLOR 15,1,11: CLS
6630 LOCATE 1,32: PRINT"Unit 4:  Screen 21"
6640 LOCATE 5,1: K4=2
6650 PRINT"      Problem 2.  What is the area under the unit normal curve"
6660 PRINT""
6670 PRINT"                  above z = -2.38 ? Type in your answer (for"
6680 PRINT""
6690 INPUT"                  example, .4213) and press the enter key.";Q4$
6700 IF J42=0 THEN C42$ = Q4$
6710 IF J42=1 THEN D42$ = Q4$
6720 PRINT""
6730 IF Q4$ = ".9913" THEN  GOTO 6740 ELSE 6770
6740 P42 = 1
6750 PRINT"                  Your response is correct."
6760 GOTO 6870
6770 IF J42 = 1 GOTO 6830
6780 PRINT"                  Your response is incorrect. Press the enter key"
6790 PRINT""
6800 PRINT"                  for further explanation."
6810 A$=INKEY$: IF A$="" GOTO 6810
6820 J42 = 1: P=P+1: GOTO 1510
6830 Q42 = 1
6840 PRINT"                  Your response is incorrect. The correct answer"
6850 PRINT""
6860 PRINT"                  is .9913."
6870 LOCATE 23,58: PRINT"Press the enter key."
6880 A$=INKEY$: IF A$="" GOTO 6880
6890 GOSUB 6550
6900 IF Q4$ = "y" OR Q4$ = "Y" GOTO 6910 ELSE 10350
6910 'screen 22
6920 SCREEN 0,1: COLOR 15,1,11: CLS
6930 LOCATE 1,32: PRINT" Unit 4:  Screen 22"
6940 LOCATE 5,1: K4=3
6950 PRINT"      Problem 3.  A normal distribution has a mean of 80 and a"
6960 PRINT""
6970 PRINT"                  standard deviation of 5. What is the percent of"
6980 PRINT""
6990 PRINT"                  scores below the raw-score of 70 ?"
7000 PRINT""
7010 PRINT"                           a.  2.28%"
7020 PRINT"                           b.  5.40%"
7030 PRINT"                           c. 10.00%"
7040 PRINT"                           d. 97.72%
7050 PRINT""
7060 PRINT"                  Type in a, b, c, or d for your answer and press"
7070 PRINT""
7080 INPUT"                  the enter key.";Q4$
7090 IF J43=0 THEN C43$ = Q4$
7100 IF J43=1 THEN D43$ = Q4$
7110 PRINT""
7120 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR Q
4$="d" OR Q4$="D" THEN 7190 ELSE 7130
7130 LOCATE 16,1
7140 PRINT"
  "
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7150 PRINT"
   "
7160 PRINT"
   "
7170 LOCATE 16,1
7180 GOTO 7060
7190 IF Q4$ = "a" OR Q4$ = "A" THEN 7200 ELSE 7230
7200 P43=1
7210 PRINT"                    Your response is correct."
7220 GOTO 7310
7230 IF J43 = 1 GOTO 7290 ELSE 7240
7240 PRINT"                    Your response is incorrect. Press the enter key fo
r"
7250 PRINT""
7260 PRINT"                    further explanation."
7270 A$ = INKEY$: IF A$ = "" GOTO 7270
7280 J43 = 1: P=P+1: GOTO 4250
7290 Q43 =1
7300 PRINT"                    Your response is incorrect. The correct answer is
a."
7310 LOCATE 23,58: PRINT"Press the enter key."
7320 A$ = INKEY$: IF A$ = "" GOTO 7320
7330 GOSUB 6550
7340 IF Q4$ = "y" OR Q4$ = "Y" GOTO 7350 ELSE 10350
7350 'screen 23
7360 SCREEN 0,1: COLOR 15,1,11: CLS
7370 LOCATE 1,32: PRINT" Unit 4:  Screen 23"
7380 LOCATE 5,1: K4=4
7390 PRINT"      Problem 4.  A normal population has a mean of 100 and a"
7400 PRINT""
7410 PRINT"                   standard deviation of 10. What is the percent of"
7420 PRINT""
7430 PRINT"                   scores above the raw-score of 116?"
7440 PRINT""
7450 PRINT"                            a. 1.60%"
7460 PRINT"                            b. 5.37%"
7470 PRINT"                            c. 5.48%"
7480 PRINT"                            d. 94.52%
7490 PRINT""
7500 PRINT"                    Type in a, b, c, or d for your answer and press"
7510 PRINT""
7520 INPUT"                    the enter key.";Q4$
7530 IF J44=0 THEN C44$=Q4$
7540 IF J44=1 THEN D44$=Q4$
7550 PRINT""
7560 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR Q
4$="d" OR Q4$="D" THEN 7630 ELSE 7570
7570 LOCATE 16,1
7580 PRINT"
   "
7590 PRINT"
   "
7600 PRINT"
   "
7610 LOCATE 16,1
7620 GOTO 7500
7630 IF Q4$ = "c" OR Q4$ = "C" THEN 7640 ELSE 7670
7640 P44=1
7650 PRINT"                    Your response is correct."
7660 GOTO 7750
7670 IF J44 = 1 GOTO 7730 ELSE 7680
7680 PRINT"                    Your response is incorrect. Press the enter key fo
r"
7690 PRINT""
7700 PRINT"                    further explanation."
7710 A$ = INKEY$: IF A$ = "" GOTO 7710
```

```
7720 J44 = 1: P=P+1: GOTO 4540
7730 Q44 =1
7740 PRINT"                        Your response is incorrect. The correct answer is
c."
7750 LOCATE 23,58: PRINT"Press the enter key."
7760 AS = INKEYS: IF AS = "" GOTO 7760
7770 GOSUB 6550
7780 IF Q4$ = "y" OR Q4$ = "Y" GOTO 7790 ELSE 10350
7790 'screen 24
7800 SCREEN 0,1: COLOR 15,1,11: CLS
7810 LOCATE 1,32: PRINT" Unit 4:  Screen 24"
7820 LOCATE 5,1: K4=5
7830 PRINT"       Problem 5.  Which of the following reflects the best "
7840 PRINT""
7850 PRINT"                   performance on a test ?"
7860 PRINT""
7870 PRINT"                            a. z-score = -2.96"
7880 PRINT"                            b. 1 standard deviation above the mean."
7890 PRINT"                            c. percentile rank of 80 "
7900 PRINT"                            d. a z-score of 1.05"
7910 PRINT"                            e. a percentile rank of 2.28"
7920 PRINT""
7930 PRINT"                    Type in a, b, c, d, or e for your answer and press
"
7940 PRINT""
7950 INPUT"                    the enter key.";Q4$
7960 IF J45=0 THEN C45$=Q4$
7970 IF J45=1 THEN D45$=Q4$
7980 PRINT""
7990 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR Q
4$="d" OR Q4$="D" OR Q4$ = "e" OR Q4$ ="E" THEN 8060 ELSE 8000
8000 LOCATE 15,1
8010 PRINT"
   "
8020 PRINT"
   "
8030 PRINT"
   "
8040 LOCATE 15,1
8050 GOTO 7930
8060 IF Q4$ = "d" OR Q4$ = "D" THEN 8070 ELSE 8100
8070 P45=1
8080 PRINT"                    Your response is correct."
8090 GOTO 8180
8100 IF J45 = 1 GOTO 8160 ELSE 8110
8110 PRINT"                    Your response is incorrect. Press the enter key fo
r"
8120 PRINT""
8130 PRINT"                    further explanation."
8140 AS = INKEYS: IF AS = "" GOTO 8140
8150 J45 = 1: P=P+1: GOTO 8220
8160 Q45 =1
8170 PRINT"                    Your response is incorrect. The correct answer is
d."
8180 LOCATE 23,58: PRINT"Press the enter key."
8190 AS = INKEYS: IF AS = "" GOTO 8190
8200 GOTO 8320
8210 AS = INKEYS: IF AS = "" GOTO 8210
8220 'screen 24a
8230 CLS:LOCATE 1,32: PRINT"Unit 4:  Screen 24a": LOCATE 5,1
8240 PRINT"                Change the z-sccres to percentile ranks and compare"
8250 PRINT""
8260 PRINT"          all of the percentile ranks. The higher the percentile"
8270 PRINT""
8280 PRINT"          rank, the better the test score."
8290 LOCATE 23,58: PRINT"Press the enter key."
```

```
8300 A$ = INKEY$: IF A$ = "" GOTO 8300
8310 GOTO 7790
8320 GOSUB 6550
8330 IF Q4$ = "y" OR Q4$ = "Y" GOTO 8340 ELSE 10350
8340 'screen 25
8350 SCREEN 0,1: COLOR 15,1,11: CLS
8360 LOCATE 1,32: PRINT"Unit 4:  Screen 25"
8370 LOCATE 5,1: K4=6
8380 PRINT"      Problem 6.  What is the area under the unit normal curve"
8390 PRINT""
8400 PRINT"                  below z = -1.47 ? Type in your answer (for"
8410 PRINT""
8420 INPUT"                  example, .4213) and press the enter key.";Q4$
8430 IF J46=0 THEN C46$ = Q4$
8440 IF J46=1 THEN D46$ = Q4$
8450 PRINT""
8460 IF Q4$ = ".0708" GOTO 8470 ELSE 8500
8470 P46 = 1
8480 PRINT"                  Your response is correct."
8490 GOTO 8600
8500 IF J46 = 1 GOTO 8560
8510 PRINT"                  Your response is incorrect. Press the enter key"
8520 PRINT""
8530 PRINT"                  for further explanation."
8540 A$=INKEY$: IF A$="" GOTO 8540
8550 J46 = 1: P=P+1: GOTO 660
8560 Q46 = 1
8570 PRINT"                  Your response is incorrect. The correct answer"
8580 PRINT""
8590 PRINT"                  is .0708."
8600 LOCATE 23,58: PRINT"Press the enter key."
8610 A$=INKEY$: IF A$="" GOTO 8610
8620 GOSUB 6550
8630 IF Q4$ = "y" OR Q4$ = "Y" GOTO 8640 ELSE 10350
8640 'screen 26
8650 SCREEN 0,1: COLOR 15,1,11: CLS
8660 LOCATE 1,32: PRINT"Unit 4:  Screen 26"
8670 LOCATE 5,1: K4=7
8680 PRINT"      Problem 7.  What is the area under the unit normal curve"
8690 PRINT""
8700 PRINT"                  above z = 1.29 ? Type in your answer (for"
8710 PRINT""
8720 INPUT"                  example, .4213) and press the enter key.";Q4$
8730 IF J47=0 THEN C47$ = Q4$
8740 IF J47=1 THEN D47$ = Q4$
8750 PRINT""
8760 IF Q4$ = ".0985" THEN  GOTO 8770 ELSE 8800
8770 P47 = 1
8780 PRINT"                  Your response is correct."
8790 GOTO 8900
8800 IF J47 = 1 GOTO 8860
8810 PRINT"                  Your response is incorrect. Press the enter key"
8820 PRINT""
8830 PRINT"                  for further explanation."
8840 A$=INKEY$: IF A$="" GOTO 8840
8850 J47 = 1: P=P+1: GOTO 1510
8860 Q47 = 1
8870 PRINT"                  Your response is incorrect. The correct answer"
8880 PRINT""
8890 PRINT"                  is .0985."
8900 LOCATE 23,58: PRINT"Press the enter key."
8910 A$=INKEY$: IF A$="" GOTO 8910
8920 GOSUB 6550
8930 IF Q4$ = "y" OR Q4$ = "Y" GOTO 8940 ELSE 10350
```

```
8940 'screen 27
8950 SCREEN 0,1: COLOR 15,1,11: CLS
8960 LOCATE 1,32: PRINT" Unit 4:  Screen 27"
8970 LOCATE 5,1: K4=8
8980 PRINT"       Problem 8.  A normal distribution has a mean of 70 and a"
8990 PRINT""
9000 PRINT"                   standard deviation of 6. What is the percent of"
9010 PRINT""
9020 PRINT"                   scores below the raw-score of 85 ?"
9030 PRINT""
9040 PRINT"                            a.  0.62%"
9050 PRINT"                            b. 85.00%"
9060 PRINT"                            c. 99.00%"
9070 PRINT"                            d. 99.38%"
9080 PRINT""
9090 PRINT"                   Type in a, b, c, or d for your answer and press"
9100 PRINT""
9110 INPUT"                   the enter key.";Q4$
9120 IF J48=0 THEN C48$ = Q4$
9130 IF J48=1 THEN D48$ = Q4$
9140 PRINT""
9150 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR Q
4$="d" OR Q4$="D" THEN 9220 ELSE 9160
9160 LOCATE 16,1
9170 PRINT"
   "
9180 PRINT"
   "
9190 PRINT"
   "
9200 LOCATE 16,1
9210 GOTO 9090
9220 IF Q4$ = "d" OR Q4$ = "D" THEN 9230 ELSE 9260
9230 P48=1
9240 PRINT"                   Your response is correct."
9250 GOTO 9340
9260 IF J48 = 1 GOTO 9320 ELSE 9270
9270 PRINT"                   Your response is incorrect. Press the enter key fo
r"
9280 PRINT""
9290 PRINT"                   further explanation."
9300 AS = INKEYS: IF AS = "" GOTO 9300
9310 J48 = 1: P=P+1: GOTO 4250
9320 Q48 =1
9330 PRINT"                   Your response is incorrect. The correct answer is
d."
9340 LOCATE 23,58: PRINT"Press the enter key."
9350 AS = INKEYS: IF AS = "" GOTO 9350
9360 GOSUB 6550
9370 IF Q4$ = "y" OR Q4$ = "Y" GOTO 9380 ELSE 10350
9380 'screen 28
9390 SCREEN 0,1: COLOR 15,1,11: CLS
9400 LOCATE 1,32: PRINT" Unit 4:  Screen 28"
9410 LOCATE 5,1: K4=9
9420 PRINT"       Problem 9.  A normal population has a mean of 100 and a"
9430 PRINT""
9440 PRINT"                   standard deviation of 8. What is the percent of"
9450 PRINT""
9460 PRINT"                   scores above the raw-score of 90 ?"
9470 PRINT""
9480 PRINT"                            a. 10.56%"
9490 PRINT"                            b. 10.75%"
9500 PRINT"                            c. 89.25%"
9510 PRINT"                            d. 89.44%
9520 PRINT""
9530 PRINT"                   Type in a, b, c, or d for your answer and press"
```

```
 9540 PRINT""
 9550 INPUT"                          the enter key.";Q4$
 9560 IF J49=0 THEN C49$=Q4$
 9570 IF J49=1 THEN D49$=Q4$
 9580 PRINT""
 9590 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR Q
4$="d" OR Q4$="D" THEN 9660 ELSE 9600
 9600 LOCATE 16,1
 9610 PRINT"
    "
 9620 PRINT"
    "
 9630 PRINT"
    "
 9640 LOCATE 16,1
 9650 GOTO 9530
 9660 IF Q4$ = "d" OR Q4$ = "D" THEN 9670 ELSE 9700
 9670 P49=1
 9680 PRINT"                          Your response is correct."
 9690 GOTO 9780
 9700 IF J49 = 1 GOTO 9760 ELSE 9710
 9710 PRINT"                          Your response is incorrect. Press the enter key fo
r"
 9720 PRINT""
 9730 PRINT"                          further explanation."
 9740 A$ = INKEY$: IF A$ = "" GOTO 9740
 9750 J49 = 1: P=P+1: GOTO 4540
 9760 Q49 =1
 9770 PRINT"                          Your response is incorrect. The correct answer is
d."
 9780 LOCATE 23,58: PRINT"Press the enter key."
 9790 A$ = INKEY$: IF A$ = "" GOTO 9790
 9800 GOSUB 6550
 9810 IF Q4$ = "y" OR Q4$ = "Y" GOTO 9820 ELSE 10350
 9820 'screen 29
 9830 SCREEN 0,1: COLOR 15,1,11: CLS
 9840 LOCATE 1,32: PRINT" Unit 4:  Screen 29"
 9850 LOCATE 5,1: K4=10
 9860 PRINT"     Problem 10.  Which of the following reflects the poorest"
 9870 PRINT""
 9880 PRINT"                         performance on a test ?"
 9890 PRINT""
 9900 PRINT"                                  a. z-score of 0"
 9910 PRINT"                                  b. 1.5 standard deviation below the mean."

 9920 PRINT"                                  c. percentile rank of 7.08"
 9930 PRINT"                                  d. a z-score = -1.41"
 9940 PRINT"                                  e. a percentile rank of 94"
 9950 PRINT""
 9960 PRINT"                          Type in a, b, c, d, or e for your answer and press
"
 9970 PRINT""
 9980 INPUT"                          the enter key.";Q4$
 9990 IF J410=0 THEN C410$=Q4$
10000 IF J410=1 THEN D410$=Q4$
10010 PRINT""
10020 IF Q4$ = "a" OR Q4$ ="A" OR Q4$ ="b" OR Q4$="B" OR Q4$="c" OR Q4$ ="C" OR
Q4$="d" OR Q4$="D" OR Q4$ = "e" OR Q4$ ="E" THEN 10090 ELSE 10030
10030 LOCATE 15,1
10040 PRINT"
    "
10050 PRINT"
    "
10060 PRINT"
    "
10070 LOCATE 15,1
```

```
10080 GOTO 9960
10090 IF Q4$ = "b" OR Q4$ = "B" THEN 10100 ELSE 10130
10100 P410=1
10110 PRINT"                        Your response is correct."
10120 GOTO 10210
10130 IF J410 = 1 GOTO 10190 ELSE 10140
10140 PRINT"                        Your response is incorrect. Press the enter key f
or"
10150 PRINT""
10160 PRINT"                        further explanation."
10170 A$ = INKEY$: IF A$ = "" GOTO 10170
10180 J410 = 1: P=P+1: GOTO 10240
10190 Q410 =1
10200 PRINT"                        Your response is incorrect. The correct answer is
 b."
10210 LOCATE 23,58: PRINT"Press the enter key."
10220 A$ = INKEY$: IF A$ = "" GOTO 10220
10230 GOTO 10350
10240 'screen 29a
10250 CLS:LOCATE 1,32: PRINT"Unit 4:  Screen 29a"
10260 LOCATE 5,1
10270 PRINT"               Change the z-scores to ercentile ranks and compare"
10280 PRINT""
10290 PRINT"          all of the percentile ranks. The lower the percentile"
10300 PRINT""
10310 PRINT"          rank, the poorer the test score."
10320 LOCATE 23,58: PRINT"Press the enter key."
10330 A$ = INKEY$: IF A$ = "" GOTO 10330
10340 GOTO 9820
10350 'screen 30
10360 CLS: LOCATE 1,32: PRINT"Unit 4:  Screen 30"
10370 LOCATE 8,1
10380 PRINT"                        Turn the printer on and press the enter key."
10390 A$ = INKEY$: IF A$ = "" GOTO 10390
10400 IF K4=0 GOTO 10560
10410 P4 = P41+P42+P43+P44+P45+P46+P47+P48+P49+P410
10420 Q4 = Q41+Q42+Q43+Q44+Q45+Q46+Q47+Q48+Q49+Q410
10430 SEC4 = P4+Q4-P
10440 PRINT""
10450 PRINT"                        The number of correct exercises is";FIRST4
10460 PRINT""
10470 PRINT"                        The number of incorrect exercises is";6-FIRST4"
10480 PRINT""
10490 PRINT"                        The number of correct exercises after remediation i
s";R-W4
10500 PRINT""
10510 PRINT"                        The number of correct problems is";SEC4
10520 PRINT""
10530 PRINT"                        The number of incorrect roblems is";K4-SEC4"
10540 PRINT""
10550 PRINT"                        The number of correct problems after remediation is
";P-Q4
10560 LPRINT"          Unit 4:  Area Under a Normal Curve Lying Below or Above a G
iven
10570 LPRINT"                       Observation."
10580 LPRINT""
10590 LPRINT"                       ";NAM$,NO$,T4$
10600 LPRINT""
10610 LPRINT"                       The number of correct exercises is";FIRST4
10620 LPRINT""
10630 LPRINT"                       The number of incorrect exercises is";6-FIRST4
10640 LPRINT""
10650 LPRINT"                       The number of correct exercises after remediation
is";R-W4
10660 IF K4=0 GOTO 10730
10670 LPRINT"                                   ";TIME$
```

```
10680 LPRINT"                    The number of correct problems is";SEC4
10690 LPRINT""
10700 LPRINT"                    The number of incorrect problems is";K4-SEC4
10710 LPRINT""
10720 LPRINT"                    The number of correct problems after remediation i
s";P-Q4
10730 LPRINT""
10740 IF I41=1 GOTO 10770
10750 LPRINT"   Exercise 1 response was correct.",A41$:GOTO 10790
10760 LPRINT""
10770 LPRINT"   Exercise 1 response was incorrect.",A41$,B41$
10780 LPRINT""
10790 LPRINT"": IF I42=1 GOTO 10820
10800 LPRINT"   Exercise 2 response was correct.",A42$:GOTO 10840
10810 LPRINT""
10820 LPRINT"   Exercise 2 response was incorrect.",A42$,B42$
10830 LPRINT""
10840 LPRINT"": IF I43=1 GOTO 10870
10850 LPRINT"   Exercise 3 response was correct.",A43$:GOTO 10890
10860 LPRINT""
10870 LPRINT"   Exercise 3 response was incorrect.",A43$,B43$
10880 LPRINT""
10890 LPRINT"": IF I44=1 GOTO 10920
10900 LPRINT"   Exercise 4 response was correct.",A44$:GOTO 10940
10910 LPRINT""
10920 LPRINT"   Exercise 4 response was incorrect.",A44$,B44$
10930 LPRINT""
10940 LPRINT"": IF I46=1 GOTO 10970
10950 LPRINT"   Exercise 5 response was correct.",A46$: GOTO 10990
10960 LPRINT""
10970 LPRINT"   Exercise 5 response was incorrect.",A46$,B46$
10980 LPRINT""
10990 LPRINT"": IF I47=1 GOTO 11020
11000 LPRINT"   Exercise 6 response was correct.",A47$: GOTO 11040
11010 LPRINT""
11020 LPRINT"   Exercise 6 response was incorrect.",A47$,B47$
11030 LPRINT""
11040 IF K4<1 GOTO 11640
11050 LPRINT"": IF J41=1 GOTO 11080
11060 LPRINT"   Problem 1 response was correct.",C41$: GOTO 11100
11070 LPRINT""
11080 LPRINT"   Problem 1 response was incorrect.",C41$,D41$
11090 LPRINT""
11100 IF K4<2 GOTO 11640
11110 LPRINT"": IF J42=1 GOTO 11140
11120 LPRINT"   Problem 2 response was correct.",C42$: GOTO 11160
11130 LPRINT""
11140 LPRINT"   Problem 2 response was incorrect.",C42$,D42$
11150 LPRINT""
11160 IF K4<3 GOTO 11640
11170 LPRINT"": IF J43=1 GOTO 11200
11180 LPRINT"   Problem 3 response was correct.",C43$: GOTO 11220
11190 LPRINT""
11200 LPRINT"   Problem 3 response was incorrect.",C43$,D43$
11210 LPRINT""
11220 IF K4<4 GOTO 11640
11230 LPRINT"": IF J44=1 GOTO 11260
11240 LPRINT"   Problem 4 response was correct.",C44$: GOTO 11280
11250 LPRINT""
11260 LPRINT"   Problem 4 response was incorrect.",C44$,D44$
11270 LPRINT""
11280 IF K4<5 GOTO 11640
11290 LPRINT"": IF J45=1 GOTO 11320
11300 LPRINT"   Problem 5 response was correct.",C45$: GOTO 11340
11310 LPRINT""
11320 LPRINT"   Problem 5 response was incorrect.",C45$,D45$
```

```
11330 LPRINT""
11340 IF K4<6 GOTO 11640
11350 LPRINT"": IF J46=1 GOTO 11380
11360 LPRINT"    Problem 6 response was correct.",C46$: GOTO 11400
11370 LPRINT""
11380 LPRINT"    Problem 6 response was incorrect.",C46$,D46$
11390 LPRINT""
11400 IF K4<7 GOTO 11640
11410 LPRINT"": IF J47=1 GOTO 11440
11420 LPRINT"    Problem 7 response was correct.",C47$: GOTO 11460
11430 LPRINT""
11440 LPRINT"    Problem 7 response was incorrect.",C47$,D47$
11450 LPRINT""
11460 IF K4<8 GOTO 11640
11470 LPRINT"": IF J48=1 GOTO 11500
11480 LPRINT"    Problem 8 response was correct.",C48$: GOTO 11520
11490 LPRINT""
11500 LPRINT"    Problem 8 response was incorrect.",C48$,D48$
11510 LPRINT""
11520 IF K4<9 GOTO 11640
11530 LPRINT"": IF J49=1 GOTO 11560
11540 LPRINT"    Problem 9 response was correct.",C49$: GOTO 11580
11550 LPRINT""
11560 LPRINT"    Problem 9 response was incorrect.",C49$,D49$
11570 LPRINT""
11580 IF K4<10 GOTO 11640
11590 LPRINT"": IF J410=1 GOTO 11620
11600 LPRINT"    Problem 10 response was correct.",C410$: GOTO 11640
11610 LPRINT""
11620 LPRINT"    Problem 10 response was incorrect.",C410$,D410$
11630 LPRINT""
11640 CLS: CHAIN "unit5"
```

```
10 COMMON NAMS,NOS
20 'Unit 5
30 SCREEN 0,1: COLOR 15,1,15: CLS
40 LOCATE 3,38: PRINT"Unit 5"
50 LOCATE 6,9 : PRINT"Part 1. Area Under a Normal Curve Lying Between Two Observ
ations.
60 LOCATE 8,9: PRINT"Part 2. The Area Under a Normal Curve Relative to the Curve
's"
70 LOCATE 10,9: PRINT"        Standard Deviation."
80 LOCATE 23,58: PRINT"Press the enter key."
90 AS = INKEYS: IF AS = "" GOTO 90
100 R=0
110 TIMES ="00:00:00"
120 SCREEN 0,1: COLOR 15,1,15: CLS
130 LOCATE 1,32: PRINT" Unit 5:  Screen ii"
140 LOCATE 4,1
150 PRINT"   Objectives:  At the end of this lesson, the student should be able"
160 PRINT""
170 PRINT"                to:
180 PRINT""
190 PRINT"                1. Approximate the proportion of area under a normal"
200 PRINT""
210 PRINT"                   curve lying between two given observations.
220 PRINT""
230 PRINT"                2. Give the percent of area under a normal curve "
240 PRINT""
250 PRINT"                   relative to the curve's standard deviation."
260 PRINT""
270 PRINT"                3. Approximate the number of observations that belongs
"
280 PRINT""
290 PRINT"                   to a given normal population relative to the popula
tion's"
300 PRINT""
310 PRINT"                   standard deviation."
320 LOCATE 23,58: PRINT"Press the enter key."
330 AS=INKEYS: IF AS="" GOTO 330
340 CLS: LOCATE 1,32: PRINT" Unit 5: Screen 1"
350 LOCATE 7,38: PRINT"Part 1"
360 LOCATE 10,9: PRINT"    Area Under a Normal Curve Lying Between Two Observati
ons"
370 LOCATE 23,58: PRINT"Press the enter key."
380 AS = INKEYS: IF AS = "" GOTO 380
390 CLS
400 LOCATE 1,32: PRINT"Unit 5:  Screen 2"
410 LOCATE 4,1
420 PRINT"            Suppose that one wishes to find the area under the"
430 PRINT""
440 PRINT"        unit normal curve between two z-values z1 and z2, with z2"
450 PRINT""
460 PRINT"        greater than or equal to z1. Using Table B, find the areas"
470 PRINT""
480 PRINT"        below z2 and z1, respectively. The area between z1 and z2"
490 PRINT""
500 PRINT"        is given by:"
510 PRINT""
520 PRINT""
530 PRINT"                  (area below z2) - (area below z1)."
540 LOCATE 23,58: PRINT"Press the enter key."
550 AS = INKEYS: IF AS="" GOTO 550
560 'screen 3
570 GOSUB 1370: LOCATE 1,1: PRINT"Unit 5:  Screen 3"
580 LOCATE 14,35: PRINT"z1": LOCATE 14,60: PRINT"z2"
590 LOCATE 16,1: Z1=-.4: Z2=1.6: GOSUB 2000
```

```
600 PRINT"              We will be interested in calculating the area of "
610 PRINT""
620 PRINT"          shaded regions of this type."
630 LOCATE 23,58: PRINT"Press the enter key."
640 AS=INKEYS: IF AS="" GOTO 640
650 'screen 4
660 SCREEN 0,1: COLOR 15,1,15: CLS
670 LOCATE 1,32: PRINT"Unit 5:  Screen 4"
680 LOCATE 4,1
690 PRINT"   Example 1.  A portion of Table B is shown below."
700 PRINT""
710 PRINT"                  z          Area Below     Area Above     Ordinate"
720 PRINT""
730 PRINT"                1.96           .9750          .0250          .0584"
740 PRINT"                1.97           .9756          .0244          .0573"
750 PRINT"                1.98           .9761          .0239          .0562"
760 PRINT"                1.99           .9767          .0233          .0551"
770 PRINT"                2.00           .9772          .0228          .0540"
780 PRINT""
790 PRINT"               The area under the unit normal curve between "
800 PRINT""
810 PRINT"               z1 = 1.96 and z2 = 1.99 is given by:
820 PRINT""
830 PRINT"                  (area below 1.99) - (area below 1.96) ="
840 PRINT""
850 PRINT"                                .9767 - .9750 ="
860 PRINT""
870 PRINT"                                    .0017"
880 PRINT""
890 COLOR 15,6,15
900 LOCATE 8,16: PRINT" 1.96          .9750 "
910 LOCATE 6,28: PRINT" Area Below "
920 LOCATE 11,16: PRINT" 1.99          .9767 "
930 COLOR 15,1,15
940 LOCATE 23,58: PRINT"Press the enter key."
950 AS = INKEYS: IF AS="" GOTO 950
960 IF J56=1 GOTO 11000
970 IF J51=1 GOTO 8860
980 'Screen 5
990 SCREEN 0,1: COLOR 15,1,15: CLS
1000 LOCATE 1,32: PRINT"Unit 5:  Screen 5"
1010 LOCATE 4,1
1020 PRINT"   Exercise 1.  A portion of Table B is shown below."
1030 PRINT""
1040 PRINT"                  z          Area Below     Area Above     Ordinate"
1050 PRINT""
1060 PRINT"                1.96           .9750          .0250          .0584"
1070 PRINT"                1.97           .9756          .0244          .0573"
1080 PRINT"                1.98           .9761          .0239          .0562"
1090 PRINT"                1.99           .9767          .0233          .0551"
1100 PRINT"                2.00           .9772          .0228          .0540"
1110 PRINT""
1120 PRINT"               Type in the area under the unit normal curve"
1130 PRINT""
1140 PRINT"               between 1.97 and 2.00 and press the enter key"
1150 PRINT""
1160 INPUT"               (for example, .4523).";Q5$
1170 IF I51=0 THEN A51$=Q5$
1180 IF I51=1 THEN B51$=Q5$
1190 PRINT""
1200 IF Q5$ =".0016" OR Q5$=".16%" THEN 1210 ELSE 1240
1210 R51 = 1
1220 PRINT"               Your response is correct."
1230 GOTO 1340
1240 IF I51 = 1 GOTO 1300
```

```
1250 PRINT"                    Your response is incorrect. Press the enter key for"
1260 PRINT""
1270 PRINT"                    further explanation."
1280 AS = INKEYS: IF AS="" GOTO 1280
1290 I51 = 1: R=R+1: GOTO 650
1300 W51 = 1
1310 PRINT"                    Your response is incorrect. The correct answer is"
1320 PRINT""
1330 PRINT"                    .0016."
1340 LOCATE 23,58: PRINT"Press the enter key."
1350 AS = INKEYS: IF AS ="" GOTO 1350.
1360 GOTO 1930
1370 SCREEN 2: CLS
1380 S=100
1390 A=240
1400 PI=3.141593
1410 XC=320:YC=100
1420 'draw axes
1430 SCREEN 2: CLS
1440 LINE (0,YC+2)-(639,YC+2),1
1450 LINE (639,0)-(639,101),1
1460 FOR X=20 TO 620 STEP 20
1470 LINE(X,YC+2) -(X,YC+4),1
1480 NEXT X
1490 LOCATE 1,78
1500 PRINT ".4"
1510 LOCATE 7,78
1520 PRINT".2"
1530 FOR Y = 0 TO 75 STEP 25
1540 LINE (636,Y) - (639,Y),1
1550 NEXT Y
1560 LOCATE 14,1
1570 PRINT "z"
1580 LOCATE 14,15
1590 PRINT "-2"
1600 LOCATE 14,27
1610 PRINT "-1"
1620 LOCATE 14,41
1630 PRINT "0"
1640 LOCATE 14,53
1650 PRINT "1"
1660 LOCATE 14,66
1670 PRINT "2"
1680 LOCATE 14,78
1690 PRINT "3"
1700 'draw graph
1710 X1=-3.5:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
1720 X2=-3.4:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
1730 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
1740 FOR X=-3.4 TO 3.5 STEP .2
1750 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
1760 LINE -(XC+S*X,YC+Y),1
1770 NEXT X
1780 RETURN
1790 'calculate area
1800 B=0
1810 I1=0
1820 M=0
1830 N 1
1840 F=1
1850 T=(((-1)^(N+1))*(Z^(2*N-1)))/((2^(N-1))*F*(2*N-1))
1860 B=B+T
1870 N=N+1
1880 F=F*(N-1)
1890 IF N<29, GOTO 1850
1900 M=(1/SQR(2*PI))*B+.5
1910 I1=INT(M*10000+.5)/10000
```

```
1920 RETURN
1930 'screen 6
1940 GOSUB 1370
1950 LOCATE 1,1: PRINT"Unit 5:  Screen 6"
1960 Z1 = .5
1970 Z2 = 1.8
1980 GOSUB 2000
1990 GOTO 2070
2000 Y3 = -A*1/SQR(2*PI)*EXP(-(Z1^2)/2)
2010 LINE (XC+S*Z1,101)-(XC+S*Z1,101+Y3)
2020 Y4 = -A*1/SQR(2*PI)*EXP(-(Z2^2)/2)
2030 LINE (XC+S*Z2,101)-(XC+S*Z2,101+Y4)
2040 PAINT (XC+S*Z2-1,(101+101+Y4)/2)
2050 PAINT (XC+S*Z1+1,(101+101+Y3)/2)
2060 RETURN
2070 LOCATE 15,1
2080 PRINT "   Example 2.  This is the graph of the unit normal distribution."
2090 PRINT ""
2100 PRINT "               The region under the curve between .50 and 1.80 has"
2110 PRINT""
2120 PRINT "               been shaded. From Table B, the area of this shaded "
2130 PRINT""
2140 PRINT "               region = (area below 1.80) - (area below .50) ="
2150 PRINT""
2160 PRINT "               .9641 - .6915 = .2726."
2170 LOCATE 23,58: PRINT"Press the enter key."
2180 AS = INKEYS: IF AS="" GOTO 2180
2190 ' Screen 7
2200 GOSUB 1370
2210 LOCATE 1,1: PRINT"Unit 5:  Screen 7"
2220 LOCATE 16,1
2230 Z1 = .75
2240 Z2 = 2!
2250 GOSUB 2000
2260 PRINT "   Exercise 2.  The region under the curve between 0.75 and 2.00"
2270 PRINT""
2280 PRINT "               has been shaded. Using Table B, type in the area of
this"
2290 PRINT""
2300 INPUT "               shaded region and press the enter key.";Q5$
2310 IF I52=0 THEN A52$=Q5$
2320 IF I52=1 THEN B52$=Q5$
2330 PRINT""
2340 IF Q5$ =".2038" OR Q5$="20.38%" THEN 2350 ELSE 2380
2350 R52 = 1
2360 PRINT"               Your response is correct."
2370 GOTO 2460
2380 IF I52 = 1 GOTO 2430
2390 PRINT"               Your response is incorrect. Press the enter key for"
2400 PRINT"               further explanation."
2410 AS = INKEYS: IF AS="" GOTO 2410
2420 I52 = 1: R=R+1: GOTO 1930
2430 W52 = 1
2440 PRINT"               Your response is incorrect. The correct answer is"
2450 PRINT"               .2038."
2460 LOCATE 23,58: PRINT"Press the enter key."
2470 AS = INKEYS: IF AS ="" GOTO 2470.
2480 'screen 8
2490 SCREEN 0,1: COLOR 15,1,15: CLS
2500 LOCATE 1,32: PRINT"Unit 5:  Screen 8"
2510 LOCATE 4,1
2520 PRINT"   Example 3.  Another portion of Table B is shown below."
2530 PRINT""
2540 PRINT"                    z          Area Below     Area Above     Ordinate"
2550 PRINT""
```

```
2560 PRINT"                -0.60          .2743          .7257          .3332"
2570 PRINT"                -0.59          .2776          .7224          .3352"
2580 PRINT"                -0.58          .2810          .7190          .3372"
2590 PRINT"                -0.57          .2843          .7157          .3391"
2600 PRINT"                -0.56          .2877          .7123          .3410"
2610 PRINT""
2620 PRINT"                The area under the unit normal curve between"
2630 PRINT""
2640 PRINT"                z1 = -0.60 and z2 = -0.57 (note that -0.57 > -0.60)"
2650 PRINT""
2660 PRINT"                is given by (area below -0.57) - (area below -0.60) ="

2670 PRINT""
2680 PRINT"                .2843 - .2743 = .0100."
2690 COLOR 15,6,15
2700 LOCATE 8,16: PRINT"-0.60          .2743 "
2710 LOCATE 6,28: PRINT" Area Below "
2720 LOCATE 11,16: PRINT"-0.57          .2843 "
2730 COLOR 15,1,15
2740 LOCATE 23,58: PRINT"Press the enter key."
2750 A$ = INKEY$: IF A$ = "" GOTO 2750
2760 'screen 9
2770 CLS
2780 LOCATE 1,32: PRINT"Unit 5:  Screen 9"
2790 LOCATE 4,1
2800 PRINT"  Exercise 3.  A portion of Table B is shown below."
2810 PRINT""
2820 PRINT"                  z          Area Below     Area Above     Ordinate"
2830 PRINT""
2840 PRINT"                -0.60          .2743          .7257          .3332"
2850 PRINT"                -0.59          .2776          .7224          .3352"
2860 PRINT"                -0.58          .2810          .7190          .3372"
2870 PRINT"                -0.57          .2843          .7157          .3391"
2880 PRINT"                -0.56          .2877          .7123          .3410"
2890 PRINT""
2900 PRINT"                Type in the area under the unit normal curve"
2910 PRINT""
2920 PRINT"                between -0.59 and -0.56 (note that -0.56 > -0.59)
2930 PRINT""
2940 INPUT"                and press the enter key (for example, .4231).";Q5$
2950 IF I53=0 THEN A53$=Q5$
2960 IF I53=1 THEN B53$=Q5$
2970 PRINT""
2980 IF Q5$ =".0101" OR Q5$="1.01%" THEN 2990 ELSE 3020
2990 R53 = 1
3000 PRINT"                Your response is correct."
3010 GOTO 3120
3020 IF I53 = 1 GOTO 3080
3030 PRINT"                Your response is incorrect. Press the enter key for"
3040 PRINT""
3050 PRINT"                further explanation."
3060 A$ = INKEY$: IF A$="" GOTO 3060
3070 I53 = 1: R=R+1: GOTO 2480
3080 W53 = 1
3090 PRINT"                Your response is incorrect. The correct answer is"
3100 PRINT""
3110 PRINT"                .0101."
3120 LOCATE 23,58: PRINT"Press the enter key."
3130 A$ = INKEY$: IF A$ ="" GOTO 3130.
3140 'screen 10
3150 SCREEN 2: CLS
3160 GOSUB 1370
3170 LOCATE 1,1: PRINT"Unit 5:  Screen 10"
3180 Z1 = -2.24
3190 Z2 = -11
3200 GOSUB 2000
3210 LOCATE 15,1
```

```
3220 PRINT"  Example 4.  This is the graph of the unit normal distribution."
3230 PRINT""
3240 PRINT"              The region under the curve between -2.24 and -1.00 "
3250 PRINT""
3260 PRINT"              is shaded. From Table B, the area of this shaded"
3270 PRINT""
3280 PRINT"              region = (area below -1.00) - (area below -2.24) ="
3290 PRINT""
3300 PRINT"              .1587 - .0125 = .1462."
3310 LOCATE 23,58: PRINT"Press the enter key."
3320 A$ = INKEY$: IF A$ = "" GOTO 3320
3330 'screen 11
3340 SCREEN 2: CLS
3350 GOSUB 1370
3360 LOCATE 1,1: PRINT"Unit 5:  Screen 11"
3370 Z1 = -1.5
3380 Z2 = -.2
3390 GOSUB 2000
3400 LOCATE 16,1
3410 PRINT"  Exercise 4.  The region under the unit normal curve between -1.50"
3420 PRINT""
3430 PRINT"              and -0.20 is shaded. Type in the area of this shaded"
3440 PRINT""
3450 INPUT"              region and press the return key.";Q5$
3460 IF I54=0 THEN A54$=Q5$
3470 IF I54=1 THEN B54$=Q5$
3480 PRINT""
3490 IF Q5$ =".3539" OR Q5$="35.39%" THEN 3500 ELSE
     R54 = 1
3510 PRINT"              Your response is correct."
3520 GOTO 3610
3530 IF I54 = 1 GOTO 3580
3540 PRINT"              Your response is incorrect. Press the enter key for"
3550 PRINT"              further explanation."
3560 A$ = INKEY$: IF A$="" GOTO 3560
3570 I54 = 1: R=R+1: GOTO 3140
3580 W54 = 1
3590 PRINT"              Your response is incorrect. The correct answer is"
3600 PRINT"              .3539."
3610 LOCATE 23,58: PRINT"Press the enter key."
3620 A$ = INKEY$: IF A$ ="" GOTO 3620.
3630 'screen 12
3640 SCREEN 0,1: COLOR 15,1,15: CLS
3650 LOCATE 1,32: PRINT"Unit 5:  Screen 12"
3660 LOCATE 3,1
3670 PRINT"     Example 5.  Selected portions of Table B are listed below:"
3680 PRINT""
3690 PRINT"                  z          Area Below      Area Above      Ordinate"
3700 PRINT""
3710 PRINT"               -2.20           .0139           .9861           .0355"
3720 PRINT""
3730 PRINT"                          ..............................."
3740 PRINT""
3750 PRINT"                0.00           .5000           .5000           .3989"
3760 PRINT""
3770 PRINT"                          ..............................."
3780 PRINT""
3790 PRINT"                2.46           .9931           .0069           .0194"
3800 PRINT""
3810 PRINT"                 The area under the unit normal distribution between"
3820 PRINT""
3830 PRINT"                 -2.20 and 2.46 = (area below 2.46) - (area below
3840 PRINT""
3850 PRINT"                 -2.20) = .9931 - .0139 = .9792."
```

```
3860 COLOR 15,6,15
3870 LOCATE 5,28: PRINT" Area Below "
3880 LOCATE 7,1 : PRINT"-2.20          .0139 "
3890 LOCATE 15,16: PRINT" 2.46          .9931"
3900 COLOR 15,1,15
3910 LOCATE 23,58: PRINT"Press the enter key."
3920 A$ = INKEY$: IF A$ ="" GOTO 3920
3930 'screen 13
3940 SCREEN 0,1: COLOR 15,1,15: CLS
3950 LOCATE 1,32: PRINT"Unit 5:  Screen 13"
3960 LOCATE 3,1
3970 PRINT"    Exercise 5.  Selected portions of Table B are listed below:"
3980 PRINT""
3990 PRINT"                  z          Area Below     Area Above     Ordinate"
4000 PRINT""
4010 PRINT"               -1.25          .1056          .8944          .1826"
4020 PRINT""
4030 PRINT"                         ..............................."
4040 PRINT""
4050 PRINT"                0.46          .6772          .????          .3589"
4060 PRINT""
4070 PRINT"                         ..............................."
4080 PRINT""
4090 PRINT"                1.57          .9418          .0582          .1163"
4100 PRINT""
4110 PRINT"                 Type in the area (for example, .4231) under the"
4120 PRINT"                 unit normal curve between 0.46 and 1.57. Then"
4130 INPUT"                 press the enter key.";Q5$
4140 IF I55=0 THEN A55$=Q5$
4150 IF I55=1 THEN B55$=Q5$
4160 PRINT""
4170 IF Q5$ =".2646" OR Q5$="26.46%" THEN 4180 ELSE 4210
4180 R55 = 1
4190 PRINT"                 Your response is correct."
4200 GOTO 4290
4210 IF I55 = 1 GOTO 4260
4220 PRINT"                 Your response is incorrect. Press the enter key for"
4230 PRINT"                 further explanation."
4240 A$ = INKEY$: IF A$="" GOTO 4240
4250 I55 = 1: R=R+1: GOTO 3630
4260 W55 = 1
4270 PRINT"                 Your response is incorrect. The correct answer is"
4280 PRINT"                 .2646 ."
4290 LOCATE 23,58: PRINT"Press the enter key."
4300 A$ = INKEY$: IF A$ ="" GOTO 4300.
4310 'screen 14
4320 GOSUB 1370
4330 LOCATE 1,1: PRINT"Unit 5:  Screen 14"
4340 LOCATE 16,1
4350 Z1 = -.5
4360 Z2 = 1!
4370 GOSUB 2000
4380 PRINT"   Example 6.  The region under the unit normal curve between "
4390 PRINT""
4400 PRINT"                -0.50 and 1.00 has been shaded above. From Table"
4410 PRINT""
4420 PRINT"                B, the area of this shaded region = (area below 1.00)
-"
4430 PRINT""
4440 PRINT"                (area below -0.50) = .8413 - .3085 = .5328."
4450 LOCATE 23,58:PRINT"Press the enter key."
4460 A$ = INKEY$: IF A$ ="" GOTO 4460
4470 'screen 15
4480 GOSUB 1370
4490 LOCATE 1,1: PRINT"Unit 5:  Screen 15"
4500 LOCATE 16,1
```

```
4510 Z1 = -1
4520 Z2 = 1
4530 GOSUB 2000
4540 PRINT"    Exercise 6.  The region under the unit normal curve between "
4550 PRINT"                 -1.00 and 1.00 has been shaded above. Using Table"
4560 PRINT"                 B, type in the area (for example, .4231) of this"
4570 INPUT"                 shaded region and press the enter key.";Q5$
4580 IF I56=0 THEN A56$=Q5$
4590 IF I56=1 THEN B56$=Q5$
4600 PRINT""
4610 IF Q5$ =".6826" OR Q5$="68.26%" THEN 4620 ELSE 4650
4620 R56 = 1
4630 PRINT"                 Your response is correct."
4640 GOTO 4730
4650 IF I56 = 1 GOTO 4700
4660 PRINT"                 Your response is incorrect. Press the enter key for"
4670 PRINT"                 further explanation."
4680 A$ = INKEY$: IF A$="" GOTO 4680
4690 I56 = 1: R=R+1: GOTO 4310
4700 W56 = 1
4710 PRINT"                 Your response is incorrect. The correct answer is"
4720 PRINT"                 .6826."
4730 LOCATE 23,58: PRINT"Press the enter key."
4740 A$ = INKEY$: IF A$ ="" GOTO 4740.
4750 'screen 17
4760 SCREEN 0,1: COLOR 15,1,15: CLS
4770 LOCATE 1,32:PRINT"Unit 5: Screen 17"
4780 LOCATE 4,1
4790 PRINT"    Example 7.  It is fairly well known that IQ scores from the "
4800 PRINT"                Stanford-Binet Intelligence Test are approximately"
4810 PRINT"                normally distributed with a mean of 100 and a "
4820 PRINT"                standard deviation of 16 for people in its population.
"
4830 PRINT"                Determine the percent of people having an IQ score"
4840 PRINT"                between 100 and 116."
4850 PRINT""
4860 PRINT"    Solution    We begin by computing the z-scores for 100 and"
4870 PRINT"                116, respectively. The z-score for 100 is z1 = "
4880 PRINT"                (X - m)/s = (100 - 100)/16 = 0. The z-score for"
4890 PRINT"                116 is z2 = (116 - 100)/16 = 16/16 = 1. The area"
4900 PRINT"                under the unit normal curve between 0 and 1 is"
4910 PRINT"                given by (area below 1.00) - (area below 0.00) ="
4920 PRINT"                .8413 -.5000 = .3413. Therfore, approximately"
4930 PRINT"                .3413 x 100 = 34.13% of people have such scores.
4940 LOCATE 23,58: PRINT"Press the enter key?"
4950 A$ = INKEY$: IF A$ = "" GOTO 4950
4960 IF J57=1 GOTO 11320
4970 IF J52=1 GOTO 9240
4980 'screen 18
4990 SCREEN 0,1: COLOR 15,1,15: CLS
5000 LOCATE 1,32 :PRINT"Unit 5:  Screen 18"
5010 LOCATE 4,1
5020 PRINT" Exercise 7.  The Stanford-Binet Intelligence Test scores are"
5030 PRINT"              approximately normally distributed in its population of
"
5040 PRINT"              scores with a mean of 100 and a standard deviation of 1
6."
5050 PRINT"              Determine the percent of individuals having an IQ score
"
5060 PRINT"              between 84 and 124."
5070 PRINT""
5080 PRINT"                                  a. 22.55%
5090 PRINT"                                  b. 48.00%"
5100 PRINT"                                  c. 76.15%"
5110 PRINT"                                  d. 77.45%"
```

```
5120 PRINT"                                    e. 93.32%"
5130 PRINT""
5140 PRINT"                  Type in a, b, c, d, or e for your answer and press"
5150 INPUT"                  the enter key.";Q5$
5160 IF I58=0 THEN A58$=Q5$
5170 IF I58=1 THEN B58$=Q5$
5180 PRINT""
5190 IF Q5$="a" OR Q5$="A" OR Q5$="b" OR Q5$="B" OR Q5$="c" OR Q5$="C" OR Q5$="d
" OR Q5$ = "D" OR Q5$ = "e" OR Q5$ = "E" THEN 5250 ELSE 5200
5200 LOCATE 16,1
5210 PRINT"
    "
5220 PRINT"
    "
5230 LOCATE 16,1
5240 GOTO 5140
5250 IF Q5$="d" OR Q5$ ="D" THEN 5260 ELSE 5290
5260 R58 = 1
5270 PRINT"                  Your response is correct."
5280 GOTO 5380
5290 IF I58=1 GOTO 5350
5300 PRINT"                  Your response is incorrect. Press the enter key"
5310 PRINT"                  for further information."
5320 I58 = 1:R=R+1
5330 A$ = INKEY$: IF A$ = "" GOTO 5330
5340 GOTO 4750
5350 W58 = 1
5360 PRINT"                  Your response is incorrect. The correct response"
5370 PRINT"                  is d."
5380 LOCATE 23,58: PRINT"Press the enter key."
5390 A$ = INKEY$: IF A$ = "" GOTO 5390
5400 'screen 19
5410 SCREEN 0,1: COLOR 15,1,15: CLS
5420 LOCATE 1,32 : PRINT"Unit 5:  Screen 19"
5430 LOCATE 5,1
5440 PRINT"   Example 8.  If men's heights are normally distributed with a"
5450 PRINT"                mean of 67.02 inches and standard deviation of 2.56"
5460 PRINT"                inches, find the percent of men having a height "
5470 PRINT"                between 61.90 and 64.46 inches."
5480 PRINT""
5490 PRINT"   Solution     The z-score for 61.90 is z1 = (X - m)/s = "
5500 PRINT"                (61.90 - 67.02)/2.56 = -5.12/2.56 = -2. The z-score fo
r"
5510 PRINT"                for 64.46 is z2 = (64.46 - 67.02)/2.56 ="
5520 PRINT"                -2.56/2.56 = -1. The area under the unit normal "
5530 PRINT"                curve between -2.00 and -1.00 is given by (area below"
5540 PRINT"                -1.00) - (area below -2.00) = .1587 - .0228 = 0.1359."
5550 PRINT"                Therefore, approximately .1359 x 100 = 13.59% of men"
5560 PRINT"                have such height."
5570 LOCATE 23,58: PRINT"Press the enter key."
5580 A$ = INKEY$: IF A$ = "" GOTO 5580
5590 IF J58=1 GOTO 11770
5600 IF J53=1 GOTO 9690
5610 'screen 20
5620 SCREEN 0,1: COLOR 15,1,15: CLS
5630 LOCATE 1,32 : PRINT"Unit 5:  Screen 20"
5640 LOCATE 3,1
5650 PRINT"  Exercise 8.  If men's heights are normally distributed with a"
5660 PRINT""
5670 PRINT"                mean of 67.02 inches and standard deviation of 2.56"
5680 PRINT""
5690 PRINT"                inches, what is the percent of men having a height "
5700 PRINT""
5710 PRINT"                between 69.58 and 72.14 inches?"
5720 PRINT""
```

```
5730 PRINT"                              a.  2.56%"
5740 PRINT"                              b. 13.59%"
5750 PRINT"                              c. 34.13%"
5760 PRINT"                              d. 68.26%"
5770 PRINT"                              e. 86.41%"
5780 PRINT""
5790 PRINT"                 Type a, b, c, d, or e for your answer and press the"
5800 PRINT""
5810 INPUT"                 enter key.";Q5$
5820 IF I59=0 THEN A59$=Q5$
5830 IF I59=1 THEN B59$=Q5$
5840 PRINT""
5850 IF Q5$="a" OR Q5$="A" OR Q5$="b" OR Q5$="B" OR Q5$="c" OR Q5$="C" OR Q5$="d
" OR Q5$ = "D" OR Q5$ = "e" OR Q5$ = "E" THEN 5920 ELSE 5860
5860 LOCATE 17,1
5870 PRINT"
   "
5880 PRINT"
   "
5890 PRINT"
   "
5900 LOCATE 17,1
5910 GOTO 5790
5920 IF Q5$="b" OR Q5$ ="B" THEN 5930 ELSE 5960
5930 R59 = 1
5940 PRINT"                 Your response is correct."
5950 GOTO 6070
5960 IF I59=1 GOTO 6030
5970 PRINT"                 Your response is incorrect. Press the enter key"
5980 PRINT""
5990 PRINT"                 for further information."
6000 I59 = 1: R=R+1
6010 A$ = INKEY$: IF A$ = "" GOTO 6010
6020 GOTO 5400
6030 W59 = 1
6040 PRINT"                 Your response is incorrect. The correct response"
6050 PRINT""
6060 PRINT"                 is b."
6070 LOCATE 23,58: PRINT"Press the enter key."
6080 A$ = INKEY$: IF A$ = "" GOTO 6080
6090 SCREEN 0,1: COLOR 15,1,15: CLS
6100 LOCATE 7,38: PRINT"Part 2"
6110 LOCATE 10,18: PRINT"   The Area Under a Normal Curve Relative to the Curve'
s"
6120 PRINT""
6130 LOCATE 12,18: PRINT"                  Standard Deviation"
6140 LOCATE 23,58: PRINT"Press the enter key."
6150 A$ = INKEY$: IF A$ = "" GOTO 6150
6160 SCREEN 0,1: COLOR 15,1,15:CLS
6170 LOCATE 1,32: PRINT"Unit 5:  Screen 21"
6180 LOCATE 7,1
6190 PRINT"                 Any normal distribution has a constant relationship"
6200 PRINT""
6210 PRINT"            with its standard deviation. The next three screens will "

6220 PRINT""
6230 PRINT"            illustrate this fact."
6240 LOCATE 23,58:PRINT"Press the enter key."
6250 A$=INKEY$: IF A$="" GOTO 6250
6260 SCREEN 2: CLS: PRINT"Unit 5:  Screen 22"
6270 GOSUB 6290
6280 GOTO 6800
6290 S=100
6300 A=240
6310 PI = 3.141593
```

```
6320 XC = 320: YC=100
6330 'draw axes
6340 LINE (0,YC+2)-(639,YC+2),1
6350 FOR X=20 TO 620 STEP 20
6360 LINE(X,YC+2) -(X,YC+4),1
6370 NEXT X
6380 LOCATE 14,2
6390 PRINT "-3s"
6400 LOCATE 14,14
6410 PRINT "-2s"
6420 LOCATE 14,27
6430 PRINT "-1s"
6440 LOCATE 14,39
6450 PRINT "mean"
6460 LOCATE 14,52
6470 PRINT "+1s"
6480 LOCATE 14,65
6490 PRINT "+2s"
6500 LOCATE 14,77
6510 PRINT "+3s"
6520 'draw graph
6530 X1=-3.5:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
6540 X2=-3.4:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
6550 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
6560 FOR X=-3.4 TO 3.5 STEP .2
6570 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
6580 LINE -(XC+S*X,YC+Y),1
6590 NEXT X
6600 FOR Z = -3 TO 3 STEP 1
6610 Y=-A*1/SQR(2*PI)*EXP(-(Z^2)/2)
6620 LINE (XC+S*Z,101)-(XC+S*Z,101+Y)
6630 NEXT Z
6640 LOCATE 12,19
6650 PRINT "13.59%"
6660 LOCATE 12,31
6670 PRINT"34.13%"
6680 LOCATE 12,44
6690 PRINT"34.13%"
6700 LOCATE 12,56
6710 PRINT"13.59%"
6720 LOCATE 11,6
6730 PRINT"2.14%"
6740 LOCATE 11,70
6750 PRINT"2.14%"
6760 LINE (65,91)-(85,98)
6770 LINE (540,98)-(560,90)
6780 LOCATE 3,1:PRINT" s = standard deviation"
6790 RETURN
6800 LOCATE '6,1
6810 PRINT"          Any normal distribution has a constant relationship with its
"
6820 PRINT""
6830 PRINT"     standard deviation.  Approximately 68.26% of the area under a nor
mal"
6840 PRINT""
6850 PRINT"     curve lies within one standard deviation of the mean either way,
6860 PRINT""
6870 PRINT"     because 34.13% + 34.13% = 68.26%."
6880 LOCATE 11,33:PRINT"*": LOCATE 11,46: PRINT"*"
6890 LOCATE 23,58:PRINT"Press the enter key."
6900 AS=INKEYS: IF AS="" THEN 6900
6910 IF J59=1 GOTO 12270
6920 IF J54=1 GOTO 10190
6930 IF IS10=1 GOTO 7140
6940 CLS:PRINT"Unit 5:  Screen 23"
6950 GOSUB 6290
```

```
6960 LOCATE 16,1
6970 PRINT"         Approximately 95.44% of the area under a normal curve lies"
6980 PRINT""
6990 PRINT"     within two standard deviations of the mean either way, because"
7000 PRINT""
7010 PRINT"     13.59% + 34.13% + 34.13% + 13.59% = 95.44%."
7020 LOCATE 11,21: PRINT"*":LOCATE 11,33:PRINT"*": LOCATE 11,46: PRINT"*": LOCAT
E 11,58: PRINT"*"
7030 LOCATE 23,58:PRINT"Press the enter key."
7040 AS=INKEYS: IF AS="" THEN 7040
7050 CLS:PRINT"Unit 5:  Screen 24"
7060 GOSUB 6290
7070 LOCATE 16,1
7080 PRINT"         Approximately 98.72% of the area under a normal curve lies"
7090 PRINT""
7100 PRINT"     within three standard deviations of the mean either way."
7110 LOCATE 10,7:PRINT"*":LOCATE 11,21: PRINT"*":LOCATE 11,33:PRINT"*": LOCATE 1
1,46: PRINT"*": LOCATE 11,58: PRINT"*":LOCATE 10,71: PRINT"*"
7120 LOCATE 23,58: PRINT"Press the enter key."
7130 AS=INKEYS: IF AS="" THEN 7130
7140 SCREEN 2: CLS:PRINT"Unit 5:  Screen 25"
7150 GOSUB 6290
7160 LOCATE 16,1
7170 PRINT"      Exercise 9.  Approximately, what percent of the area under a"
7180 PRINT"                   normal curve lies between the mean and one standar
d"
7190 PRINT"                   deviation above the mean ?
7200 PRINT""
7210 PRINT"                   Type in your answer (for example, 17.32%) and pres
s"
7220 INPUT"                   the enter key.";Q5$
7230 IF I510=0 THEN A510$=Q5$
7240 IF I510=1 THEN B510$=Q5$
7250 IF Q5$="34.13%" OR Q5$="34.13" THEN GOTO 7260 ELSE 7290
7260 R512=1
7270 PRINT"                   Your response is correct."
7280 GOTO 7370
7290 IF I510=1 GOTO 7340
7300 PRINT"                   Your response is incorrect. Press the enter key"
7310 PRINT"                   for further explanation."
7320 AS=INKEYS: IF AS="" THEN 7320
7330 I510=1: R=R+1: GOTO 6260
7340 W510=1
7350 PRINT"                   Your response is incorrect. The correct response"
7360 PRINT"                   is 34.13%."
7370 LOCATE 23,58: PRINT"Press the enter key."
7380 AS=INKEYS: IF AS="" THEN 7380
7390 SCREEN 2: CLS: PRINT"Unit 5:  Screen 26"
7400 GOSUB 6290
7410 LOCATE 16,1
7420 PRINT"      Example 9.  A large group of test scores are normally"
7430 PRINT"                  distributed with mean 60 and standard deviation"
7440 PRINT"                  of 5. If 100 of these scores are randomly selected,
"
7450 PRINT"                  approximately (68.26%)(100) = (.6826)(100) = 68.26"

7460 PRINT"                  or about 68 of these test scores should lie "
7470 PRINT"                  between 55 and 65, since 55 and 65 are, respectivel
y,"
7480 PRINT"                  one standard deviation below and above the mean."
7490 LOCATE 23,58: PRINT"Press the enter key."
7500 A$=INKEY$: IF AS="" GOTO 7500
7510 IF I512 = 1 GOTO 8170
7520 SCREEN 2: CLS: PRINT"Unit 5:  Screen 27"
7530 GOSUB 6290
7540 LOCATE 16.1
```

```
7550 PRINT"     Example 10.  A large group of test scores is normally"
7560 PRINT"                  distributed with mean 80 and standard deviation of
10."
7570 PRINT"                  If 100 of these test scores are randomly selected,
"
7580 PRINT"                  then approximately (13.59%)(100) = (.13 9)(100) = 1
3.59 or"
7590 PRINT"                  about 14 of these test scores should lie between 60
 and 70,"
7600 PRINT"                  because 60 and 70 are 2 standard deviations and 1"
7610 PRINT"                  standard deviation, respectively, below the mean of
 80."
7620 LOCATE 23,58: PRINT"Press the enter key."
7630 AS=INKEYS: IF AS="" GOTO 7630
7640 IF J510=1 GOTO 12540
7650 IF J55=1 GOTO 10460
7660 SCREEN 2: CLS: LOCATE 1,32:PRINT"Unit 5:  Screen 28"
7670 LOCATE 4,1
7680 PRINT"       Normal Curve Axis"
7690 LINE (200,27) - (620,27),1
7700 FOR X=200 TO 620 STEP 70
7710 LINE (X,27) - (X,23),1
7720 NEXT X
7730 LOCATE 3,1
7740 PRINT"                              2.14%   13.59%   34.13%   34.13%  13.59%
  2.14%"
7750 LOCATE 5,1
7760 PRINT"                          50       60       70       80       90       10
0      110"
7770 LOCATE 7,1
7780 PRINT"     Exercise 10.  A large group of observations are normally distrib
uted"
7790 PRINT""
7800 PRINT"                  with mean 80 and standard deviation of 10. If 200
of"
7810 PRINT""
7820 PRINT"                  these observations are randomly selected, how many
"
7830 PRINT""
7840 PRINT"                  of these 200 observations should lie between 90 an
d 100 ?"
7950 PRINT""
7860 PRINT"                  a.  14    b. 20     c. 26     d.  27    e. 70
7870 PRINT""
7880 PRINT"                  Type a, b, c, d, or e for your answer and press th
e"
7890 PRINT""
7900 INPUT"                  enter key.";Q5$
7910 IF I511=0 THEN A511$=Q5$
7920 IF I511=1 THEN B511$=Q5$
7930 PRINT""
7940 IF Q5$ ="a" OR Q5$ ="A" OR Q5$="b" OR Q5$="B" OR Q5$ ="c" OR Q5$="C" OR Q5$
="d" OR Q5$="D" OR Q5$ = "e" OR Q5$ = "E" THEN 8010 ELSE 7950
7950 LOCATE 17,1
7960 PRINT"
  "
7970 PRINT"
  "
7980 PRINT"
  "
7990 LOCATE 17,1
8000 GOTO 7880
8010 IF Q5$ ="d" OR Q5$="D" THEN 8020 ELSE 8050
8020 R511=1
8030 PRINT"                  Your response is correct."
8040 GOTO 8150
8050 IF I511 = 1 GOTO 8110
```

```
8060 PRINT"                    Your response is incorrect. Press the enter key"
8070 PRINT""
8080 PRINT"                    for further explanation."
8090 AS=INKEYS: IF AS="" GOTO 8090
8100 I511=1: R=R+1: GOTO 7520
8110 W511=1
8120 PRINT"                    Your response is incorrect. The correct response"
8130 PRINT""
8140 PRINT"                    is d."
8150 LOCATE 23,58: PRINT"Press the enter key."
8160 AS=INKEYS: IF AS="" GOTO 8160
8170 SCREEN 2: CLS: LOCATE 1,32:PRINT"Unit 5:  Screen 29"
8180 LOCATE 4,1
8190 PRINT"       Normal Curve Axis"
8200 LINE (200,27) - (620,27),1
8210 FOR X=200 TO 620 STEP 70
8220 LINE (X,27) - (X,23),1
8230 NEXT X
8240 LOCATE 3,1
8250 PRINT"                              2.14%   13.59%   34.13%   34.13%  13.59%
  2.14%"
8260 LOCATE 5,1
8270 PRINT"                           50       60       70       80       90       10
0      110"
8280 LOCATE 7,1
8290 PRINT"     Exercise 11.  A large group of observations are normally distrib
uted"
8300 PRINT""
8310 PRINT"                    with mean 80 and standard deviation of 10. If 300
of"
8320 PRINT""
8330 PRINT"                    these observations are randomly selected, how many
"
8340 PRINT""
8350 PRINT"                    of these 300 observations should lie between 70 an
d 90 ?"
8360 PRINT""
8370 PRINT"                    a.  34    b. 68     c. 102    d.  203   e.  205
8380 PRINT""
8390 PRINT"                    Type a, b, c, d, or e for your answer and press th
e"
8400 PRINT""
8410 INPUT"                    enter key.";Q5$
8420 IF I512=0 THEN A512$=Q5$
8430 IF I512=1 THEN B512$=Q5$
8440 PRINT""
8450 IF Q5$ ="a" OR Q5$ ="A" OR Q5$="b" OR Q5$="B" OR Q5$ ="c" OR Q5$="C" OR Q5$
="d" OR Q5$="D" OR Q5$ = "e" OR Q5$ = "E" THEN 8520 ELSE 8460
8460 LOCATE 17,1
8470 PRINT"
  "
8480 PRINT"
  "
8490 PRINT"
  "
8500 LOCATE 17,1
8510 GOTO 8390
8520 IF Q5$ ="e" OR Q5$="E" THEN 8530 ELSE 8560
8530 R512=1
8540 PRINT"                    Your response is correct."
8550 GOTO 8660
8560 IF I512 = 1 GOTO 8620
8570 PRINT"                    Your response is incorrect. Press the enter key"
8580 PRINT""
8590 PRINT"                    for further explanation."
```

```
8600 AS=INKEY$: IF AS=""GOTO 8600
8610 I512=1: R=R+1: GOTO 7390
8620 W512=1
8630 PRINT"                    Your response is incorrect. The correct response"
8640 PRINT""
8650 PRINT"                    is e."
8660 LOCATE 23,58: PRINT"Press the enter key."
8670 AS=INKEYS: IF AS="" GOTO 8670
8680 R5 = R51+R52+R53+R54+R55+R56+R58+R59+R510+R511+R512
8690 W5 = W51+W52+W53+W54+W55+W56+W58+W59+W510+W511+W512
8700 FIRST5 = R5+W5-R
8710 T5$ = TIME$
8720 TIME$ ="00:00:00"
8730 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32: PRINT" Unit 5:  Screen 30"
8740 LOCATE 7,1
8750  PRINT"                  This concludes the discussion of Unit 5. You worked
"
8760 PRINT""
8770 PRINT"             correctly";FIRST5"exercise(s) out of 11. There are 10"
8780 PRINT""
8790 PRINT"             review problems for this unit. Would you like to work"
8800 PRINT""
8810 PRINT"             some review problems? Press y if yes or n if no and"
8820 PRINT""
8830 INPUT"             and press the enter key.";Q5$
8840 IF Q5$ = "y" OR Q5$ = "Y" OR Q5$ = "n" OR Q5$ = "N" GOTO  8850 ELSE LOCATE
15,1: PRINT"
       ": LOCATE 15,1: GOTO 8830
8850 IF Q5$ = "y" OR Q5$ = "Y" GOTO 8860 ELSE 13060
8860 'screen 41
8870 SCREEN 0,1: COLOR 15,1,15: CLS
8880 LOCATE 1,32: PRINT"Unit 5:  Screen 31"
8890 LOCATE 5,1: K5=1
8900 PRINT"      Problem 1.  What is the area under the unit normal curve"
8910 PRINT""
8920 PRINT"                 between z = -1.25 and z = 2.00 ? Type in your"
8930 PRINT""
8940 PRINT"                 answer (for example, .5643) and press the enter"
8950 PRINT""
8960 INPUT"                 key.";Q5$
8970 IF J51=0 THEN C51$=Q5$
8980 IF J51=1 THEN D51$=Q5$
8990 PRINT""
9000 IF Q5$ = "0.8716"  OR Q5$ = ".8716" THEN 9010 ELSE 9040
9010 P51 = 1
9020 PRINT"                 Your response is correct."
9030 GOTO 9140
9040 IF J51 = 1 GOTO 9100
9050 PRINT"                 Your response is incorrect. Press the enter key"
9060 PRINT""
9070 PRINT"                 for further explanation."
9080 AS=INKEYS: IF AS="" GOTO 9080
9090 J51 = 1: P=P+1: GOTO 650
9100 Q51 = 1
9110 PRINT"                 Your response is incorrect. The correct answer"
9120 PRINT""
9130 PRINT"                 is .8716."
9140 LOCATE 23,58: PRINT"Press the enter key."
9150 AS=INKEYS: IF AS="" GOTO 9150
9160 GOSUB 9180
9170 IF Q5$ = "y" OR Q5$ = "Y" GOTO 9240 ELSE 13060
9180 CLS: LOCATE 5,1
9190 PRINT"             Would you like to work another review problem ? Type"
9200 PRINT""
9210 INPUT"         y if yes or n if no and press the enter key.";Q5$
9220 IF Q5$ = "y" OR Q5$ = "Y" OR Q5$ = "n" OR Q5$ = "N" THEN 9230 ELSE LOCATE 7
,1: PRINT"
       ": LOCATE 7,1: GOTO 9210
```

```
9230 RETURN
9240 'screen 43
9250 SCREEN 0,1: COLOR 15,1,15: CLS
9260 LOCATE 1,32: PRINT" Unit 5:  Screen 32"
9270 LOCATE 3,1: K5=2
9280 PRINT"      Problem 2.  A normal distribution has a mean of 80 and a"
9290 PRINT""
9300 PRINT"                  standard deviation of 10. What is the percent of"
9310 PRINT""
9320 PRINT"                  scores between 70 and 90 ?"
9330 PRINT""
9340 PRINT"                           a. 20.00%"
9350 PRINT"                           b. 34.13%"
9360 PRINT"                           c. 68.26%"
9370 PRINT"                           d. 70.12%"
9380 PRINT"                           e. 95.34%"
9390 PRINT""
9400 PRINT"                   Type in a, b, c, d, or e for your answer and press
"
9410 PRINT""
9420 INPUT"                   the enter key.";Q5$
9430 IF J52=0 THEN C52$=Q5$
9440 IF J52=1 THEN D52$=Q5$
9450 PRINT""
9460 IF Q5$ = "a" OR Q5$ ="A" OR Q5$ ="b" OR Q5$="B" OR Q5$="c" OR Q5$ ="C" OR Q
5$="d" OR Q5$="D" OR Q5$ = "e" OR Q5$ = "E" THEN 9530 ELSE 9470
9470 LOCATE 15,1
9480 PRINT"
   "
9490 PRINT"
   "
9500 PRINT"
   "
9510 LOCATE 15,1
9520 GOTO 9400
9530 IF Q5$ = "c" OR Q5$ = "C" THEN 9540 ELSE 9570
9540 P52=1
9550 PRINT"                   Your response is correct."
9560 GOTO 9650
9570 IF J52 = 1 GOTO 9630 ELSE 9580
9580 PRINT"                   Your response is incorrect. Press the enter key fo
r"
9590 PRINT""
9600 PRINT"                   further explanation."
9610 A$ = INKEY$: IF A$ = "" GOTO 9610
9620 J52 = 1: P=P+1: GOTO 4750
9630 Q52 = 1
9640 PRINT"                   Your response is incorrect. The correct answer is
c."
9650 LOCATE 23,58: PRINT"Press the enter key."
9660 A$ = INKEY$: IF A$ = "" GOTO 9660
9670 GOSUB 9180
9680 IF Q5$ = "y" OR Q5$ = "Y" GOTO 9690 ELSE 13060
9690 'screen 33
9700 SCREEN 0,1: COLOR 15,1,15: CLS
9710 LOCATE 1,32 : PRINT"Unit 5:  Screen 33"
9720 LOCATE 3,1: K5=3
9730 PRINT"   Problem 3.  If men's heights are normally distributed with a"
9740 PRINT""
9750 PRINT"               mean of 67.02 inches and standard deviation of 2.56"
9760 PRINT""
9770 PRINT"               inches, what is the percent of men having a height "
9780 PRINT""
9790 PRINT"               between 65.74 and 69.58 inches?"
```

```
 9800 PRINT""
 9810 PRINT"                                  a.  31.74%"
 9820 PRINT"                                  b.  46.72%"
 9830 PRINT"                                  c.  53.28%"
 9840 PRINT"                                  d.  68.26%"
 9850 PRINT"                                  e.  none of the above"
 9860 PRINT""
 9870 PRINT"                Type a, b, c, d, or e for your answer and press the"
 9880 PRINT""
 9890 INPUT"                enter key.";Q5$
 9900 IF J53=0 THEN C53$=Q5$
 9910 IF J53=1 THEN D53$=Q5$
 9920 PRINT""
 9930 IF Q5$="a" OR Q5$="A" OR Q5$="b" OR Q5$="B" OR Q5$="c" OR Q5$="C" OR Q5$="d
" OR Q5$ = "D" OR Q5$ = "e" OR Q5$ = "E" THEN 10000 ELSE 9940
 9940 LOCATE 17,1
 9950 PRINT"
    "
 9960 PRINT"
    "
 9970 PRINT"
    "
 9980 LOCATE 17,1
 9990 GOTO 9870
10000 IF Q5$="c" OR Q5$ ="C" THEN 10010 ELSE 10040
10010 P53 = 1
10020 PRINT"                Your response is correct."
10030 GOTO 10150
10040 IF J53=1 GOTO 10110
10050 PRINT"                Your response is incorrect. Press the enter key"
10060 PRINT""
10070 PRINT"                for further information."
10080 J53 = 1: P=P+1
10090 A$ = INKEY$: IF A$ = "" GOTO 10090
10100 GOTO 5400
10110 Q53 = 1
10120 PRINT"                Your response is incorrect. The correct response"
10130 PRINT""
10140 PRINT"                is c."
10150 LOCATE 23,58: PRINT"Press the enter key."
10160 A$ = INKEY$: IF A$ = "" GOTO 10160
10170 GOSUB 9180
10180 IF Q5$ = "y" OR Q5$ = "Y" GOTO 10190 ELSE 13060
10190 SCREEN 2: CLS: PRINT"Unit 5: screen 34"
10200 GOSUB 6290
10210 LOCATE 16,1: K5=4
10220 PRINT"       Problem 4.  Approximately, what percent of the area under a"
10230 PRINT"                   normal curve lies between two and three standard"
10240 PRINT"                   deviations above the mean?"
10250 PRINT""
10260 PRINT"                   Type in your answer (for example, 17.32%) and"
10270 INPUT"                   press the enter key.";Q5$
10280 IF J54=0 THEN C54$=Q5$
10290 IF J54=1 THEN D54$=Q5$
10300 IF Q5$="2.14%" OR Q5$="2.14" THEN GOTO 10310 ELSE 10340
10310 P54=1
10320 PRINT"                   Your response is correct."
10330 GOTO 10420
10340 IF J54=1 GOTO 10390
10350 PRINT"                   Your response is incorrect. Press the enter key"
10360 PRINT"                   for further explanation."
10370 A$=INKEY$: IF A$ = "" THEN 10370
10380 J54=1: P=P+1: GOTO 6260
10390 PRINT"                   Your response is incorrect. The correct response"
10400 PRINT"                   is 2.14% ."
10410 Q54 = 1
```

```
10420 LOCATE 23,58: PRINT"Press the enter key."
10430 AS=INKEYS: IF AS="" THEN 10430
10440 GOSUB 9190
10450 IF Q5$ = "y" OR Q5$ = "Y" GOTO 10460 ELSE 13060
10460 SCREEN 2: CLS: LOCATE 1,32:PRINT"Unit 5:  Screen 34"
10470 LOCATE  ,1: K5=5
10480 PRINT"       Normal Curve Axis"
10490 LINE (200,27) - (620,27),1
10500 FOR X=200 TO 620 STEP 70
10510 LINE (X,27) - (X,23),1
10520 NEXT X
10530 LOCATE 3,1
10540 PRINT"                              2.14%   13.59%   34.13%   34.13%  13.59%
   2.14%"
10550 LOCATE 5,1
10560 PRINT"                           50       60       70       80       90       1
00       110"
10570 LOCATE 7,1
10580 PRINT"       Problem 5.  A large group of observations are normally distri
buted"
10590 PRINT""
10600 PRINT"                   with mean 80 and standard deviation of 10. If 300
 of"
10610 PRINT""
10620 PRINT"                   these observations are randomly selected, how man
y"
10630 PRINT""
10640 PRINT"                   of these 300 observations should lie between 100
and 110 ?"
10650 PRINT""
10660 PRINT"                   a. 6     b. 7     c. 30    d. 41    e. 102
10670 PRINT""
10680 PRINT"                   Type a, b, c, d, or e for your answer and press t
he"
10690 PRINT""
10700 INPUT"                   enter key.";Q5$
10710 IF J55=0 THEN C55$=Q5$
10720 IF J55=1 THEN D55$=Q5$
10730 PRINT""
10740 IF Q5$ ="a" OR Q5$ ="A" OR Q5$="b" OR Q5$="B" OR Q5$ ="c" OR Q5$="C" OR Q5
S="d" OR Q5$="D" OR Q5$ ="e" OR Q5$ = "E" THEN 10810 ELSE 10750
10750 LOCATE 17,1
10760 PRINT"
   "
10770 PRINT"
   "
10780 PRINT"
   "
10790 LOCATE 17,1
10800 GOTO 10680
10810 IF Q5$ ="a" OR Q5$="A" THEN 10820 ELSE 10850
10820 P55=1
10830 PRINT"                   Your response is correct."
10840 GOTO 10950
10850 IF J55 = 1 GOTO 10910
10860 PRINT"                   Your response is incorrect. Press the enter key"
10870 PRINT""
10880 PRINT"                   for further explanation."
10890 AS=INKEYS: IF AS="" GOTO 10890
10900 J55=1: P=P+1: GOTO 7520
10910 Q55=1
10920 PRINT"                   Your response is incorrect. The correct response"

10930 PRINT""
10940 PRINT"                   is a."
10950 LOCATE 23,58: PRINT"Press the enter key."
```

```
10960 AS=INKEYS: IF AS="" GOTO 10960
10970 GOSUB 9180
10980 IF Q5$ = "y" OR Q5$ = "Y" GOTO 10990 ELSE 13060
10990 SCREEN 0,1: COLOR 15,1,15: CLS
11000 'screen 36
11010 SCREEN 0,1: COLOR 15,1,15: CLS
11020 LOCATE 1,32: PRINT"Unit 5:  Screen 36"
11030 LOCATE 5,1: K5=6
11040 PRINT"      Problem 6.  What is the area under the unit normal curve"
11050 PRINT""
11060 PRINT"                  between z = -2.99 and z = -1.06 ? Type in your"
11070 PRINT""
11080 PRINT"                  answer (for example, .5643) and press the enter"
11090 PRINT""
11100 INPUT"                  key.";Q5$
11110 IF J56=0 THEN C56$=Q5$
11120 IF J56=1 THEN D56$=Q5$
11130 PRINT""
11140 IF Q5$ = "0.1432"  OR Q5$ = ".1432" THEN 11150 ELSE 11180
11150 P56 = 1
11160 PRINT"                  Your response is correct."
11170 GOTO 11280
11180 IF J56 = 1 GOTO 11240
11190 PRINT"                  Your response is incorrect. Press the enter key"
11200 PRINT""
11210 PRINT"                  for further explanation."
11220 AS=INKEYS: IF AS="" GOTO 11220
11230 J56 = 1: P=P+1: GOTO 650
11240 Q56 = 1
11250 PRINT"                  Your response is incorrect. The correct answer"
11260 PRINT""
11270 PRINT"                  is .1432."
11280 LOCATE 23,58: PRINT"Press the enter key."
11290 AS=INKEYS: IF AS="" GOTO 11290
11300 GOSUB 9180
11310 IF Q5$ = "y" OR Q5$ = "Y" GOTO 11320 ELSE 13060
11320 'screen 37
11330 SCREEN 0,1: COLOR 15,1,15: CLS
11340 LOCATE 1,32: PRINT" Unit 5:  Screen 37"
11350 LOCATE 5,1: K5=7
11360 PRINT"      Problem 7.  A normal distribution has a mean of 74 and a"
11370 PRINT""
11380 PRINT"                  standard deviation of 5. What is the percent of"
11390 PRINT""
11400 PRINT"                  scores lying between 68 and 81 ?"
11410 PRINT""
11420 PRINT"                           a.  4.15%"
11430 PRINT"                           b. 19.59%"
11440 PRINT"                           c. 80.41%"
11450 PRINT"                           d. 91.92%"
11460 PRINT"                           e. 95.85%"
11470 PRINT""
11480 PRINT"                   Type in a, b, c, d, or e for your answer and pres
s"
11490 PRINT""
11500 INPUT"                   the enter key.";Q5$
11510 IF J57=0 THEN C57$=Q5$
11520 IF J57=1 THEN D57$=Q5$
11530 PRINT""
11540 IF Q5$ = "a" OR Q5$ ="A" OR Q5$ ="b" OR Q5$="B" OR Q5$="c" OR Q5$ ="C" OR
Q5$="d" OR Q5$="D" OR Q5$ = "e" OR Q5$ = "E" THEN 11610 ELSE 11550
11550 LOCATE 17,1
11560 PRINT"
    "
11570 PRINT"
    "
```

```
11580 PRINT"
                    "
11590 LOCATE 17,1
11600 GOTO 11480
11610 IF Q5$ = "c" OR Q5$ = "C" THEN 11620 ELSE 11650
11620 P57=1
11630 PRINT"                    Your response is correct."
11640 GOTO 11730
11650 IF J57 = 1 GOTO 11710 ELSE 11660
11660 PRINT"                    Your response is incorrect. Press the enter key f
or"
11670 PRINT""
11680 PRINT"                    further explanation."
11690 A$ = INKEY$: IF A$ = "" GOTO 11690
11700 J57 = 1: P=P+1: GOTO 4750
11710 Q57 = 1
11720 PRINT"                    Your response is incorrect. The correct answer is
 c."
11730 LOCATE 23,58: PRINT"Press the enter key."
11740 A$ = INKEY$: IF A$ = "" GOTO 11740
11750 GOSUB 9180
11760 IF Q5$ = "y" OR Q5$ = "Y" GOTO 11770 ELSE 13060
11770 'screen 38
11780 SCREEN 0,1: COLOR 15,1,15: CLS
11790 LOCATE 1,32 : PRINT"Unit 5:  Screen 38"
11800 LOCATE 3,1: K5=8
11810 PRINT"   Problem 8.  If men's heights are normally distributed with a"
11820 PRINT""
11830 PRINT"               mean of 67.02 inches and standard deviation of 2.56"
11840 PRINT""
11850 PRINT"               inches, what is the percent of men having a height "
11860 PRINT""
11870 PRINT"               between 61.90 and 67.02 inches?"
11880 PRINT""
11890 PRINT"                              a.   2.28%"
11900 PRINT"                              b.  47.72%"
11910 PRINT"                              c.  50.00%"
11920 PRINT"                              d.  52.28%"
11930 PRINT"                              e.  none of the above"
11940 PRINT""
11950 PRINT"               Type a, b, c, d, or e for your answer and press the"
11960 PRINT""
11970 INPUT"               enter key.";Q5$
11980 IF J58=0 THEN C58$=Q5$
11990 IF J58=1 THEN D58$=Q5$
12000 PRINT""
12010 IF Q5$="a" OR Q5$="A" OR Q5$="b" OR Q5$="B" OR Q5$="c" OR Q5$="C" OR Q5$="
d" OR Q5$ = "D" OR Q5$ = "e" OR Q5$ = "E" THEN 12080 ELSE 12020
12020 LOCATE 17,1
12030 PRINT"
    "
12040 PRINT"
    "
12050 PRINT"
    "
12060 LOCATE 17,1
12070 GOTO 11950
12080 IF Q5$="b" OR Q5$ ="B" THEN 12090 ELSE 12120
12090 P58 = 1
12100 PRINT"               Your response is correct."
12110 GOTO 12230
12120 IF J58=1 GOTO 12190
12130 PRINT"               Your response is incorrect. Press the enter key"
12140 PRINT""
12150 PRINT"               for further information."
```

```
12160 J58 = 1: P=P+1
12170 A$ = INKEY$: IF A$ = "" GOTO 12170
12180 GOTO 5400
12190 Q58 = 1
12200 PRINT"               Your response is incorrect. The correct response"
12210 PRINT""
12220 PRINT"               is b."
12230 LOCATE 23,58: PRINT"Press the enter key."
12240 A$ = INKEY$: IF A$ = "" GOTO 12240
12250 GOSUB 9180
12260 IF Q5$ = "y" OR Q5$ = "Y" GOTO 12270 ELSE 13060
12270 SCREEN 2: CLS: PRINT"Unit 5: screen 39"
12280 GOSUB 6290
12290 LOCATE 16,1: K5=9
12300 PRINT"      Problem 9.  Approximately, what percent of the area under a"
12310 PRINT"                  normal curve lies between three and one standard"
12320 PRINT"                  deviations below the mean?"
12330 PRINT""
12340 PRINT"                  Type in your answer (for example, 17.32%) and"
12350 INPUT"                  press the enter key.";Q5$
12360 IF J59=0 THEN C59$=Q5$
12370 IF J59=1 THEN D59$=Q5$
12380 IF Q5$="15.73%" OR Q5$="15.73" THEN GOTO 12390 ELSE 12420
12390 P59=1
12400 PRINT"                  Your response is correct."
12410 GOTO 12500
12420 IF J59=1 GOTO 12470
12430 PRINT"                  Your response is incorrect. Press the enter key"
12440 PRINT"                  for further explanation."
12450 A$=INKEY$: IF A$ = "" THEN 12450
12460 J59=1: P=P+1: GOTO 6260
12470 PRINT"                  Your response is incorrect. The correct response"
12480 PRINT"                  is 15.73%."
12490 Q59 = 1
12500 LOCATE 23,58: PRINT"Press the enter key."
12510 A$=INKEY$: IF A$="" THEN 12510
12520 GOSUB 9180
12530 IF Q5$ = "y" OR Q5$ = "Y" GOTO 12540 ELSE 13060
12540 SCREEN 2: CLS: LOCATE 1,32:PRINT"Unit 5:  Screen 39"
12550 LOCATE 4,1: K5=10
12560 PRINT"      Normal Curve Axis"
12570 LINE (200,27) - (620,27),1
12580 FOR X=200 TO 620 STEP 70
12590 LINE (X,27) - (X,23),1
12600 NEXT X
12610 LOCATE 3,1
12620 PRINT"                              2.14%   13.59%   34.13%   34.13%  13.59%
   2.14%"
12630 LOCATE 5,1
12640 PRINT"                          50       60       70       80       90      1
00      110"
12650 LOCATE 7,1
12660 PRINT"      Problem 10.  A large group of observations are normally distri
buted"
12670 PRINT""
12680 PRINT"                  with mean 80 and standard deviation of 10. If 250
 of"
12690 PRINT""
12700 PRINT"                  these observations are randomly selected, how man
y"
12710 PRINT""
12720 PRINT"                  of these 250 observations should lie between 60 a
nd 90 ?"
12730 PRINT""
12740 PRINT"                  a. 75    b. 171   c. 204   d. 205   e. 206
12750 PRINT""
12760 PRINT"                  Type a, b, c, d, or e for your answer and press t
he"
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```
12770 PRINT""
12780 INPUT"                        enter key.";Q5$
12790 IF J510=0 THEN C510$=Q5$
12800 IF J510=1 THEN D510$=Q5$
12810 PRINT""
12820 IF Q5$ ="a" OR Q5$ ="A" OR Q5$="b" OR Q5$="B" OR Q5$ ="c" OR Q5$="C" OR Q5
S="d" OR Q5$="D" OR Q5$ ="e" OR Q5$ = "E" THEN 12890 ELSE 12830
12830 LOCATE 17,1
12840 PRINT"
      "
12850 PRINT"
   "
12960 PRINT"
   "
12970 LOCATE 17,1
12880 GOTO 12760
12890 IF Q5$ ="d" OR Q5$="D" THEN 12900 ELSE 12930
12900 P510=1
12910 PRINT"                        Your response is correct."
12920 GOTO 13030
12930 IF J510 = 1 GOTO 12990
12940 PRINT"                        Your response is incorrect. Press the enter key"
12950 PRINT""
12960 PRINT"                        for further explanation."
12970 A$=INKEY$: IF A$="" GOTO 12970
12980 J510=1: P=P+1: GOTO 7520
12990 Q510=1
13000 PRINT"                        Your response is incorrect. The correct response"

13010 PRINT""
13020 PRINT"                        is d."
13030 LOCATE 23,58: PRINT"Press the enter key."
13040 A$=INKEY$: IF A$="" GOTO 13040
13050 SCREEN 0,1: COLOR 15,1,15: CLS
13060 'screen 35
13070 CLS: LOCATE 1,32: PRINT"Unit 5:  Screen 35"
13080 LOCATE 8,1
13090 PRINT"                    Turn the printer on and press the enter key."
13100 A$ = INKEY$: IF A$ = "" GOTO 13100
13110 IF K5=0 GOTO 13270
13120 P5=P51+P52+P53+P54+P55+P56+P57+P58+P59+P510
13130 Q5=Q51+Q52+Q53+Q54+Q55+Q56+Q57+Q58+Q59+Q510
13140 SEC5 = P5+Q5-P
13150 PRINT""
13160 PRINT"                    The number of correct exercises is";FIRST5
13170 PRINT""
13180 PRINT"                    The number of incorrect exercises is";11-FIRST5
13190 PRINT""
13200 PRINT"                    The number of correct exercises after remediation i
s";R-W5
13210 PRINT""
13220 PRINT"                    The number of correct problems is";SEC5
13230 PRINT""
13240 PRINT"                    The number of incorrect problems is";K5-SEC5
13250 PRINT""
13260 PRINT"                    The number of correct problems after remediation is
";P-Q5
13270 LPRINT"    Unit 5:  Part 1.  Total Area Under a Normal Curve Lying Below"
13280 LPRINT"             One Observation and Above a Second Observation."
13290 LPRINT""
13300 LPRINT"             Part 2.  Area Under a Normal Curve Relative to the Cur
ve's"
13310 LPRINT"             Standard Deviation."
13320 LPRINT""
```

```
13330 LPRINT"                  ";NAM$,NO$,T5$
13340 LPRINT""
13350 LPRINT"                  The number of correct exercises is";FIRST5
13360 LPRINT""
13370 LPRINT"                  The number of incorrect exercises is"; 11-FIRST5"
13380 LPRINT""
13390 LPRINT"                  The number of correct exercises after remediation
is";R-W5
13400 IF K5=0 GOTO 13470
13410 LPRINT"                                  ";TIME$
13420 LPRINT"                  The number of correct problems is";SEC5
13430 LPRINT""
13440 LPRINT"                  The number of incorrect problems is"; K5-SEC5"
13450 LPRINT""
13460 LPRINT"                  The number of correct problems after remediation i
s";P-Q5
13470 LPRINT""
13480 LPRINT""
13490 LPRINT""
13500 IF I51=1 GOTO 13530
13510 LPRINT"   Exercise 1 response was correct.",A51$:GOTO 13550
13520 LPRINT""
13530 LPRINT"   Exercise 1 response was incorrect.",A51$,B51$
13540 LPRINT""
13550 LPRINT"": IF I52=1 GOTO 13580
13560 LPRINT"   Exercise 2 response was correct.",A52$:GOTO 13600
13570 LPRINT""
13580 LPRINT"   Exercise 2 response was incorrect.",A52$,B52$
13590 LPRINT""
13600 LPRINT"": IF I53=1 GOTO 13630
13610 LPRINT"   Exercise 3 response was correct.",A53$:GOTO 13650
13620 LPRINT""
13630 LPRINT"   Exercise 3 response was incorrect.",A53$,B53$
13640 LPRINT""
13650 LPRINT"": IF I54=1 GOTO 13680
13660 LPRINT"   Exercise 4 response was correct.",A54$:GOTO 13700
13670 LPRINT""
13680 LPRINT"   Exercise 4 response was incorrect.",A54$,B54$
13690 LPRINT""
13700 LPRINT"": IF I55=1 GOTO 13730
13710 LPRINT"   Exercise 5 response was correct.",A55$: GOTO 13750
13720 LPRINT""
13730 LPRINT"   Exercise 5 response was incorrect.",A55$,B55$
13740 LPRINT""
13750 LPRINT"": IF I56=1 GOTO 13780
13760 LPRINT"   Exercise 6 response was correct.",A56$: GOTO 13800
13770 LPRINT""
13780 LPRINT"   Exercise 6 response was incorrect.",A56$,B56$
13790 LPRINT""
13800 LPRINT"": IF I58=1 GOTO 13830
13810 LPRINT"   Exercise 7 response was correct.",A58$: GOTO 13850
13820 LPRINT""
13830 LPRINT"   Exercise 7 response was incorrect.",A58$,B58$
13840 LPRINT""
13850 LPRINT: IF I59=1 GOTO 13880
13860 LPRINT"   Exercise 8 response was correct.",A59$:GOTO 13900
13870 LPRINT""
13880 LPRINT"   Exercise 8 response was incorrect.",A59$,B59$
13890 LPRINT""
13900 LPRINT"": IF I510=1 GOTO 13930
13910 LPRINT"   Exercise 9 response was correct.",A510$:GOTO 13950
13920 LPRINT""
13930 LPRINT"   Exercise 9 response was incorrect.",A510$,B510$
13940 LPRINT""
13950 LPRINT"": IF I511=1 GOTO 13980
13960 LPRINT"   Exercise 10 response was correct.",A511$:GOTO  4000
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```
13970 LPRINT""
13980 LPRINT"   Exercise 10 response was incorrect.",A511$,B511$
13990 LPRINT""
14000 LPRINT"": IF I512=1 GOTO 14030
14010 LPRINT"   Exercise 11 response was correct.",A512$:GOTO 14050
14020 LPRINT""
14030 LPRINT"   Exercise 11 response was incorrect.",A512$,B512$
14040 LPRINT""
14050 IF K5<1 GOTO 14650
14060 LPRINT"": IF J51=1 GOTO 14090
14070 LPRINT"   Problem 1 response was correct.",C51$: GOTO 14110
14080 LPRINT""
14090 LPRINT"   Problem 1 response was incorrect.",C51$,D51$
14100 LPRINT""
14110 IF K5<2 GOTO 14650
14120 LPRINT"": IF J52=1 GOTO 14150
14130 LPRINT"   Problem 2 response was correct.",C52$: GOTO 14170
14140 LPRINT""
14150 LPRINT"   Problem 2 response was incorrect.",C52$,D52$
14160 LPRINT""
14170 IF K5<3 GOTO 14650
14180 LPRINT"": IF J53=1 GOTO 14210
14190 LPRINT"   Problem 3 response was correct.",C53$: GOTO 14230
14200 LPRINT""
14210 LPRINT"   Problem 3 response was incorrect.",C53$,D53$
14220 LPRINT""
14230 IF K5<4 GOTO 14650
14240 LPRINT"": IF J54=1 GOTO 14270
14250 LPRINT"   Problem 4 response was correct.",C54$: GOTO 14290
14260 LPRINT""
14270 LPRINT"   Problem 4 response was incorrect.",C54$,D54$
14280 LPRINT""
14290 IF K5<5 GOTO 14650
14300 LPRINT"": IF J55=1 GOTO 14330
14310 LPRINT"   Problem 5 response was correct.",C55$: GOTO 14350
14320 LPRINT""
14330 LPRINT"   Problem 5 response was incorrect.",C55$,D55$
14340 LPRINT""
14350 IF K5<6 GOTO 14650
14360 LPRINT"": IF J56=1 GOTO 14390
14370 LPRINT"   Problem 6 response was correct.",C56$: GOTO 14410
14380 LPRINT""
14390 LPRINT"   Problem 6 response was incorrect.",C56$,D56$
14400 LPRINT""
14410 IF K5<7 GOTO 14650
14420 LPRINT"": IF J57=1 GOTO 14450
14430 LPRINT"   Problem 7 response was correct.",C57$: GOTO 14470
14440 LPRINT""
14450 LPRINT"   Problem 7 response was incorrect.",C57$,D57$
14460 LPRINT""
14470 IF K5<8 GOTO 14650
14480 LPRINT"": IF J58=1 GOTO 14510
14490 LPRINT"   Problem 8 response was correct.",C58$: GOTO 14530
14500 LPRINT""
14510 LPRINT"   Problem 8 response was incorrect.",C58$,D58$
14520 LPRINT""
14530 IF K5<9 GOTO 14650
14540 LPRINT"": IF J59=1 GOTO 14570
14550 LPRINT"   Problem 9 response was correct.",C59$: GOTO 14590
14560 LPRINT""
14570 LPRINT"   Problem 9 response was incorrect.",C59$,D59$
14580 LPRINT""
14590 IF K5<10 GOTO 14650
14600 LPRINT"": IF J510=1 GOTO 14630
14610 LPRINT"   Problem 10 response was correct.",C510$: GOTO 14650
14620 LPRINT""
14630 LPRINT"   Problem 10 response was incorrect.",C510$,D510$
14640 LPRINT""
14650 CLS: CHAIN "unit6"
```

```
10 COMMON NAMS,NOS
20 'Unit 6
30 SCREEN 0,1: COLOR 15,1,15: CLS
40 LOCATE 7,38: PRINT"Unit 6"
50 LOCATE 11,9: PRINT"Total Area Under a Normal Curve Lying Below One Observatio
n"
60 LOCATE 13,9: PRINT"              and Above a Second Observation."
70 LOCATE 23,58: PRINT"Press the enter key."
80 AS = INKEYS: IF AS="" GOTO 80
90 R=0
100 TIMES ="00:00:00"
110 SCREEN 0,1: COLOR 15,1,15: CLS
120 LOCATE 1,32: PRINT" Unit 6:  Screen ii"
130 LOCATE 5,1
140 PRINT"    Objective:  At the end of this lesson, the student should be able"
150 PRINT""
160 PRINT"                to approximate the proportion of the area of a normal"
170 PRINT""
180 PRINT"                distribution lying below one observation and above a"
190 PRINT""
200 PRINT"                second observation."
210 LOCATE 23,58: PRINT"Press the enter key."
220 AS = INKEYS: IF AS = "" GOTO 220
230 'screen 1
240 SCREEN 0,1: COLOR 15,1,15: CLS
250 LOCATE 1,32: PRINT"Unit 6:  Screen 1"
260 LOCATE 4,1
270 PRINT"             Suppose that one wishes to find the total area"
280 PRINT""
290 PRINT"        under the unit normal curve below z1 and above z2, with z2"
300 PRINT""
310 PRINT"        greater than or equal to z1. Using Table B, find the areas"
320 PRINT""
330 PRINT"        below z1 and above z2, respectively. The total area is "
340 PRINT""
350 PRINT"        given by:
360 PRINT""
370 PRINT""
380 PRINT"                  (area below z1) + (area above z2)."
390 COLOR 15,6,15
400 LOCATE 15,18
410 PRINT" (area below z1) + (area above z2)."
420 COLOR 15,1,15
430 LOCATE 23,58: PRINT"Press the enter key."
440 AS = INKEYS: IF AS="" GOTO 440
450 'screen 2
460 GOSUB 1230: Z1=-.4: Z2=1.6: LOCATE 1,1:PRINT"Unit 6:  Screen 2"
470 GOSUB 1860: LOCATE 14,35: PRINT"z1": LOCATE 14,60: PRINT"z2"
480 LOCATE 16,1
490 PRINT"               We will be interested in calculating the total area"
500 PRINT""
510 PRINT"          of shaded regions of this type."
520 LOCATE 23,58: PRINT"Press the enter key."
530 AS=INKEYS: IF AS="" GOTO 530
540 'screen 23
550 SCREEN 0,1: COLOR 15,1,15: CLS
560 LOCATE 1,32: PRINT"Unit 6:  Screen 3"
570 LOCATE 4,1
580 PRINT"   Example 1.  A portion of Table B is shown below."
590 PRINT""
600 PRINT"                  z          Area Below      Area Above      Ordinate"
610 PRINT""
620 PRINT"                1.96          .9750           .0250          .3584"
```

```
630 PRINT"                1.97          .9756          .0244          .0573"
640 PRINT"                1.98          .9761          .0239          .0562"
650 PRINT"                1.99          .9767          .0233          .0551"
660 PRINT"                2.00          .9772          .0228          .0540"
670 PRINT""
680 PRINT"              The total area under the unit normal curve below"
690 PRINT""
700 PRINT"              z1 = 1.96 and above z2 = 1.99 is given by:
710 PRINT""
720 PRINT"                 (area below 1.96) + (area above 1.99) ="
730 PRINT""
740 PRINT"                                .9750 + .0233 ="
750 PRINT""
760 PRINT"                                    .9983"
770 COLOR 15,6,15
780 LOCATE 6,28: PRINT" Area Below " : LOCATE 6,43: PRINT" Area Above "
790 LOCATE 8,16: PRINT" 1.96          .9750 "
800 LOCATE 11,16: PRINT" 1.99 ": LOCATE 11,45: PRINT" .0233 "
810 COLOR 15,1,15
820 LOCATE 23,58: PRINT"Press the enter key."
830 A$ = INKEY$ : IF A$ = "" GOTO 830
840 IF J66 = 1 GOTO 8130
850 IF J61 = 1 GOTO 6080
860 'screen 24
870 SCREEN 0,1: COLOR 15,1,15: CLS
880 LOCATE 1,32: PRINT"Unit 6:  Screen 4"
890 LOCATE 4,1
900 PRINT"   Exercise 1.  A portion of Table B is shown below."
910 PRINT""
920 PRINT"                 z          Area Below     Area Above     Ordinate"
930 PRINT""
940 PRINT"               1.96          .9750          .0250          .0584"
950 PRINT"               1.97          .9756          .0244          .0573"
960 PRINT"               1.98          .9761          .0239          .0562"
970 PRINT"               1.99          .9767          .0233          .0551"
980 PRINT"               2.00          .9772          .0228          .0540"
990 PRINT""
1000 PRINT"               Type in the total area (for example, .3412) below"
1010 PRINT""
1020 INPUT"               1.97 and above 2.00 and press the enter key"; Q6$
1030 IF I61=0 THEN A61$=Q6$
1040 IF I61=1 THEN B61$=Q6$
1050 PRINT""
1060 IF Q6$ =".9984" OR Q6$="99.84%" THEN 1070 ELSE 1100
1070 R61 = 1
1080 PRINT"               Your response is correct."
1090 GOTO 1230
1100 IF I61 = 1 GOTO 1160
1110 PRINT"               Your response is incorrect. Press the enter key for"
1120 PRINT""
1130 PRINT"               further explanation."
1140 A$ = INKEY$: IF A$="" GOTO 1140
1150 I61 = 1: R=R+1: GOTO 540
1160 W61 = 1
1170 PRINT"               Your response is incorrect. The correct answer is"
1180 PRINT""
1190 PRINT"               .9984."
1200 LOCATE 23,58: PRINT"Press the enter key."
1210 A$ = INKEY$: IF A$ ="" GOTO 1210.
1220 GOTO 1790
1230 SCREEN 2: CLS
1240 S=100
1250 A=240
1260 PI=3.141593
1270 XC=320:YC=100
```

```
1280 'draw axes
1290 SCREEN 2: CLS
1300 LINE (0,YC+2)-(639,YC+2),1
1310 LINE (639,0)-(639,191),1
1320 FOR X=20 TO 620 STEP 20
1330 LINE(X,YC+2) -(X,YC+4),1
1340 NEXT X
1350 LOCATE 1,78
1360 PRINT ".4"
1370 LOCATE 7,78
1380 PRINT".2"
1390 FOR Y = 0 TO 75 STEP 25
1400 LINE (636,Y) - (639,Y),1
1410 NEXT Y
1420 LOCATE 14,1
1430 PRINT "z"
1440 LOCATE 14,15
1450 PRINT "-2"
1460 LOCATE 14,27
1470 PRINT "-1"
1480 LOCATE 14,41
1490 PRINT "0"
1500 LOCATE 14,53
1510 PRINT "1"
1520 LOCATE 14,66
1530 PRINT "2"
1540 LOCATE 14,78
1550 PRINT "3"
1560 'draw graph
1570 X1=-3.5:Y1=-A*1/(SQR(2*PI))*EXP(-(X1^2)/2)
1580 X2=-3.4:Y2=-A*1/(SQR(2*PI))*EXP(-(X2^2)/2)
1590 LINE(XC+S*X1,YC+Y1)-(XC+S*X2,YC+Y2),1
1600 FOR X=-3.4 TO 3.5 STEP .2
1610 Y=-A*1/(SQR(2*PI))*EXP(-(X^2)/2)
1620 LINE -(XC+S*X,YC+Y),1
1630 NEXT X
1640 RETURN
1650 'calculate area
1660 B=0
1670 I1=0
1680 M=0
1690 N=1
1700 F=1
1710 T=(((-1)^(N+1))*(Z^(2*N-1)))/((2^(N-1))*F*(2*N-1))
1720 B=B+T
1730 N=N+1
1740 F=F*(N-1)
1750 IF N<29, GOTO 1710
1760 M=(1/SQR(2*PI))*B+.5
1770 I1=INT(M*10000+.5)/10000
1780 RETURN
1790 'screen 5
1800 GOSUB 1230
1810 LOCATE 1,1: PRINT"Unit 6:  Screen 5"
1820 Z1 = .5
1830 Z2 = 1.8
1840 GOSUB 1860
1850 GOTO 1930
1860 Y3 = -A*1/SQR(2*PI)*EXP(-(Z1^2)/2)
1870 LINE (XC+S*Z1,191)-(XC+S*Z1,191+Y3)
1880 Y4 = -A*1/SQR(2*PI)*EXP(-(Z2^2)/2)
1890 LINE (XC+S*Z2,191)-(XC+S*Z2,191+Y4)
1900 PAINT (XC+S*Z2+1,(191+191+Y4)/2)
1910 PAINT (XC+S*Z1-1,(191+191+Y3)/2)
1920 RETURN
1930 LOCATE 15,1
1940 PRINT "   Example 2.  This is the graph of the unit normal distribution."
```

```
1950 PRINT ""
1960 PRINT "                The region under the curve below .50 and above 1.80"
1970 PRINT""
1980 PRINT "                is shaded. From Table B, the area of this shaded"
1990 PRINT""
2000 PRINT "                region = (area below .50) + (area above 1.80) ="
2010 PRINT""
2020 PRINT "                .6915 + .0359 = .7274."
2030 LOCATE 23,58: PRINT"Press the enter key."
2040 A$ = INKEY$: IF A$="" GOTO 2040
2050 ' Screen 6
2060 GOSUB 1230
2070 LOCATE 1,1: PRINT"Unit 6:  Screen 6"
2080 LOCATE 16,1
2090 Z1 = .75
2100 Z2 = 21
2110 GOSUB 1860
2120 PRINT"   Exercise 2.  The regions under the curve below 0.75 and above"
2130 PRINT"                2.00 is shaded. Using Table B, compute the total"
2140 PRINT"                area (for example, .4313) of these shaded regions"
2150 INPUT"                and press the enter key.";Q6$
2160 IF I62=0 THEN A62$=Q6$
2170 IF I62=1 THEN B62$=Q6$
2180 PRINT""
2190 IF Q6$ =".7962" OR Q6$="79.62%" THEN 2200 ELSE 2230
2230 R62 = 1
2210 PRINT"                Your response is correct."
2220 GOTO 2310
2230 IF I62 = 1 GOTO 2280
2240 PRINT"                Your response is incorrect. Press the enter key for"
2250 PRINT"                further explanation."
2260 A$ = INKEY$: IF A$="" GOTO 2260
2270 I62 = 1: R=R+1: GOTO 1790
2280 W62 = 1
2290 PRINT"                Your response is incorrect. The correct answer is"
2300 PRINT"                .7962."
2310 LOCATE 23,58: PRINT"Press the enter key."
2320 A$ = INKEY$: IF A$ ="" GOTO 2320.
2330 'screen 7
2340 SCREEN 0,1: COLOR 15,1,15: CLS
2350 LOCATE 1,32: PRINT"Unit 6:  Screen 7"
2360 LOCATE 5,1
2370 PRINT"   Example 3.  Another portion of Table B is shown below."
2380 PRINT""
2390 PRINT"                  z          Area Below     Area Above     Ordinate"
2400 PRINT""
2410 PRINT"               -0.60          .2743          .7257          .3332"
2420 PRINT"               -0.59          .2776          .7224          .3352"
2430 PRINT"               -0.58          .2811          .7190          .3372"
2440 PRINT"               -0.57          .2843          .7157          .3391"
2450 PPINT"               -0.56          .2877          .7123          .3410"
2460 PRINT""
2470 PRINT"               The total area under the unit normal curve below"
2480 PRINT""
2490 PRINT"               z1 = -0.60 and above z2 = -0.57 (note that -0.57 > -0.
60)"
2500 PRINT""
2510 PRINT"               is given by (area below -0.60) + (area above -0.57) ="

2520 PRINT""
2530 PRINT"               .2743 + .7157 = .9900."
2540 COLOR 15,6,15
2550 LOCATE 7,28:PRINT" Area Below ": LOCATE 7,43:PRINT" Area Above "
2560 LOCATE 9,16:PRINT"-0.60          .2743 "
2570 LOCATE 12,16:PRINT"-0.57 ": LOCATE 12,45: PPINT" .7157 "
```

```
2580 COLOR 15,1,15
2590 LOCATE 23,58: PRINT"Press the enter key."
2600 A$ = INKEY$: IF A$ = "" GOTO 2600
2610 IF J68=1 GOTO 8900
2620 IF J63=1 GOTO 6910
2630 'screen 8
2640 CLS
2650 LOCATE 1,32: PRINT"Unit 6:  Screen 8"
2660 LOCATE 5,1
2670 PRINT"  Exercise 3.  A portion of Table B is shown below:"
2680 PRINT""
2690 PRINT"                    z          Area Below     Area Above     Ordinate"
2700 PRINT""
2710 PRINT"                 -0.60          .2743          .7257          .3332"
2720 PRINT"                 -0.59          .2776          .7224          .3352"
2730 PRINT"                 -0.58          .2811          .7190          .3372"
2740 PRINT"                 -0.57          .2843          .7157          .3391"
2750 PRINT"                 -0.56          .2877          .7123          .3410"
2760 PRINT""
2770 PRINT"                 Type in the total area under the unit normal curve"
2780 PRINT""
2790 PRINT"                 below -0.59 and above -0.56 (note that -0.56 > -0.59)
2800 PRINT""
2810 INPUT"                 and press the enter key.";Q6$
2820 IF I63=0 THEN A63$=Q6$
2830 IF I63=1 THEN B63$=Q6$
2840 PRINT""
2850 IF Q6$ =".9899" OR Q6$="98.99%" THEN 2860 ELSE 2890
2860 R63 = 1
2870 PRINT"                 Your response is correct."
2880 GOTO 2970
2890 IF I63 = 1 GOTO 2940
2900 PRINT"                 Your response is incorrect. Press the enter key for"
2910 PRINT"                 further explanation."
2920 A$ = INKEY$: IF A$="" GOTO 2920
2930 I63 = 1: R=R+1: GOTO 2330
2940 W63 = 1
2950 PRINT"                 Your response is incorrect. The correct answer is"
2960 PRINT"                 .9899."
2970 LOCATE 23,58: PRINT"Press the enter key."
2980 A$ = INKEY$: IF A$ ="" GOTO 2980.
2990 'screen 9
3000 SCREEN 2: CLS
3010 GOSUB 1230
3020 LOCATE 1,1: PRINT"Unit 6:  Screen 9"
3030 Z1 = -2.24
3040 Z2 = -1!
3050 GOSUB 1960
3060 LOCATE 15,1
3070 PRINT"  Example 4.  This is the graph of the unit normal distribution."
3080 PRINT""
3090 PRINT"                 The region under the curve below -2.24 and above -1.00"
3100 PRINT""
3110 PPINT"                 is shaded. Using Table B, the area of this shaded"
3120 PRINT""
3130 PRINT"                 region = (area below -2.24) + (area above -1.00) ="
3140 PRINT""
3150 PRINT"                 .0125 + .8413 = .8538."
3160 LOCATE 23,58: PRINT"Press the enter key."
3170 A$ = INKEY$: IF A$ = "" GOTO 3170
3180 'screen 10
3190 SCREEN 2: CLS
3200 GOSUB 1230
```

```
3210 LOCATE 1,1: PRINT"Unit 6:  Screen 10"
3220 Z1 = -1.5
3230 Z2 = -.2
3240 GOSUB 1860
3250 LOCATE 16,1
3260 PRINT"  Exercise 4.  The regions under the unit normal curve below -1.50"
3270 PRINT"               and above -.20 are shaded. Type in the total area"
3280 PRINT"               (for example, .4532) of these regions and press"
3290 INPUT"               the enter key.";Q6$
3300 IF I64=0 THEN A64$=Q6$
3310 IF I64=1 THEN B64$=Q6$
3320 PRINT""
3330 IF Q6$ =".6461" OR Q6$="64.61%" THEN 3340 ELSE 3370
3340 R64 = 1
3350 PRINT"               Your response is correct."
3360 GOTO 3450
3370 IF I64 = 1 GOTO 3420
3380 PRINT"               Your response is incorrect. Press the enter key for"
3390 PRINT"               further explanation."
3400 A$ = INKEY$: IF A$="" GOTO 3400
3410 I64 = 1: R=R+1: GOTO 2990
3420 W64 = 1
3430 PRINT"               Your response is incorrect. The correct answer is"
3440 PRINT"               .6461."
3450 LOCATE 23,58: PRINT"Press the enter key."
3460 A$ = INKEY$: IF A$ = "" GOTO 3460
3470 'screen 11
3480 SCREEN 0,1: COLOR 15,1,15: CLS
3490 LOCATE 1,32: PRINT"Unit 6:  Screen 11"
3500 LOCATE 5,1
3510 PRINT"     Example 5.  Selected portions of Table B are shown below:"
3520 PRINT""
3530 PRINT"                  z          Area Below     Area Above     Ordinate"
3540 PRINT""
3550 PRINT"               -2.20          .0139          .9861          .0355"
3560 PRINT""
3570 PRINT"                         ..............................."
3580 PRINT""
3590 PRINT"                0.00          .5000          .5000          .3989"
3600 PRINT""
3610 PRINT"                         ..............................."
3620 PRINT""
3630 PRINT"                2.46          .9931          .0069          .0194"
3640 PRINT""
3650 PRINT"                 The area under the unit normal curve below -2.20"
3660 PRINT""
3670 PRINT"                 and above 2.46 = (area below -2.20) + (area above"
3680 PRINT""
3690 PRINT"                 2.46) = .0139 + .0069 = .0208."
3700 COLOR 15,6,15
3710 LOCATE 7,28: PRINT" Area Below ": LOCATE 7,42: PRINT" Area Above "
3720 LOCATE 9,16: PRINT"-2.20          .0139 "
3730 LOCATE 17,16: PRINT" 2.46 ": LOCATE 17,45: PRINT" .0069 "
3740 COLOR 15,1,15
3750 LOCATE 23,58: PRINT"Press the enter key."
3760 A$ = INKEY$: IF A$ ="" GOTO 3760
3770 'screen 12
3780 SCREEN 0,1: COLOR 15,1,15: CLS
3790 LOCATE 1,32: PRINT"Unit 6:  Screen 12"
3800 LOCATE 3,1
3810 PRINT"    Exercise 5.  Selected portions of Table B are shown below:"
3820 PRINT""
3830 PRINT"                  z          Area Below     Area Above     Ordinate"
3840 PRINT""
3850 PRINT"               -1.25          .1056          .8944          .1826"
3860 PRINT""
3870 PRINT"                         ..............................."
```

```
3880 PRINT""
3890 PRINT"                3.46          .6772          .3228          .3589"
3900 PRINT""
3910 PRINT"                          ..............................."
3920 PRINT""
3930 PRINT"                1.57          .9418          .0582          .1163"
3940 PRINT""
3950 PRINT"                 Type in the total area (for example, .5430) under"
3960 PRINT"                 the unit normal curve lying below -1.25 and above"
3970 INPUT"                 1.57. Then press the enter key.";Q6$
3980 IF I65=0 THEN A65$=Q6$
3990 IF I65=1 THEN B65$=Q6$
4000 PRINT""
4010 IF Q6$ =".1638" OR Q6$="16.38%" THEN 4020 ELSE 4050
4020 R65 = 1
4030 PRINT"                 Your response is correct."
4040 GOTO 4130
4050 IF I65 = 1 GOTO 4100
4060 PRINT"                 Your response is incorrect. Press the enter key for"
4070 PRINT"                 further explanation."
4080 A$ = INKEY$: IF A$="" GOTO 4080
4090 I65 = 1: R=R+1: GOTO 3470
4100 W65 = 1
4110 PRINT"                 Your response is incorrect. The correct answer is"
4120 PRINT"                 .1638."
4130 LOCATE 23,58: PRINT"Press the enter key."
4140 A$ = INKEY$: IF A$ ="" GOTO 4140.
4150 'screen 13
4160 GOSUB 1230
4170 LOCATE 1,1: PRINT"Unit 6:  Screen 13"
4180 LOCATE 16,1
4190 Z1 = -.5
4200 Z2 = 1!
4210 GOSUB 1860
4220 PRINT"   Example 6.  The regions under the unit normal curve below -.50"
4230 PRINT""
4240 PRINT"                and above 1.00 are shaded above. From Table B, the"
4250 PRINT""
4260 PRINT"                total area of these shaded regions = (area below -.50)
"
4270 PRINT""
4280 PRINT"                + (area above 1.00) = .3085 + .1587 = .4672."
4290 LOCATE 23,58:PRINT"Press the enter key."
4300 A$ = INKEY$: IF A$ ="" GOTO 4300
4310 'screen 14
4320 GOSUB 1230
4330 LOCATE 1,1: PRINT"Unit 6:  Screen 14"
4340 LOCATE 16,1
4350 Z1 = -1
4360 Z2 = 1
4370 GOSUB 1860
4380 PRINT"   Exercise 6.  The regions under the unit normal curve below"
4390 PRINT"                -1.00 and above 1.00 are shaded above. Using Table B,
4400 PRINT"                type in the total area (for example, .6452) of these"
4410 INPUT"                shaded regions and press the enter key.";Q6$
4420 IF I66=0 THEN A66$=Q6$
4430 IF I66=1 THEN B66$=Q6$
4440 PRINT""
4450 IF Q6$ =".3174" OR Q6$="31.74%" THEN 4460 ELSE 4490
4460 R66 = 1
4470 PRINT"                 Your response is correct."
4480 GOTO 4570
```

```
4490 IF I66 = 1 GOTO 4540
4500 PRINT"                Your response is incorrect. Press the enter key for"
4510 PRINT"                further explanation."
4520 A$ = INKEY$: IF A$="" GOTO 4520
4530 I66 = 1: R=R+1: GOTO 4150
4540 W66 = 1
4550 PRINT"                Your response is incorrect. The correct answer is"
4560 PRINT"                .3174."
4570 LOCATE 23,58:PRINT"Press the enter key."
4580 A$ = INKEY$: IF A$ ="" GOTO 4580
4590 'screen 16
4600 SCREEN 0,1: COLOR 15,1,15: CLS
4610 LOCATE 1,32:PRINT"Unit 6: Screen 16"
4620 LOCATE 4,1
4630 PRINT"   Example 7.  It is fairly well known that IQ scores from the "
4640 PRINT"                Stanford-Binet Intelligence Test are approximately"
4650 PRINT"                normally distributed with a mean of 100 and a "
4660 PRINT"                standard deviation of 16 for people in its population.
"
4670 PRINT"                Determine the percent of people having an IQ score"
4680 PRINT"                below 84 and above 116."
4690 PRINT""
4700 PRINT"   Solution     We begin by computing the z-scores for 84 and"
4710 PRINT"                116, respectively. The z-score for 84 is z1 = "
4720 PRINT"                (X - m)/s = (84 - 100)/16 = -16/16 = -1. The z-score"
4730 PRINT"                of 116 is z2 = (116 - 100)/16 = 16/16 = 1. The area"
4740 PRINT"                under the unit normal curve below -1 or above 1"
4750 PRINT"                is given by (area below -1.00) + (area above 1.00) ="
4760 PRINT"                .1587 + .1587 = .3174. Therfore, approximately"
4770 PRINT"                .3174 x 100% = 31.74% of people have such scores.
4780 LOCATE 23,58: PRINT"Press the enter key."
4790 A$ = INKEY$: IF A$ = "" GOTO 4790
4800 IF J67 =1 GOTO 8450
4810 IF J62 =1 GOTO 6460
4820 'screen 17
4830 SCREEN 0,1: COLOR 15,1,15: CLS
4840 LOCATE 1,32 :PRINT"Unit 6:  Screen 17"
4850 LOCATE 7,1
4860 PRINT"  Exercise 7.  The Stanford-Binet Intelligence Test scores are"
4870 PRINT"                approximately normally distributed with a mean of"
4880 PRINT"                100 and a standard deviation of 16 for people in"
4890 PRINT"                its population. Determine the percent of people having
 an"
4900 PRINT"                IQ score below 84 and above 132."
4910 PRINT""
4920 PRINT"                                a. 15.87%"
4930 PRINT"                                b. 18.15%"
4940 PRINT"                                c. 48.00%"
4950 PRINT"                                d. 84.00%"
4960 PRINT"                                e. none of the above"
4970 PRINT""
4980 PRINT"                Type in a, b, c, d, or e for your answer and press"
4990 INPUT"                the enter key.";Q6$
5000 IF I67=0 THEN A67$=Q6$
5010 IF I67=1 THEN B67$=Q6$
5020 PRINT""
5030 IF Q6$="a" OR Q6$="A" OR Q6$="b" OR Q6$="B" OR Q6$="c" OR Q6$="C" OR Q6$="d
" OR Q6$ = "D" OR Q6$ = "e" OR Q6$ = "E" THEN 5090 ELSE 5040
5040 LOCATE 19,1
5050 PRINT"
   "
5060 PRINT"
   "
5070 LOCATE 19,1
5080 GOTO 4980
5090 IF Q6$="b" OR Q6$ ="B" THEN 5100 ELSE 5130
5100 R67 = 1
```

```
5110 PRINT"                Your response is correct."
5120 GOTO 5220
5130 IF I67 =1 GOTO 5190
5140 PRINT"                Your response is incorrect. Press the enter key"
5150 PRINT"                for further information."
5160 I67 = 1
5170 A$ = INKEY$: IF A$ = "" GOTO 5170
5180 R=R+1: GOTO 4590
5190 W67 = 1
5200 PRINT"                Your response is incorrect. The correct response"
5210 PRINT"                is b."
5220 LOCATE 23,58: PRINT"Press the enter key."
5230 A$ = INKEY$: IF A$ = "" GOTO 5230
5240 'screen 18
5250 SCREEN 0,1: COLOR 15,1,15: CLS
5260 LOCATE 1,32 : PRINT"Unit 6:  Screen 18"
5270 LOCATE 5,1
5280 PRINT"   Example 8.  If men's heights are normally distributed with a"
5290 PRINT"                mean of 67.02 inches and standard deviation of 2.56"
5300 PRINT"                inches, find the percent of men having a height "
5310 PRINT"                below 61.90 and above 64.46 inches."
5320 PRINT""
5330 PRINT"   Solution     The z-score for 61.90 is z1 = (X - m)/s = "
5340 PRINT"                (61.90 - 67.02)/2.56 = -5.12/2.56 = -2. The z-score"
5350 PRINT"                for 64.46 is z2 = (64.46 - 67.02)/2.56 ="
5360 PRINT"                -2.56/2.56 = -1. The total area under the unit normal"

5370 PRINT"                curve below -2.00 and above -1.00 is given by (area"
5380 PRINT"                below -2.00) + (area above -1.00) = - .0228 + .8413 ="

5390 PRINT"                .8641. Therefore, approximately .8641 x 100% = 86.41%"

5400 PRINT"                of men have such heights."
5410 LOCATE 23,58: PRINT"Press the enter key."
5420 A$ = INKEY$: IF A$ = "" GOTO 5420
5430 IF J610=1 GOTO 9690
5440 IF J65=1 GOTO 7700
5450 'screen 19
5460 SCREEN 0,1: COLOR 15,1,15: CLS
5470 LOCATE 1,32 : PRINT"Unit 6:  Screen 19"
5480 LOCATE 5,1
5490 PRINT"  Exercise 8.  If men's heights are normally distributed with a"
5500 PRINT"                mean of 67.02 inches and standard deviation of 2.56"
5510 PRINT"                inches, what is the percent of men having a height "
5520 PRINT"                below 69.58 and above 72.14 inches?"
5530 PRINT""
5540 PRINT"                                a. 13.59%
5550 PRINT"                                b. 64.46%"
5560 PRINT"                                c. 69.58%"
5570 PRINT"                                d. 86.41%"
5580 PRINT"                                e. 89.23%"
5590 PRINT""
5600 PRINT"                Type a, b, c, d or e for your answer and press the"
5610 INPUT"                enter key.";Q6$
5620 IF I68=0 THEN A68$=Q6$
5630 IF I68=1 THEN B68$=Q6$
5640 PRINT""
5650 IF Q6$="a" OR Q6$="A" OR Q6$="b" OR Q6$="B" OR Q6$="c" OR Q6$="C" OR Q6$="d
" OR Q6$ = "D" OR Q6$ = "e" OR Q6$ ="E" THEN 5710 ELSE 5660
5660 LOCATE 16,1
5670 PRINT"
    "
5680 PRINT"
    "
5690 LOCATE 16,1
```

```
5700 GOTO 5600
5710 IF Q6$="d" OR Q6$ ="D" THEN 5720 ELSE 5750
5720 R68 = 1
5730 PRINT"                Your response is correct."
5740 GOTO 5840
5750 IF I68=1 GOTO 5810
5760 PRINT"                Your response is incorrect. Press the enter key"
5770 PRINT"                for further information."
5780 I68 = 1
5790 A$ = INKEY$: IF A$ = "" GOTO 5790
5800 R=R+1: GOTO 5240
5810 W68 = 1
5820 PRINT"                Your response is incorrect. The correct response"
5830 PRINT"                is d."
5840 LOCATE 23,58: PRINT"Press the enter key."
5850 A$ = INKEY$: IF A$ = "" GOTO 5850
5860 R6 = R61+R62+R63+R64+R65+R66+R67+R68
5870 W6 = W61+W62+W63+W64+W65+W66+W67+W68
5880 FIRST6 = R6+W6-R
5890 T6$ = TIME$
5900 TIME$ = "00:00:00"
5910 'screen 20
5920 SCREEN 0,1: COLOR 15,1,15: CLS
5930 LOCATE 1,32: PRINT"Unit 6:  Screen 20"
5940 LOCATE 7,1
5950 PRINT"             This concludes the discussion of Unit 6: The Total Area"

5960 PRINT""
5970 PRINT"        Under a Normal Curve Lying Below One Observation and Above a"

5980 PRINT""
5990 PRINT"        Second Observation. You worked correctly";FIRST6"exercise(s)"

6000 PRINT""
6010 PRINT"        out of 8. There are 10 review problems for this unit. Would"
6020 PRINT""
6030 PRINT"        you like to work some review problems? Type y if yes or n"
6040 PRINT""
6050 INPUT"        n if no and press the enter key.";Q6$
6060 IF Q6$ = "y" OR Q6$ = "Y" OR Q6$ = "n" OR Q6$ = "N" GOTO 6070 ELSE LOCATE 1
7,1: PRINT"
      ": LOCATE 17,1: GOTO 6050
6070 IF Q6$ = "y" OR Q6$ = "Y" GOTO 6080 ELSE 10100
6080 'screen 21
6090 SCREEN 0,1: COLOR 15,1,15: CLS
6100 LOCATE 1,32: PRINT"Unit 6:  Screen 21"
6110 LOCATE 5,1: K6=1
6120 PRINT"      Problem 1.  What is the area under the unit normal curve lying"

6130 PRINT""
6140 PRINT"                 below z = -1.25 and above z = 2.00? Type in your "
6150 PRINT""
6160 PRINT"                 answer (for example, .6532) and press the enter"
6170 PRINT""
6180 INPUT"                 key.";Q6$
6190 IF J61=0 THEN C61$=Q6$
6200 IF J61=1 THEN D61$=Q6$
6210 PRINT""
6220 IF Q6$ = ".1284" THEN 6230 ELSE 6260
6230 P61 = 1
6240 PRINT"                 Your response is correct."
6250 GOTO 6360
6260 IF J61 = 1 GOTO 6320
6270 PRINT"                 Your response is incorrect. Press the enter key"
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```
6280 PRINT""
6290 PRINT"                    for further explanation."
6300 AS=INKEYS: IF AS="" GOTO 6300
6310 J61 = 1: P=P+1: GOTO 540
6320 Q61 = 1
6330 PRINT"                    Your response is incorrect. The correct answer"
6340 PRINT""
6350 PRINT"                    is .1284."
6360 LOCATE 23,58: PRINT"Press the enter key."
6370 AS=INKEYS: IF AS="" GOTO 6370
6380 GOSUB 6400
6390 IF Q6S = "y" OR Q6S ="Y" GOTO 6460 ELSE 10100
6400 CLS: LOCATE 5,1
6410 PRINT"              Would you like to work another review problem? Type"
6420 PRINT""
6430 INPUT"        y if yes or n if no and press the enter key.";Q6S
6440 IF Q6S = "y" OR Q6S = "Y" OR Q6S = "n" OR Q6S = "N" THEN GOTO 6450 ELSE LOC
ATE 7,1: PRINT"
          ": LOCATE 7,1: GOTO 6430
6450 RETURN
6460 'screen 22
6470 SCREEN 0,1: COLOR 15,1,15: CLS
6480 LOCATE 1,32: PRINT" Unit 6:  Screen 22"
6490 LOCATE 5,1: K6=2
6500 PRINT"      Problem 2.  A normal distribution has a mean of 80 and a"
6510 PRINT""
6520 PRINT"                  standard deviation of 10. What is the percent of"
6530 PRINT""
6540 PRINT"                  scores lying below 70 and above 90?"
6550 PRINT""
6560 PRINT"                           a. 15.87%"
6570 PRINT"                           b. 31.74%"
6580 PRINT"                           c. 68.26%"
6590 PRINT"                           d. 70.00%"
6600 PRINT"                           e. 80.00%"
6610 PRINT""
6620 PRINT"                   Type in a, b, c, d, or e for your answer and press
"
6630 PRINT""
6640 INPUT"                   the enter key.";Q6S
6650 IF J62=0 THEN C62S=Q6S
6660 IF J62=1 THEN D62S=Q6S
6670 PRINT""
6680 IF Q6S = "a" OR Q6S ="A" OR Q6S ="b" OR Q6S="B" OR Q6S="c" OR Q6S ="C" OR Q
6S="d" OR Q6S="D" OR Q6S ="e" OR Q6S ="E" THEN 6750 ELSE 6690
6690 LOCATE 17,1
6700 PRINT"
   "
6710 PRINT"
   "
6720 PRINT"
   "
6730 LOCATE 17,1
6740 GOTO 6620
6750 IF Q6S = "b" OR Q6S = "B" THEN 6760 ELSE 6790
6760 P62=1
6770 PRINT"                    Your response is correct."
6780 GOTO 6870
6790 IF J62 = 1 GOTO 6850 ELSE 6800
6800 PRINT"                    Your response is incorrect. Press the enter key fo
r"
6810 PRINT""
6820 PRINT"                    further explanation."
6830 AS = INKEYS: IF AS = "" GOTO 6830
6840 J62 = 1: P=P+1: GOTO 4590
```

```
6850 Q62 = 1
6860 PRINT"                    Your response is incorrect. The correct answer is
b."
6870 LOCATE 23,59: PRINT"Press the enter key."
6880 AS = INKEYS: IF AS = "" GOTO 6880
6890 GOSUB 6400
6900 IF Q6S = "y" OR Q6S = "Y" GOTO 6910 ELSE 10100
6910 'screen 23
6920 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32: PRINT"Unit 6:  Screen 23"
6930 LOCATE 5,1: K6=3
6940 PRINT"   Problem 3.  What is the area under the unit normal curve lying"
6950 PRINT""
6960 PRINT"                below z = -1.15 and above z = -0.19?"
6970 PRINT""
6980 PRINT"                Type in your answer (for example, .6532) and press"
6990 PRINT""
7000 INPUT"                the enter key."; Q6S
7010 IF J63=0 THEN C63S=Q6S
7020 IF J63=1 THEN D63S=Q6S
7030 PRINT""
7040 IF Q6S =".7004" OR Q6S="70.04%" THEN 7050 ELSE 7080
7050 P63 = 1
7060 PRINT"                Your response is correct."
7070 GOTO 7180
7080 IF J63 = 1 GOTO 7140
7090 PRINT"                Your response is incorrect. Press the enter key for"
7100 PRINT""
7110 PRINT"                further explanation."
7120 AS = INKEYS: IF AS="" GOTO 7120
7130 J63 = 1: P=P+1: GOTO 2330
7140 Q63 = 1
7150 PRINT"                Your response is incorrect. The correct answer is"
7160 PRINT""
7170 PRINT"                .7004."
7180 LOCATE 23,58: PRINT"Press the enter key."
7190 AS = INKEYS: IF AS ="" GOTO 7190.
7200 GOSUB 6400
7210 IF Q6S = "y" OR Q6S = "Y" GOTO 7220 ELSE 10100
7220 'screen 24
7230 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32: PRINT"Unit 6:  Screen 24"
7240 LOCATE 5,1: K6=4
7250 PRINT"   Problem 4.  The total area under the unit normal curve lying"
7260 PRINT""
7270 PRINT"                below z1 and above z2 is .3476. If z2 = 1.10, what"
7280 PRINT""
7290 PRINT"                is the value of z1?"
7300 PRINT""
7310 PRINT"                Type in your answer (for example, 1.23 or -2.23)"
7320 PRINT""
7330 INPUT"                and press the enter key.";Q6S
7340 IF J64=0 THEN C64S=Q6S
7350 IF J64=1 THEN D64S=Q6S
7360 PRINT""
7370 IF Q6S ="-0.8" OR Q6S="-0.80" OR Q6S = "-.8" OR Q6S = "-.80" THEN 7380 ELSE
 7410
7380 P64 = 1
7390 PRINT"                Your response is correct."
7400 GOTO 7510
7410 IF J64 = 1 GOTO 7470
7420 PRINT"                Your response is incorrect. Press the enter key for"
7430 PRINT""
7440 PRINT"                further explanation."
7450 AS = INKEYS: IF AS="" GOTO 7450
7460 J64 = 1: P=P+1: GOTO 7560
7470 Q64 = 1
```

```
7480 PRINT"                Your response is incorrect. The correct answer is"
7490 PRINT""
7500 PRINT"                -0.80."
7510 LOCATE 23,58: PRINT"Press the enter key."
7520 A$ = INKEYS: IF A$ ="" GOTO 7520.
7530 GOSUB 6400
7540 IF Q6$ = "y" OR Q6$ = "Y" GOTO 7700 ELSE 10100
7550 GOTO 7700
7560 'screen 24a
7570 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32:PRINT"Unit 6:  Screen 24a"
7580 LOCATE 5,1
7590 PRINT"             Since the total area of the shaded regions equal .3476 a
nd "
7600 PRINT""
7610 PRINT"         the area above 1.10 equals .1357, the area below z1 must equa
l"
7620 PRINT""
7630 PRINT"         to .3476 - .1357 = .2119. Now use Table B to determine the va
lue"
7640 PRINT""
7650 PRINT"         of z1."
7660 LOCATE 23,58
7670 PRINT"Press the enter key."
7680 A$ = INKEYS: IF A$ = "" GOTO 7680
7690 IF J64=1 GOTO 7220
7700 'screen 25
7710 SCREEN 0,1: COLOR 15,1,15: CLS
7720 LOCATE 1,32 : PRINT"Unit 6:  Screen 25"
7730 LOCATE 5,1: K6=5
7740 PRINT"   Problem 5.  If men's heights are normally distributed with a"
7750 PRINT"               mean of 67.02 inches and standard deviation of 2.56"
7760 PRINT"               inches, what is the percent of men having a height "
7770 PRINT"               below 64.46 and above 72.14 inches?"
7780 PRINT""
7790 PRINT"                                   a.  7.68%
7800 PRINT"                                   b. 17.08%"
7810 PRINT"                                   c. 18.15%"
7820 PRINT"                                   d. 64.46%"
7830 PRINT"                                   e. 81.85%"
7840 PRINT""
7850 PRINT"               Type a, b, c, d or e for your answer and press the"
7860 INPUT"               enter key.";Q6$
7870 IF J65=0 THEN C65$=Q6$
7880 IF J65=1 THEN D65$=Q6$
7890 PRINT""
7900 IF Q6$="a" OR Q6$="A" OR Q6$="b" OR Q6$="B" OR Q6$="c" OR Q6$="C" OR Q6$="d
" OR Q6$ = "D" OR Q6$ = "e" OR Q6$ ="E" THEN 7960 ELSE 7910
7910 LOCATE 16,1
7920 PRINT"
   "
7930 PRINT"
   "
7940 LOCATE 16,1
7950 GOTO 7850
7960 IF Q6$="c" OR Q6$ ="C" THEN 7970 ELSE 8000
7970 P65 = 1
7980 PRINT"               Your response is correct."
7990 GOTO 8090
8000 IF J65=1 GOTO 8060
8010 PRINT"               Your response is incorrect. Press the enter key"
8020 PRINT"               for further information."
8030 J65 = 1
8040 A$ = INKEYS: IF A$ = "" GOTO 8040
8050 P=P+1: GOTO 5240
8060 Q65 = 1
8070 PRINT"               Your response is incorrect. The correct response"
8080 PRINT"               is c."
```

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8090 LOCATE 23,58: PRINT"Press the enter key."
8100 A$ = INKEY$: IF A$ = "" GOTO 8100
8110 GOSUB 6400
8120 IF Q6$ = "y" OR Q6$ = "Y" GOTO 8130 ELSE 10100
8130 'screen 26
8140 SCREEN 0,1: COLOR 15,1,15: CLS
8150 LOCATE 1,32: PRINT"Unit 6:  Screen 26"
8160 LOCATE 5,1: K6=6
8170 PRINT"      Problem 6.  What is the area under the unit normal curve lying"

8180 PRINT""
8190 PRINT"                  below z = -2.81 and above z = -0.50? Type in your "

8200 PRINT""
8210 PRINT"                  answer (for example, .6532) and press the enter"
8220 PRINT""
8230 INPUT"                  key.";Q6$
8240 IF J66=0 THEN C66$=Q6$
8250 IF J66=1 THEN D66$=Q6$
8260 PRINT""
8270 IF Q6$ = ".6940" OR Q6$ = ".694" THEN 8280 ELSE 8310
8280 P66 = 1
8290 PRINT"                  Your response is correct."
8300 GOTO 8410
8310 IF J66 = 1 GOTO 8370
8320 PRINT"                  Your response is incorrect. Press the enter key"
8330 PRINT""
8340 PRINT"                  for further explanation."
8350 A$=INKEY$: IF A$="" GOTO 8350
8360 J66 = 1: P=P+1: GOTO 540
8370 Q66 = 1
8380 PRINT"                  Your response is incorrect. The correct answer"
8390 PRINT""
8400 PRINT"                  is .6940."
8410 LOCATE 23,58: PRINT"Press the enter key."
8420 A$=INKEY$: IF A$="" GOTO 8420
8430 GOSUB 6400
8440 IF Q6$ = "y" OR Q6$ = "Y" GOTO 8450 ELSE 10100
8450 'screen 27
8460 SCREEN 0,1: COLOR 15,1,15: CLS
8470 LOCATE 1,32: PRINT" Unit 6:  Screen 27"
8480 LOCATE 5,1: K6=7
8490 PRINT"      Problem 7.  A normal distribution has a mean of 78 and a"
8500 PRINT""
8510 PRINT"                  standard deviation of 6. What is the percent of"
8520 PRINT""
8530 PRINT"                  scores lying below 67 and above 81?"
8540 PRINT""
8550 PRINT"                          a.  4.46%"
8560 PRINT"                          b. 34.23%"
8570 PRINT"                          c. 65.77%"
8580 PRINT"                          d. 95.56%"
8590 PRINT"                          e. none of the above"
8600 PRINT""
8610 PRINT"                  Type in a, b, c, d, or e for your answer and press
"
8620 PRINT""
8630 INPUT"                  the enter key.";Q6$
8640 IF J67=0 THEN C67$=Q6$
8650 IF J67=1 THEN D67$=Q6$
8660 PRINT""
8670 IF Q6$ = "a" OR Q6$ ="A" OR Q6$ ="b" OR Q6$="B" OR Q6$="c" OR Q6$ ="C" OR Q
6$="d" OR Q6$="D" OR Q6$ ="e" OR Q6$ ="E" THEN 8740 ELSE 8680
8680 LOCATE 17,1
8690 PRINT"
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```
    "
 8700 PRINT"
    "
 8710 PRINT"
    "
 8720 LOCATE 17,1
 8730 GOTO 8610
 8740 IF Q6$ = "b" OR Q6$ = "B" THEN 8750 ELSE 8780
 8750 P67=1
 8760 PRINT"                          Your response is correct."
 8770 GOTO 8860
 8780 IF J67 = 1 GOTO 8840 ELSE 8790
 8790 PRINT"                          Your response is incorrect. Press the enter key fo
r"
 8800 PRINT""
 8810 PRINT"                          further explanation."
 8820 A$ = INKEY$: IF A$ = "" GOTO 8820
 8830 J67 = 1: P=P+1: GOTO 4590
 8840 Q67 = 1
 8850 PRINT"                          Your response is incorrect. The correct answer is
b."
 8860 LOCATE 23,58: PRINT"Press the enter key."
 8870 A$ = INKEY$: IF A$ = "" GOTO 8870
 8880 GOSUB 6400
 8890 IF Q6$ = "y" OR Q6$ = "Y" GOTO 8900 ELSE 10100
 8900 'screen 28
 8910 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32: PRINT"Unit 6:  Screen 28"
 8920 LOCATE 5,1: K6=8
 8930 PRINT"    Problem 8.  What is the area under the unit normal curve lying"
 8940 PRINT""
 8950 PRINT"                          below z = -1.69 and above z = 0?"
 8960 PRINT""
 8970 PRINT"                          Type in your answer (for example, .6532) and press"
 8980 PRINT""
 8990 INPUT"                          the enter key."; Q6$
 9000 IF J68=0 THEN C68$=Q6$
 9010 IF J68=1 THEN D68$=Q6$
 9020 PRINT""
 9030 IF Q6$ =".5455" OR Q6$="54.55%" THEN 9040 ELSE 9070
 9040 P68 = 1
 9050 PRINT"                          Your response is correct."
 9060 GOTO 9170
 9070 IF J68 = 1 GOTO 9130
 9080 PRINT"                          Your response is incorrect. Press the enter key for"
 9090 PRINT""
 9100 PRINT"                          further explanation."
 9110 A$ = INKEY$: IF A$="" GOTO 9110
 9120 J68 = 1: P=P+1: GOTO 2330
 9130 Q68 = 1
  140 PRINT"
 9150 PRINT""                         Your response is incorrect. The correct answer is"
 9160 PRINT"                          .5455."
 9170 LOCATE 23,58: PRINT"Press the enter key."
 9180 A$ = INKEY$: IF A$ ="" GOTO 9180.
 9190 GOSUB 6400
 9200 IF Q6$ = "y" OR Q6$ = "Y" GOTO 9210 ELSE 10100
 9210 'screen 29
 9220 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32: PRINT"Unit 6:  Screen 29"
 9230 LOCATE 5,1: K6=9
 9240 PRINT"    Problem 9.  The total area under the unit normal curve lying"
 9250 PRINT""
 9260 PRINT"                          below z1 and above z2 is .9688. If z1 = -2.41, what"
 9270 PRINT""
 9280 PRINT"                          is the value of z2?"
 9290 PRINT""
 9300 PRINT"
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9310 PRINT""
9320 INPUT"                and press the enter key.";Q6$
9330 IF J69=0 THEN C69$=Q6$
9340 IF J69=1 THEN D69$=Q6$
9350 PRINT""
9360 IF Q6$ ="-1.76" THEN 9370 ELSE 9400
9370 P69 = 1
9380 PRINT"                Your response is correct."
9390 GOTO 9500
9400 IF J69 = 1 GOTO 9460
9410 PRINT"                Your response is incorrect. Press the enter key for"
9420 PRINT""
9430 PRINT"                further explanation."
9440 A$ = INKEY$: IF A$="" GOTO 9440
9450 J69 = 1: P=P+1: GOTO 9550
9460 Q69 = 1
9470 PRINT"                Your response is incorrect. The correct answer is"
9480 PRINT""
9490 PRINT"                -1.76."
9500 LOCATE 23,58: PRINT"Press the enter key."
9510 A$ = INKEY$: IF A$ ="" GOTO 9510.
9520 GOSUB 6400
9530 IF Q6$ = "y" OR Q6$ = "Y" GOTO 9690 ELSE 10100
9540 GOTO 9690
9550 'screen 29a
9560 SCREEN 0,1: COLOR 15,1,15: CLS: LOCATE 1,32:PRINT"Unit 6:  Screen 29a"
9570 LOCATE 5,1
9580 PRINT"             Since the total area of the shaded regions equal .9688 a
nd "
9590 PRINT""
9600 PRINT"        the area below -2.41 equals .0080, the area above z2 must equ
al"
9610 PRINT""
9620 PRINT"        to .9688 - .0080 = .9608. Now use Table B to determine the va
lue"
9630 PRINT""
9640 PRINT"        of z2."
9650 LOCATE 23,58
9660 PRINT"Press the enter key."
9670 A$ = INKEY$: IF A$ = "" GOTO 9670
9680 IF J69=1 GOTO 9210
9690 'screen 30
9700 SCREEN 0,1: COLOR 15,1,15: CLS
9710 LOCATE 1,32 : PRINT"Unit 6:  Screen 30"
9720 LOCATE 5,1: K6=10
9730 PRINT"   Problem 10. If men's heights are normally distributed with a"
9740 PRINT"                mean of 67.02 inches and standard deviation of 2.56"
9750 PRINT"                inches, what is the percent of men having a height "
9760 PRINT"                below 63.18 and above 74.70 inches?"
9770 PRINT""
9780 PRINT"                                    a.  6.81%
9790 PRINT"                                    b. 34.88%"
9800 PRINT"                                    c. 65.12%"
9810 PRINT"                                    d. 93.19%"
9820 PRINT"                                    e. none of the above"
9830 PRINT""
9840 PRINT"                Type a, b, c, d or e for your answer and press the"
9850 INPUT"                enter key.";Q6$
9860 IF J610=0 THEN C610$=Q6$
9870 IF J610=1 THEN D610$=Q6$
9880 PRINT""
9890 IF Q6$="a" OR Q6$="A" OR Q6$="b" OR Q6$="B" OR Q6$="c" OR Q6$="C" OR Q6$="d
" OR Q6$ = "D" OR Q6$ = "e" OR Q6$ ="E" THEN 9950 ELSE 9900
9900 LOCATE 16,1
9910 PRINT"
   "
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9920 PRINT"
    "
9930 LOCATE 16,1
9940 GOTO 9840
9950 IF Q6$="a" OR Q6$ ="A" THEN 9960 ELSE 9990
9960 P610 = 1
9970 PRINT"                Your response is correct."
9980 GOTO 10080
9990 IF J610=1 GOTO 10050
10000 PRINT"               Your response is incorrect. Press the enter key"
10010 PRINT"               for further information."
10020 J610 = 1
10030 A$ = INKEY$: IF A$ = "" GOTO 10030
10040 P=P+1: GOTO 5240
10050 Q610 = 1
10060 PRINT"               Your response is incorrect. The correct response"
10070 PRINT"               is a."
10080 LOCATE 23,58: PRINT"Press the enter key."
10090 A$ = INKEY$: IF A$ = "" GOTO 10090
10100 'screen 45
10110 CLS: LOCATE 1,32: PRINT"Unit 6:  Screen 26"
10120 LOCATE 8,1
10130 PRINT"                Turn the printer on and press the enter key."
10140 A$ = INKEY$: IF A$ = "" GOTO 10140
10150 IF K6 = 0 GOTO 10310
10160 P6 = P61+P62+P63+P64+P65+P66+P67+P68+P69+P610
10170 Q6 = Q61+Q62+Q63+Q64+Q65+Q66+Q67+Q68+Q69+Q610
10180 SEC6 = P6+Q6-P
10190 PRINT""
10200 PRINT"                The number of correct exercises is";FIRST6
10210 PRINT""
10220 PRINT"                The number of incorrect exercises is";8-FIRST6"
10230 PRINT""
10240 PRINT"                The number of correct exercises after remediation i
s";R-W6
10250 PRINT""
10260 PRINT"                The number of correct problems is";SEC6
10270 PRINT""
10280 PRINT"                The number of incorrect problems is";K6-SEC6"
10290 PRINT""
10300 PRINT"                The number of correct problems after remediation is
";P-Q6
10310 LPRINT"                                   Unit 6
10320 LPRINT""
10330 LPRINT""
10340 LPRINT"                ";NAM$,NO$,T6$
10350 LPRINT""
10360 LPRINT"                The number of correct exercises is";FIRST6
10370 LPRINT""
10380 LPRINT"                The number of incorrect exercises is";8-FIRST6"
10390 LPRINT""
10400 LPRINT"                The number of correct exercises after remediation
is";R-W6
10410 IF K6=0 GOTO 10480
10420 LPRINT"                                ";TIME$
10430 LPRINT"                The number of correct problems is";SEC6
10440 LPRINT""
10450 LPRINT"                The number of correct problems is";K6-SEC6"
10460 LPRINT""
10470 LPRINT"                The number of correct problems after remediation i
s";P-Q6
10480 LPRINT""
10490 LPRINT""
10500 LPRINT""
10510 IF I61=1 GOTO 10540
10520 LPRINT"   Exercise 1 response was correct.",A61$:GOTO  9560
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10530 LPRINT""
10540 LPRINT"   Exercise 1 response was incorrect.",A61$,B61$
10550 LPRINT""
10560 LPRINT"": IF I62=1 GOTO 10590
10570 LPRINT"   Exercise 2 response was correct.",A62$:GOTO 10610
10580 LPRINT""
10590 LPRINT"   Exercise 2 response was incorrect.",A62$,B62$
10600 LPRINT""
10610 LPRINT"": IF I63=1 GOTO 10640
10620 LPRINT"   Exercise 3 response was correct.",A63$:GOTO 10660
10630 LPRINT""
10640 LPRINT"   Exercise 3 response was incorrect.",A63$,B63$
10650 LPRINT""
10660 LPRINT"": IF I64=1 GOTO 10690
10670 LPRINT"   Exercise 4 response was correct.",A64$:GOTO 10710
10680 LPRINT""
10690 LPRINT"   Exercise 4 response was incorrect.",A64$,B64$
10700 LPRINT""
10710 LPRINT"": IF I65=1 GOTO 10740
10720 LPRINT"   Exercise 5 response was correct.",A65$: GOTO 10760
10730 LPRINT""
10740 LPRINT"   Exercise 5 response was incorrect.",A65$,B65$
10750 LPRINT""
10760 LPRINT"": IF I66=1 GOTO 10790
10770 LPRINT"   Exercise 6 response was correct.",A66$: GOTO 10810
10780 LPRINT""
10790 LPRINT"   Exercise 6 response was incorrect.",A66$,B66$
10800 LPRINT""
10810 LPRINT"": IF I67=1 GOTO 10840
10820 LPRINT"   Exercise 7 response was correct.",A67$: GOTO 10860
10830 LPRINT""
10840 LPRINT"   Exercise 7 response was incorrect.",A67$,B67$
10850 LPRINT""
10860 LPRINT"": IF I68=1 GOTO 10890
10870 LPRINT"   Exercise 8 response was correct.",A68$:GOTO 10910
10880 LPRINT""
10890 LPRINT"   Exercise 8 response was incorrect.",A68$,B68$
10900 LPRINT""
10910 IF K6<1 GOTO 11510
10920 LPRINT"": IF J61=1 GOTO 10950
10930 LPRINT"   Problem 1 response was correct.",C61$: GOTO 10970
10940 LPRINT""
10950 LPRINT"   Problem 1 response was incorrect.",C61$,D61$
10960 LPRINT""
10970 IF K6<2 GOTO 11510
10980 LPRINT"": IF J62=1 GOTO 11010
10990 LPRINT"   Problem 2 response was correct.",C62$: GOTO 11030
11000 LPRINT""
11010 LPRINT"   Problem 2 response was incorrect.",C62$,D62$
11020 LPPINT""
11030 IF K6<3 GOTO 11510
11040 LPRINT"": IF J63=1 GOTO 11070
11050 LPRINT"   Problem 3 response was correct.",C63$: GOTO 11090
11060 LPRINT""
11070 LPRINT"   Problem 3 response was incorrect.",C63$,D63$
11080 LPPINT""
11090 IF K6<4 GOTO 11510
11100 LPRINT"": IF J64=1 GOTO 11130
11110 LPRINT"   Problem 4 response was correct.",C64$: GOTO 11150
11120 LPRINT""
11130 LPRINT"   Problem 4 response was incorrect.",C64$,D64$
11140 LPRINT""
11150 IF K6<5 GOTO 11510
11160 LPRINT"": IF J65=1 GOTO 11190
11170 LPRINT"   Problem 5 response was correct.",C65$: GOTO 11210
11180 LPRINT""
```

```
11190 LPRINT"   Problem 5 response was incorrect.",C65$,D65$
11200 LPRINT""
11210 IF K6<6 GOTO 11510
11220 LPRINT"": IF J66=1 GOTO 11250
11230 LPRINT"   Problem 6 response was correct.",C66$: GOTO 11270
11240 LPRINT""
11250 LPRINT"   Problem 6 response was incorrect.",C66$,D66$
11260 LPRINT""
11270 IF K6<7 GOTO 11510
11280 LPRINT"": IF J67=1 GOTO 11310
11290 LPRINT"   Problem 7 response was correct.",C67$: GOTO 11330
11300 LPRINT""
11310 LPRINT"   Problem 7 response was incorrect.",C67$,D67$
11320 LPRINT""
11330 IF K6<8 GOTO 11270
11340 LPRINT"": IF J68=1 GOTO 11370
11350 LPRINT"   Problem 8 response was correct.",C68$: GOTO 11390
11360 LPRINT""
11370 LPRINT"   Problem 8 response was incorrect.",C68$,D68$
11380 LPRINT""
11390 IF K6<9 GOTO 11510
11400 LPRINT"": IF J69=1 GOTO 11430
11410 LPRINT"   Problem 9 response was correct.",C69$: GOTO 11450
11420 LPRINT""
11430 LPRINT"   Problem 9 response was incorrect.",C69$,D69$
11440 LPRINT""
11450 IF K6<10 GOTO 11510
11460 LPRINT"": IF J610=1 GOTO 11490
11470 LPRINT"   Problem 10 response was correct.",C610$: GOTO 11510
11480 LPRINT""
11490 LPRINT"   Problem 10 response was incorrect.",C610$,D610$
11500 LPRINT""
11510 CLS: CHAIN "unit7"
```

```
10 COMMON NAMS,NOS
20 ' Unit 7:  Standard Scores
30 R=0
40 SCREEN 0,1: COLOR 15,1,6: CLS
50 LOCATE 10,1
60 PRINT"
70 PRINT""                                          Unit 7"
80 PRINT"                                        Standard Scores"
90 LOCATE 23,58: PRINT"Press the enter key."
100 AS = INKEYS: IF AS = "" GOTO 100
110 TIMES = "00:00:00"
120 SCREEN 0,1 : COLOR 15,9,6:CLS
130 LOCATE 1,32: PRINT"Unit 7:  Screen ii"
140 LOCATE 3,1
150 PRINT"          Objectives:  At the end of Unit 7:  Standard Scores, the"
160 PRINT""
170 PRINT"                       student should be able to:"
180 PRINT""
190 PRINT"                       1. Identify the distinguishing characteristics"
200 PRINT""
210 PRINT"                          of a standard score scale."
220 PRINT""
230 PRINT"                       2. Transform a raw-score to its equivalent "
240 PRINT""
250 PRINT"                          T-score."
260 PRINT""
270 PRINT"                       3. Determine the percentile rank of a given"
280 PRINT""
290 PRINT"                          T-score."
300 PRINT""
310 PRINT"                       4. Transform a z-score to its corresponding"
320 PRINT""
330 PRINT"                          standard score on a given standard score scal
e."
340 LOCATE 23,58: PRINT"Press the enter key."
350 AS = INKEYS: IF AS="" GOTO 350
360 ' screen 1
370 SCREEN 0,1: COLOR 15,1,6: CLS
380 LOCATE 1,32: PRINT"Unit 7:  Screen 1"
390 LOCATE 5,1
400 PRINT"              Observations or raw-scores are often transformed "
410 PRINT""
420 PRINT"         to standard scores to facilitate interpretation. With"
430 PRINT""
440 PRINT"         standard scores, the mean and standard deviation are fixed."
450 PRINT""
460 PRINT"         Regardless of what the raw-score mean and standard deviation"
470 PRINT""
480 PRINT"         happen to be, they are converted to a fixed mean and a fixed"
490 PRINT""
500 PRINT"         standard deviation. Since the raw-scores are then expressed"
510 PRINT""
520 PRINT"         in terms of a standard score scale, they are called standard"
530 PRINT""
540 PRINT"         scores."
550 PRINT""
560 PRINT"              By using a standard score scale, performance on all"
570 PRINT""
580 PPINT"         variables can be expressed and then compared.
590 COLOR 15,6,6
600 LOCATE 7,57: PRINT" With "
610 LOCATE 9,9
620 PRINT"standard scores, the mean and standard deviation are fixed."
630 COLOR 15,1,6
640 LOCATE 23,58: PRINT"Press the enter key."
```

```
650 AS=INKEYS: IF AS = "" GOTO 650
660 IF J76 = 1 GOTO 9060
670 IF J71 = 1 GOTO 6740
680 'screen 2
690 SCREEN 0,1: COLOR 15,1,6: CLS
730 LOCATE 1,32: PRINT"Unit 7:  Screen 2"
710 LOCATE 5,1
720 PRINT"          z-Score Scale  -----+-----+-----+-----+-----+-----+-----+----
-"
730 PRINT"                              -3    -2    -1     0    +1    +2    +3"
740 PRINT""
750 PRINT""
760 PRINT""
770 PRINT"               The z-score scale shown above, with mean = 0 and"
780 PRINT""
790 PRINT"          standard deviation = 1, is considered to be the most widely
800 PRINT""
810 PRINT"          used standard score scale in statistics. However, the z-scor
e"
820 PRINT""
830 PRINT"          scale has the disadvantages of involving negative numbers"
840 PRINT""
850 PRINT"          and/or decimals."
860 LOCATE 6,48: COLOR 12,1,6: PRINT"0" : COLOR 15,1,6
870 LOCATE 23,58:PRINT"Press the enter key."
880 AS=INKEYS: IF AS="" GOTO 880
890 'screen 3
900 SCREEN 0,1: COLOR 15,1,6: CLS
910 LOCATE 1,32: PRINT"Unit 7:  Screen 3"
920 LOCATE 5,1
930 PRINT"     T-Score Scale  -----+-----+-----+-----+-----+-----+-----+-----+--
---"
940 PRINT"                           10    20    30    40    50    60    70    80
950 PRINT""
960 PRINT""
970 PRINT"                  One of the most commonly used standard-score scales
for"
980 PRINT""
990 PRINT"             reporting performance, such as in standardized educationa
l"
1000 PRINT""
1010 PRINT"             and psychological tests, is the T-score scale. The T-sco
re"
1020 PRINT""
1030 PRINT"             scale has a mean of 50 and a standard deviation of 10. T
he T-"
1040 PRINT""
1050 PRINT"             score scale is shown above. T-scores are usually rounded
"
1060 PRINT""
1070 PRINT"             to two figures. For example, a T-score of 62.3 is rounde
d"
1080 PRINT""
1090 PRINT"             to 62 and a T-score of 62.6 is rounded to 63."
1100 COLOR 15,6,6
1110 LOCATE 13,60
1120 PRINT" The T-score "
1130 LOCATE 15,14
1140 PRINT"scale has a mean of 50 and a standard deviation of 10."
1150 LOCATE 6,50: COLOR 12,1,6: PRINT"50"
1160 COLOR 15,1,6
1170 LOCATE 23,58:PRINT"Press the enter key."
1180 AS=INKEYS: IF AS = "" GOTO 1180
1190 IF J72=1 GOTO 7270
1200 'screen 4
```

```
1210 SCREEN 0,1: COLOR 15,1,6: CLS
1220 LOCATE 1,32: PRINT"Unit 7: Screen 4"
1230 LOCATE 5,1
1240 PRINT"                    z-scale  -----+-----+-----+-----+-----+-----+-----
+------"
1250 PRINT"                                  -3    -2    -1     0    +1    +2    +
3"
1260 LOCATE 9,1
1270 PRINT"                    T-scale  -----+-----+-----+-----+-----+-----+-----
+------"
1280 PRINT"                                  20    30    40    50    60    70
80
1290 PRINT""
1300 PRINT""
1310 PRINT"                       A z-score can be readily converted to a T-scor
e"
1320 PRINT""
1330 PRINT"                   by using the formula:  T = 50 + 10z."
1340 PRINT""
1350 PRINT"      Example 1.  If the z-score = +1, what is the corresponding"
1360 PRINT""
1370 PRINT"                   T-score?
1380 PRINT""
1390 PRINT"       Solution.  T = 50 + 10z = 50 + 10(+1) = 50 + 10 = 60."
1400 COLOR 15,6,6
1410 LOCATE 15,41: PRINT" T = 50 + 10z."
1420 COLOR 15,1,6
1430 LOCATE 6,52: COLOR 12,1,6: PRINT"0": LOCATE 10,52: PRINT"50": COLOR 15,1,6
1440 LOCATE 2?,58: PRINT"Press the enter key."
1450 AS = INKEYS: IF AS="" GOTO 1440
1460 'screen 5
1470 SCREEN 0,1: COLOR 15,1,6: CLS
1480 LOCATE 1,32: PRINT"Unit 7: Screen 5"
1490 LOCATE 5,1
1500 PRINT"                    z-scale  -----+-----+-----+-----+-----+-----+-----+
-----"
1510 PRINT"                                 -3    -2    -1     0    +1    +2    +3
"
1520 LOCATE 9,1
1530 PRINT"                    T-scale  -----+-----+-----+-----+-----+-----+-----+
-----"
1540 PRINT"                                  20    30    40    50    60    70    8
0"
1550 LOCATE 6,51: COLOR 12,1,6: PRINT"0": LOCATE 10,51: PRINT"50": COLOR 15,1,6
1560 PRINT""
1570 PRINT""
1580 PRINT"     Exercise 1.  If the z-score = +2.7, what is the corresponding"
1590 PRINT""
1600 PRINT"                   T-score?
1610 PRINT""
1620 INPUT"                   Type in your answer and press the enter key.";Q7$
1630 PRINT""
1640 IF I71=0 THEN A71$=Q7$
1650 IF I71=1 THEN B71$=Q7$
1660 IF Q7$="77" THEN 1670 ELSE 1700
1670 R71=1
1680 PRINT"                   Your response is correct."
1690 GOTO 1800
1700 IF I71=1 GOTO 1760
1710 PRINT"                   Your response is incorrect. Press the enter key"
1720 PRINT""
1730 PRINT"                   for further explanation."
1740 AS=INKEYS: IF AS="" GOTO 1740
1750 I71=1: R=R+1: GOTO 1200
1760 W71=1
1770 PRINT"                   Your response is incorrect. The correct answer is"
1780 PRINT""
```

```
1790 PRINT"                    77."
1800 LOCATE 23,58: PRINT"Press the enter key."
1810 A$=INKEY$: IF A$="" GOTO 1810
1820 'screen 6
1830 SCREEN 0,1: COLOR 15,1,6: CLS
1840 LOCATE 1,32: PRINT"Unit 7: Screen 6"
1850 LOCATE 7,1
1860 PRINT"       Example 2.  If the z-score = -2.83, what is the corresponding"
1870 PRINT""
1880 PRINT"                   T-score?"
1890 PRINT""
1900 PRINT"       Solution.   T = 50 + 10z = 50 + 10(-2.83) = 50 - 28.3 = 21.7"
1910 PRINT""
1920 PRINT"                   or 22. Note that 21.7 is rounded to two digits."
1930 COLOR 15,6,6
1940 LOCATE 13,25
1950 PRINT" Note that 21.7 is rounded to two digits. "
1960 COLOR 15,1,6
1970 LOCATE 23,58: PRINT"Press the enter key."
1980 A$ = INKEY$: IF A$ = "" GOTO 1980
1990 'screen 7
2000 SCREEN 0,1: COLOR 15,1,6: CLS
2010 LOCATE 1,32: PRINT"Unit 7: Screen 7"
2020 LOCATE 5,1
2030 PRINT"      Exercise 2.  If the z-score = -1.56, what is the corresponding"

2040 PRINT""
2050 PRINT"                   T-score?"
2060 PRINT""
2070 INPUT"                   Type in your answer and press the enter key.";Q7$
2080 PRINT""
2090 IF I72=0 THEN A72$=Q7$
2100 IF I72=1 THEN B72$=Q7$
2110 IF Q7$="34" OR Q7$ = "34.4" THEN 2120 ELSE 2150
2120 R72=1
2130 PRINT"                   Your response is correct."
2140 GOTO 2250
2150 IF I72=1 GOTO 2210
2160 PRINT"                   Your response is incorrect. Press the enter key"
2170 PRINT""
2180 PRINT"                   for further explanation."
2190 A$=INKEY$: IF A$="" GOTO 2190
2200 I72=1: R=R+1: GOTO 1820
2210 W72=1
2220 PRINT"                   Your response is incorrect. The correct answer is"

2230 PRINT""
2240 PRINT"                   34.4 or just 34, rounded to two digits."
2250 LOCATE 23,58: PRINT"Press the enter key."
2260 A$=INKEY$: IF A$="" GOTO 2260
2270 ' screen 8
2280 SCREEN 0,1: COLOR 15,1,6: CLS
2290 LOCATE 1,32: PRINT"Unit 7:  Screen 8"
2300 LOCATE 6,1
2310 PRINT"       Example 3.  A normal population of raw-scores has a mean of"
2320 PRINT""
2330 PRINT"                   of 90 and a standard deviation of 5. What is the"

2340 PRINT""
2350 PRINT"                   T-score for the raw-score of 100?"
2360 PRINT""
2370 PRINT""
2380 PRINT"       Solution.   First compute the z-score for the raw-score of"
2390 PRINT""
2400 PRINT"                   100. Recall that z = (X - m)/s = (100 - 90)/5 ="
```

```
2410 PRINT""
2420 PRINT"                          10/5 = +2. The corresponding T-score is given by
2430 PRINT""
2440 PRINT"                          T = 50 + 10z = 50 + 10(+2) = 50 + 20 = 70."
2450 LOCATE 23,58: PRINT"Press the enter key."
2460 A$ = INKEY$: IF A$ = "" GOTO 2460
2470 IF J78=1 GOTO 9980
2480 IF J73=1 GOTO 7740
2490 ' screen 9
2500 SCREEN 0,1: COLOR 15,1,6: CLS
2510 LOCATE 1,32: PRINT"Unit 7:  Screen 9"
2520 LOCATE 6,1
2530 PRINT"       Exercise 3.  A normal population of observations has a mean"
2540 PRINT""
2550 PRINT"                          of 100 and a standard deviation of 15. What is"
2560 PRINT""
2570 PRINT"                          the T-score for an observed value of 139?"
2580 PRINT""
2590 PRINT""
2600 INPUT"                          Type in your response and press the enter key.";Q
7$
2610 PRINT""
2620 IF I73=0 THEN A73$=Q7$
2630 IF I73=1 THEN B73$=Q7$
2640 IF Q7$="76" THEN 2650 ELSE 2680
2650 R73=1
2660 PRINT"                          Your response is correct."
2670 GOTO 2780
2680 IF I73=1 GOTO 2740
2690 PRINT"                          Your response is incorrect. Press the enter key"
2700 PRINT""
2710 PRINT"                          for further explanation."
2720 A$=INKEY$: IF A$="" GOTO 2720
2730 I73=1: R=R+1: GOTO 2270
2740 W73=1
2750 PRINT"                          Your response is incorrect. The correct answer is
"
2760 PRINT""
2770 PRINT"                          76."
2780 LOCATE 23,58: PRINT"Press the enter key."
2790 A$ = INKEY$: IF A$ = "" GOTO 2790
2800 ' screen 10
2810 SCREEN 0,1: COLOR 15,1,6: CLS
2820 LOCATE 1,32: PRINT"Unit 7:  Screen 10"
2930 LOCATE 5,1
2840 PRINT"                One advantage of T-scores is that if two tests report"

2850 PRINT""
2860 PRINT"          results using T-scores, an examinee's relative level of "
2870 PRINT""
2980 PRINT"          performance can be compared directly without the use of"
2890 PRINT""
2900 PRINT"          further information. This comparison is possible because"
2910 PRINT""
2920 PRINT"          the mean and the standard deviation for both sets of scores
"
2930 PRINT""
2940 PRINT"          will be the same."
2950 LOCATE 23,58: PRINT"Press the enter key."
2960 A$ = INKEY$: IF A$ = "" THEN 2960
2970 ' screen 11
2980 SCREEN 0,1: COLOR 15,1,6: CLS
2990 LOCATE 1,32: PRINT"Unit 7:  Screen 11"
3000 LOCATE 5,1
3010 PRINT"       Example 4.  Mary's T-score on Test A is 50, whereas her T-score
"
```

```
3020 PRINT""
3030 PRINT"                    on Test B is 65. On which test is Mary's relative"
3040 PRINT""
3050 PRINT"                    performance better?
3060 PRINT""
3070 PRINT""
3080 PRINT"      Solution.  Since Mary's T-score is higher on Test B, Mary's"
3090 PRINT""
3100 PRINT"                 relative performance is better on Test B."
3110 LOCATE 23,58: PRINT"Press the enter key."
3120 A$ = INKEY$: IF A$ = "" THEN 3120
3130 ' screen 12a
3140 SCREEN 0,1: COLOR 15,1,6: CLS
3150 LOCATE 1,32: PRINT"Unit 7:  Screen 12a"
3160 LOCATE 5,1
3170 PRINT"              Let us recall the definition of percentile rank"
3180 PRINT""
3190 PRINT"          before continuing with T-scores. The percentile rank"
3200 PRINT""
3210 PRINT"          of a given observation is the percentage of observations"
3220 PRINT""
3230 PRINT"          falling below the given observation.
3240 LOCATE 23,58: PRINT"Press the enter key."
3250 A$ = INKEY$: IF A$ = "" GOTO 3250
3260 SCREEN 0,1: COLOR 15,1,6: CLS
3270 LOCATE 1,32: PRINT"Unit 7:  Screen 12"
3280 LOCATE 5,1
3290 PRINT"      Example 5.  What is the percentile rank for the T-score of 40?
"
3300 PRINT""
3310 PRINT"      Solution.   First compute the z-score for the T-score of 40."
3320 PRINT""
3330 PRINT"                  Recall that z = (T - m)/s. The mean and standard"
3340 PRINT""
3350 PRINT"                  deviation for T-scores are 50 and 10, respectively.
"
3360 PRINT""
3370 PRINT"                  The z-score of 40 is given by z = (40 - 50)/10 ="
3380 PRINT""
3390 PRINT"                  -10/10 = -1.00. Using Table B, the percentage of th
e"
3400 PRINT""
3410 PRINT"                  area under the unit normal curve below z = -1.00 "
3420 PRINT""
3430 PRINT"                  is .1587 x 100 = 15.87."
3440 COLOR 15,6,6
3450 LOCATE 19,22
3460 PRINT".1587 x 100 = 15.87."
3470 COLOR 15,1,6
3480 LOCATE 23,58: PRINT"Press the enter key."
3490 AS=INKEY$: IF AS = "" GOTO 3490
3500 IF J79 = 1 GOTO 10320
3510 IF J74 = 1 GOTO 8080
3520 'screen 13
3530 SCREEN 0,1: COLOR 15,1,6: CLS
3540 LOCATE 1,32: PRINT"Unit 7:  Screen 13"
3550 LOCATE 6,1
3560 PRINT"      Exercise 4.  What is the percentile rank for the T-score of 65?
"
3570 PRINT""
3580 PRINT"                  Type in your answer (e.g. 32.13) and press the"
3590 PRINT""
3600 INPUT"                  enter key.";Q7$
3610 PRINT""
3620 IF I74=0 THEN A74$=Q7$
3630 IF I74=1 THEN B74$=Q7$
```

```
3640 IF Q7S="93.321" OR Q7S="93.32
" THEN 3650 ELSE 3680
3650 R74=1
3660 PRINT"                    Your response is correct."
3670 GOTO 3780
3680 IF I74=1 GOTO 3740
3690 PRINT"                    Your response is incorrect. Press the enter key"
3700 PRINT""
3710 PRINT"                    for further explanation."
3720 AS=INKEYS: IF AS="" GOTO 3720
3730 I74=1: R=R+1: GOTO 3130
3740 W74=1
3750 PRINT"                    Your response is incorrect. The correct answer is"

3760 PRINT""
3770 PRINT"                    93.32."
3780 LOCATE 23,58: PRINT"Press the enter key."
3790 AS=INKEYS: IF AS="" GOTO 3790
3800 'screen 14
3810 SCREEN 0,1: COLOR 15,1,6: CLS
3820 LOCATE 1,32: PRINT"Unit 7:  Screen 14"
3830 LOCATE 7,1
3840 PRINT"               This concludes our discussion on T-scores. Press the"
3850 PRINT""
3860 PRINT"          enter key to continue.
3870 AS = INKEYS: IF AS ="" GOTO 3870
3880 'screen 14a
3890 SCREEN 0,1: COLOR 15,1,6: CLS
3900 LOCATE 1,32: PRINT"Unit 7:  Screen 14"
3910 LOCATE 4,32: PRINT"Deviation IQs"
3920 LOCATE 7,1
3930 PRINT"               Some intelligence test scales, such as the Wechsler"
3940 PRINT""
3950 PRINT"          Intelligence Scales and the Stanford-Binet Intelligence"
3960 PRINT""
3970 PRINT"          Scale, are also a type of standard score called deviation"
3980 PRINT""
3990 PRINT"          IQs. The mean and standard deviation on the Wechsler"
4000 PRINT""
4010 PRINT"          Intelligence Scales are 100 and 15, respectively. The mean"

4020 PRINT""
4030 PRINT"          of the Stanford-Binet Intelligence Scale is 100 and its"
4040 PRINT""
4050 PRINT"          standard deviation is 16."
4060 LOCATE 23,58: PRINT"Press the enter key."
4070 AS=INKEYS: IF AS="" GOTO 4070
4080 IF J77 = 1 GOTO 9510
4090 IF I76 = 1 GOTO 4980
4100 'screen 15
4110 SCREEN 0,1: COLOR 15,1,6: CLS
4120 LOCATE 1,32: PRINT"Unit 7:  Screen 15"
4130 LOCATE 5,1
4140 PRINT"      z-Score Scale      ---+-----+-----+-----+-----+-----+-----+---"

4150 PRINT"                           -3    -2    -1     0    +1    +2    +3   "

4160 PRINT""
4170 PRINT"      Wechsler           ---+-----+-----+-----+-----+-----+-----+---"

4180 PRINT"      Intelligence Scale    55    70    85   100   115   130   145  "

4190 PRINT""
4200 PRINT"      Example 6.  If an individual scores one standard deviation"
```

```
4210 PRINT""
4220 PRINT"                    above the mean of his age group, the individual's"
4230 PRINT""
4240 PRINT"                    Wechsler's IQ is 115."
4250 LOCATE 6,47: COLOR 12,1,6: PRINT"0": LOCATE 9,46: PRINT"100": COLOR 15,1,6
4260 LOCATE 23,58: PRINT"Press the enter key."
4270 AS = INKEYS: IF AS = "" GOTO 4270
4280 'screen 16
4290 SCREEN 0,1: COLOR 15,1,6: CLS
4300 LOCATE 1,32: PRINT"Unit 7:  Screen 16"
4310 LOCATE 5,1
4320 PRINT"      z-Score Scale      ---+-----+-----+-----+-----+-----+-----+---"
4330 PRINT"                           -3    -2    -1     0    +1    +2    +3   "
4340 PRINT""
4350 PRINT"      Wechsler           ---+-----+-----+-----+-----+-----+-----+---"
4360 PRINT"      Intelligence Scale    55    70    85   100   115   130   145  "
4370 LOCATE 6,47: COLOR 12,1,6: PRINT"0": LOCATE 9,46: PRINT"100": COLOR 15,1,6
4380 PRINT""
4390 PRINT"     Exercise 5.  If an individual scores two standard deviations"
4400 PRINT""
4410 PRINT"                    below the mean of his age group, the individual's"
4420 PRINT""
4430 PRINT"                    Wechsler's IQ is?"
4440 PRINT""
4450 INPUT"                    Type in your answer and press the enter key.";Q7$
4460 PRINT""
4470 IF I75=0 THEN A75$=Q7$
4480 IF I75=1 THEN B75$=Q7$
4490 IF Q7$="70" THEN 4500 ELSE 4530
4500 R75=1
4510 PRINT"                    Your response is correct."
4520 GOTO 4720
4530 IF I75=1 GOTO 4680
4540 IF Q7$ = "130" GOTO 4550 ELSE 4630
4550 PRINT"                    Incorrect. The score of 130 is +2 standard deviatio
ns"
4560 PRINT""
4570 PRINT"                    above the mean. Press the enter key to continue": I
75 = 1: R=R+1
4580 AS = INKEYS: IF AS = "" GOTO 4580
4590 LOCATE 17,1:PRINT"
                    "
4600 LOCATE 19,1: PRINT"
                    "
4610 LOCATE 21,1: PRINT"
                    "
4620 LOCATE 17,1: GOTO 4450
4630 PRINT"                    Your response is incorrect. Press the enter key"
4640 PRINT""
4650 PRINT"                    for further explanation."
4660 AS=INKEYS: IF AS="" GOTO 4660
4670 I75=1: R=R+1: GOTO 4100
4680 W75=1
4690 PRINT"                    Your response is incorrect. The correct answer is"
4700 PRINT""
4710 PRINT"                    70."
4720 LOCATE 23,58: PRINT"Press the enter key."
4730 AS=INKEYS: IF AS="" GOTO 4730
4740 'screen 17
4750 SCREEN 0,1: COLOR 15,1,6: CLS
4760 LOCATE 1,32: PRINT"Unit 7:  Screen 17"
4770 LOCATE 5,1
4780 PRINT"               A z-score can be converted to any other standard"
```

```
4790 PRINT""
4800 PRINT"          score, C, with the use of the formula:"
4810 PRINT""
4820 PRINT"                                   C = m + sz"
4830 PRINT""
4840 PRINT"          where C is the new standard score equivalent to z,"
4850 PRINT""
4860 PRINT"                m is the desired mean of the new standard-score scale
,"
4870 PRINT""
4880 PRINT"                s is the desired standard deviation of the new standa
rd"
4890 PRINT""
4900 PRINT"                  score scale, and
4910 PRINT""
4920 PRINT"                z is the z-score of the given observation."
4930 COLOR 15,6,6
4940 LOCATE 9,34: PRINT" C = m + sz, "
4950 COLOR 15,1,6
4960 LOCATE 23,58: PRINT"Press the enter key."
4970 AS=INKEYS: IF AS="" GOTO 4970
4980 'screen 18
4990 SCREEN 0,1: COLOR 15,1,6: CLS
5000 LOCATE 1,32: PRINT"Unit 7:  Screen 18"
5010 LOCATE 5,1
5020 PRINT"          Example 7.  Suppose that we wish to transform a group"
5030 PRINT""
5040 PRINT"                      of z-scores to standard scores whose mean"
5050 PRINT""
5060 PRINT"                      and standard deviation are 75 and 10,"
5070 PRINT""
5080 PRINT"                      respectively. We should use the transformation
5090 PRINT""
5100 PRINT"                      C = 75 + 10z. If z = -2, then C = 75 + 10(-2)="

5110 PRINT""
5120 PRINT"                      75 + (-20) = 55."
5130 LOCATE 23,58: PRINT"Press the enter key."
5140 AS=INKEYS: IF AS="" GOTO 5140
5150 'screen 19
5160 SCREEN 0,1: COLOR 15,1,6: CLS
5170 LOCATE 1,32: PRINT"Unit 7:  Screen 19"
5180 LOCATE 5,1
5190 PRINT"      Exercise 6.  What is the formula for converting z-scores"
5200 PRINT""
5210 PRINT"                   to Wechsler IQs?"
5220 PRINT""
5230 PRINT"                           a.  15 + 100z"
5240 PRINT"                           b.  15 - 100z"
5250 PRINT"                           c.  50 +  10z"
5260 PRINT"                           d. 100 +  15z"
5270 PRINT"                           e. 100 -  15z"
5280 PRINT""
5290 PRINT"                   Type a, b, c, d, or e for your answer and press th
e
5300 PRINT""
5310 INPUT"                   enter key.";Q7$
5320 PRINT""
5330 IF I76 = 0 THEN A76$ = Q7$
5340 IF I76 = 1 THEN B76$ = Q7$
5350 IF Q7$ = "a" OR Q7$ = "A" OR Q7$ = "b" OR Q7$ = "B" OR Q7$ = "c" OR Q7$ = "
C" OR Q7$ = "d" OR Q7$ = "D" OR Q7$ = "e" OR Q7$ = "E" THEN 5420 ELSE 5360
5360 LOCATE 15,1
5370  PRINT"
   "
```

```
5380  PRINT"
   "
5390  PRINT"
   "
5400 LOCATE 15,1
5410 GOTO 5290
5420 IF Q7$ = "d" OR Q7$ = "D" THEN 5430 ELSE 5460
5430 R76 = 1
5440 PRINT"                    Your response is correct."
5450 GOTO 5560
5460 IF I76 = 1 GOTO 5520
5470 PRINT"                    Your response is incorrect. Press the enter key"
5480 PRINT""
5490 PRINT"                    for further information."
5500 A$ = INKEY$: IF A$ = "" GOTO 5500
5510 I76 = 1: R=R+1: GOTO 3880
5520 W76 = 1
5530 PRINT"                    Your response is incorrect. The correct answer"
5540 PRINT""
5550 PRINT"                    is d."
5560 LOCATE 23,58: PRINT"Press the enter key."
5570 A$=INKEY$: IF A$="" GOTO 5570
5580 'screen 20
5590 SCREEN 0,1: COLOR 15,1,6: CLS
5600 LOCATE 1,32: PRINT"Unit 7:  Screen 20"
5610 LOCATE 5,1
5620 PRINT"      Example 8.  The formula for converting z-scores to Wechsler's"
5630 PRINT""
5640 PRINT"                  IQs is C = 100 + 15z. If z = -1.8, what is the"
5650 PRINT""
5660 PRINT"                  corresponding Wechsler IQ?"
5670 PRINT""
5680 PRINT"      Solution.   C = 100 + 15z = 100 + 15(-1.8) = 100 - 27 = 73."
5690 LOCATE 23,58: PRINT"Press the enter key."
5700 A$=INKEY$: IF A$="" GOTO 5700
5710 'screen 21
5720 SCREEN 0,1: COLOR 15,1,6: CLS
5730 LOCATE 1,32: PRINT"Unit 7:  Screen 21"
5740 LOCATE 5,1
5750 PRINT"     Exercise 7.  If the z-score of a raw-score belonging to a"
5760 PRINT""
5770 PRINT"                  normal population is +3, what is the "
5780 PRINT""
5790 PRINT"                  corresponding Wechsler IQ?"
5800 PRINT""
5810 PRINT"                  Type in your answer (e.g. 112) and press the"
5820 PRINT""
5830 INPUT"                  enter key.";Q7$
5840 PRINT""
5850 IF I77=0 THEN A77$=Q7$
5860 IF I77=1 THEN B77$=Q7$
5870 IF Q7$="145" OR Q7$ = "145." OR Q7$ = "145.0" THEN 5880 ELSE 5910
5880 R77=1
5890 PRINT"                    Your response is correct."
5900 GOTO 6010
5910 IF I77=1 GOTO 5970
5920 PRINT"                    Your response is incorrect. Press the enter key"
5930 PRINT""
5940 PRINT"                    for further explanation."
5950 A$=INKEY$: IF A$ "" GOTO 5950
5960 I77=1: R=R+1: GOTO 5580
5970 W77=1
5980 PRINT"                    Your response is incorrect. The correct answer is"
5990 PRINT""
6000 PRINT"                    145."
6010 LOCATE 23,59: PRINT"Press the enter key."
6020 A$=INKEY$: IF A$="" GOTO 6020
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```
6030 'screen 22
6040 CLS:LOCATE 1,32: PRINT"Unit 7:  Screen 22"
6050 LOCATE 3,1
6060 PRINT"                This concludes the discussion on deviation IQs. The"
6070 PRINT""
6080 PRINT"          next screen will give a comparative listing of the typical"

6090 PRINT""
6100 PRINT"          standard scores for a normal population. The mean for each"

6110 PRINT ""
6120 PRINT"          scale is printed in light red. The standard deviation for"
6130 PRINT""
6140 PRINT"          each scale can be obtained by subtracting the mean from"
6150 PRINT""
6160 PRINT"          that number printed to the right of the mean."
6170 PRINT""
6180 PRINT"               The following acronyms will be used:
6190 PRINT""
6200 PRINT"                 GRE = Graduate Records Examination"
6210 PRINT""
6220 PRINT"                 SAT = Scholastic Aptitude Test of the College"
6230 PRINT"                       Entrance Examination Board"
6240 PRINT""
6250 PRINT"                 ACT = American College Testing Assessment."
6260 LOCATE 23,58: PRINT"Press the enter key."
6270 AS = INKEYS: IF AS = "" GOTO 6270
6280 'screen 23
6290 CLS:LOCATE 1,32: PRINT"Unit 7:  Screen 23"
6300 LOCATE 2,20: PRINT"Typical Standard Scores for a Normal Population"
6310 PRINT""
6320 PRINT"   % of Cases        2.14%   13.59%   34.13%   34.13%   13.59%    2.1
4%"
6330 PRINT""
6340 PRINT" z-Score Scale  --|--------|--------|--------|--------|--------|-----
---|--"
6350 PRINT"                  -3       -2       -1        0       +1       +2
  +3 "
6360 PRINT""
6370 PRINT" T-Score Scale  --|--------|--------|--------|--------|--------|-----
---|--"
6380 PRINT"                   20       30       40       50       60       70
   80"
6390 PRINT""
6400 PRINT" GRE,SAT Scale  --|--------|--------|--------|--------|--------|-----
---|--"
6410 PRINT"                  200      300      400      500      600      700
  800"
6420 PRINT""
6430 PRINT"     ACT Scale  --|--------|--------|--------|--------|--------|-----
---|--"
6440 PRINT"                   5        10       15       20       25       30
   35"
6450 PRINT""
6460 PRINT" Wechsler       --|--------|--------|--------|--------|--------|-----
---|--"
6470 PRINT"  Deviation IQ    55       70       85      100      115      130
  145"
6480 PRINT""
6490 PRINT" Stanford-Binet --|--------|--------|--------|--------|--------|-----
---|--"
6500 PRINT"  Deviation IQ    52       68       84      100      116      132
  148"
6510 COLOR 12,1,6: LOCATE 7,46: PRINT"0": LOCATE 10,46: PRINT"50": LOCATE 13,45:
 PRINT"500":LOCATE 16,46: PRINT"20": LOCATE 19,45: PRINT"100": LOCATE 22,45: PRI
```

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NT"100": COLOR 15,1,6
6520 LOCATE 23,58: PRINT"Press the enter key."
6530 A$ = INKEY$: IF A$ = "" GOTO 6530
6540 R7 = R71+R72+R73+R74+R75+R76+R77
6550 W7 = W71+W72+W73+W74+W75+W76+W77
6560 FIRST7 = R7+W7-R
6570 T7$ = TIME$
6580 TIME$ = "00:00:00"
6590 'screen 24
6600 CLS: COLOR 15,1,6: LOCATE 1,32: PRINT"Unit 7:  Screen 24"
6610 PRINT""
6620 LOCATE 7,1
6630 PRINT"                This concludes our discussion of Unit 7:  Standard"
6640 PRINT""
6650 PRINT"          Scores. You worked correctly";FIRST7"exercise(s) out of 7."

6660 PRINT""
6670 PRINT"          There are ten review problems for this unit. Would you "
6680 PRINT""
6690 PRINT"          like to work some review problems? Type y if yes or n if"
6700 PRINT""
6710 INPUT"          no and press the enter key.";Q7$
6720 IF Q7$ = "y" OR Q7$ = "Y" OR Q7$ = "n" OR Q7$ = "N" GOTO 6730 ELSE LOCATE 1
5,1: PRINT"
        ": LOCATE 15,1: GOTO 6710
6730 IF Q7$ = "y" OR Q7$ = "Y" GOTO 6740 ELSE 11280
6740 'screen 25
6750 SCREEN 0,1: COLOR 15,1,6: CLS
6760 LOCATE 1,32: PRINT"Unit 7:  Screen 25"
6770 LOCATE 5,1: K7=1
6780 PRINT"      Problem 1.  A standard-score scale has:"
6790 PRINT""
6800 PRINT"                              a. a fixed z-score and a fixed t-score."
6810 PRINT""
6920 PRINT"                              b. a fixed raw-score and a fixed z-score.
"
6830 PRINT""
6840 PRINT"                              c. a fixed mean and a fixed standard devi
ation."
6850 PRINT""
6860 PRINT"                              d. a fixed mean only."
6870 PRINT""
6880 PRINT"                              e. none of the above."
6890 PRINT""
6900 PRINT"                    Type a, b, c, d, or e for your answer and press"
6910 PRINT""
6920 INPUT"                    enter key.";Q7$
6930 PRINT""
6940 IF J71 = 0 THEN C71$ = Q7$
6950 IF J71 = 1 THEN D71$ = Q7$
6960 IF Q7$ = "a" OR Q7$ = "A" OR Q7$ = "b" OR Q7$ = "B" OR Q7$ = "c" OR Q7$ = "
C" OR Q7$ = "d" OR Q7$ = "D" OR Q7$ = "e" OR Q7$ = "E" THEN 7030 ELSE 6970
6970 LOCATE 17,1
6980  PRINT"
  "
6990  PRINT"
  "
7000  PRINT"
  "
7010 LOCATE 17,1
7020 GOTO 6900
7030 IF Q7$ = "c" OR Q7$ = "C" THEN 7040 ELSE 7070
7040 P71 = 1
7050 PRINT"                    Your response is correct."
7060 GOTO 7170
7070 IF J71 = 1 GOTO 7130
7080 PRINT"                    Your response is incorrect. Press the enter key"
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7090 PRINT""
7100 PRINT"                    for further information."
7110 A$ = INKEY$: IF A$ = "" GOTO 7110
7120 J71 = 1: P=P+1: GOTO 360
7130 Q71 = 1
7140 PRINT"                    Your response is incorrect. The correct answer"
7150 PRINT""
7160 PRINT"                    is c."
7170 LOCATE 23,58: PRINT"Press the enter key."
7180 A$=INKEY$: IF A$="" GOTO 7180
7190 GOSUB 7210
7200 IF Q7$ = "y" OR Q7$ = "Y" GOTO 7270 ELSE 11280
7210 CLS: LOCATE 5,1
7220 PRINT"              Would you like to work another review problem? Type y"
7230 PRINT""
7240 INPUT"        if yes or n if no and press the enter key.";Q7$
7250 IF Q7$ = "y" OR Q7$ = "Y" OR Q7$ = "n" OR Q7$ = "N" THEN 7260 ELSE LOCATE 7
,1: PRINT"
       ": LOCATE 7,1: GOTO 7240
7260 RETURN
7270 'screen 26
7280 SCREEN 0,1: COLOR 15,1,6: CLS
7290 LOCATE 1,32: PRINT"Unit 7:  Screen 26"
7300 LOCATE 5,1: K7=2
7310 PRINT"      Problem 2.  The mean and standard deviation of the T-score"
7320 PRINT""
7330 PRINT"                    system are:"
7340 PRINT""
7350 PRINT"                              a. 0 and 1, respectively."
7360 PRINT""
7370 PRINT"                              b. 10 and 50, respectively."
7380 PRINT""
7390 PRINT"                              c. 50 and 10, respectively."
7400 PRINT""
7410 PRINT"                              d. 100 and 15, respectively."
7420 PRINT""
7430 PRINT"                    Type a, b, c, or d for your answer and press"
7440 PRINT""
7450 INPUT"                    the enter key.";Q7$
7460 PRINT""
7470 IF J72 = 0 THEN C72$ = Q7$
7480 IF J72 = 1 THEN D72$ = Q7$
7490 IF Q7$ = "a" OR Q7$ = "A" OR Q7$ = "b" OR Q7$ = "B" OR Q7$ = "c" OR Q7$ = "
C" OR Q7$ = "d" OR Q7$ = "D" THEN 7560 ELSE 7500
7500 LOCATE 17,1
7510  PRINT"
   "
7520  PRINT"
   "
7530  PRINT"
   "
7540 LOCATE 17,1
7550 GOTO 7430
7560 IF Q7$ = "c" OR Q7$ = "C" THEN 7570 ELSE 7600
7570 P72 = 1
7580 PRINT"                    Your response is correct."
7590 GOTO 7700
7600 IF J72 = 1 GOTO 7660
7610 PRINT"                    Your response is incorrect. Press the enter key"
7620 PRINT""
7630 PRINT"                    for further information."
7640 A$ = INKEY$: IF A$ = "" GOTO 7640
7650 J72 = 1: P=P+1: GOTO 890
7660 Q72 = 1
7670 PRINT"                    Your response is incorrect. The correct answer"
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7680 PRINT""
7690 PRINT"                    is c."
7700 LOCATE 23,58: PRINT"Press the enter key."
7710 AS=INKEYS: IF AS="" GOTO 7710
7720 GOSUB 7210
7730 IF Q7$ = "y" OR Q7$ = "Y" GOTO 7740 ELSE 11280
7740 'screen 27
7750 SCREEN 0,1: COLOR 15,1,6: CLS
7760 LOCATE 1,32: PRINT"Unit 7:  Screen 27"
7770 LOCATE 5,1: K7=3
7780 PRINT"      Problem 3.  The mean and standard deviation of a normal "
7790 PRINT""
7800 PRINT"                  population are 85 and 6, respectively. What"
7810 PRINT""
7820 PRINT"                  is the T-score for the raw-score of 76?"
7830 PRINT""
7840 PRINT"                  Type in your answer (e.g. 83) and press the"
7850 PRINT""
7860 INPUT"                  enter key.";Q7$
7870 PRINT""
7880 IF J73=0 THEN C73$=Q7$
7890 IF J73=1 THEN D73$=Q7$
7900 IF Q7$="35" OR Q7$="35." OR Q7$ = "35.0" THEN 7910 ELSE 7940
7910 P73=1
7920 PRINT"                  Your response is correct."
7930 GOTO 8040
7940 IF J73=1 GOTO 8000
7950 PRINT"                  Your response is incorrect. Press the enter key"
7960 PRINT""
7970 PRINT"                  for further explanation."
7980 AS=INKEYS: IF AS="" GOTO 7980
7990 J73=1: P=P+1: GOTO 2270
8000 Q73=1
8010 PRINT"                  Your response is incorrect. The correct answer is"
8020 PRINT""
8030 PRINT"                  35."
8040 LOCATE 23,58: PRINT"Press the enter key."
8050 AS=INKEYS: IF AS="" GOTO 8050
8060 GOSUB 7210
8070 IF Q7$ = "y" OR Q7$ = "Y" GOTO 8080 ELSE 11280
8080 'screen 28
8090 SCREEN 0,1: COLOR 15,1,6: CLS
8100 LOCATE 1,32: PRINT"Unit 7:  Screen 28"
8110 LOCATE 5,1: K7=4
8120 PRINT"      Problem 4.  What percent of scores falls below the T-score"
8130 PRINT""
8140 PRINT"                  of 63?"
8150 PRINT""
8160 PRINT"                  Type in your answer (e.g. 32.23%) and press the"
8170 PRINT""
8180 INPUT"                  enter key.";Q7$
8190 PRINT""
8200 IF J74=0 THEN C74$=Q7$
8210 IF J74=1 THEN D74$=Q7$
8220 IF Q7$="90.32%" OR Q7$="90.32" THEN 8230 ELSE 8260
8230 P74=1
8240 PRINT"                  Your response is correct."
8250 GOTO 8360
8260 IF J74=1 GOTO 8320
8270 PRINT"                  Your response is incorrect. Press the enter key"
8280 PRINT""
8290 PRINT"                  for further explanation."
8300 AS=INKEYS: IF AS="" GOTO 8300
8310 J74=1: P=P+1: GOTO 3130
8320 Q74=1
8330 PRINT"                  Your response is incorrect. The correct answer is"
8340 PRINT""
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8350 PRINT"                    90.32% ."
8360 LOCATE 23,58: PRINT"Press the enter key."
8370 AS=INKEYS: IF AS="" GOTO 8370
8380 GOSUB 7210
8390 IF Q7S = "y" OR Q7S = "Y" GOTO 8400 ELSE 11280
8400 'screen 29
8410 SCREEN 0,1: COLOR 15,1,6: CLS
8420 LOCATE 1,32: PRINT"Unit 7:  Screen 29"
8430 LOCATE 3,1: K7=5
8440 PRINT"       Problem 5.  Which of the following reflect the poorest"
8450 PRINT""
8460 PRINT"                   performance on a group of tests?
8470 PRINT""
8480 PRINT"                             a. Test A: z-score = -1.50"
8490 PRINT""
8500 PRINT"                             b. Test B: a percentile rank of 10"
8510 PRINT""
8520 PRINT"                             c. Test C: T-score = 30"
8530 PRINT""
8540 PRINT"                             d. Wechsler IQ  score = 80"
8550 PRINT""
8560 PRINT"                             e. Test E: 1 standard deviation below the
 mean"
8570 PRINT""
8580 PRINT"                   Type a, b, c, d, or e for your answer and press"
8590 PRINT""
8600 INPUT"                   the enter key.";Q7S
8610 PRINT""
8620 IF J75 = 0 THEN C75S = Q7S
8630 IF J75 = 1 THEN D75S = Q7S
8640 IF Q7S = "a" OR Q7S = "A" OR Q7S = "b" OR Q7S = "B" OR Q7S = "c" OR Q7S = "
C" OR Q7S = "d" OR Q7S = "D" OR Q7S = "e" OR Q7S = "E" THEN 8710 ELSE 8650
8650 LOCATE 17,1
8660  PRINT"
   "
8670  PRINT"
   "
8680  PRINT"
   "
8690 LOCATE 17,1
8700 GOTO 8580
8710 IF Q7S = "c" OR Q7S = "C" THEN 8720 ELSE 8750
8720 P75 = 1
8730 PRINT"                   Your response is correct."
8740 GOTO 8850
8750 IF J75 = 1 GOTO 8810
8760 PRINT"                   Your response is incorrect. Press the enter key"
8770 PRINT""
8780 PRINT"                   for further information."
8790 AS = INKEYS: IF AS = "" GOTO 8790
8800 J75 = 1: P=P+1: GOTO 8900
8810 Q75 = 1
8820 PRINT"                   Your response is incorrect. The correct answer"
8830 PRINT""
8840 PRINT"                   is c."
8850 LOCATE 23,58: PRINT"Press the enter key."
8860 AS=INKEYS: IF AS="" GOTO 8860
8870 GOSUB 7210
8880 IF Q7S = "y" OR Q7S = "Y" GOTO 9060 ELSE 11280
8890 GOTO 9060
8900 'screen 29a
8910 CLS
8920 LOCATE 1,32: PRINT"Unit 7: Screen 29a"
8930 LOCATE 5,1
8940 PRINT"              One way to solve this problem is to convert each"
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 8950 PRINT""
 8960 PRINT"          score to its percentile rank equivalent. For example,"
 8970 PRINT""
 8980 PRINT"          the percentile rank of the T-score of 60 is 84.13."
 8990 PRINT""
 9000 PRINT"          Then compare the percentile ranks to see which score"
 9010 PRINT""
 9020 PRINT"          yield the smallest percentile rank."
 9030 LOCATE 23,58: PRINT"Press the enter key."
 9040 AS = INKEY$: IF AS = "" GOTO 9040
 9050 GOTO 8400
 9060 'screen 30
 9070 SCREEN 0,1: COLOR 15,1,6: CLS
 9080 LOCATE 1,32: PRINT"Unit 7:  Screen 30"
 9090 LOCATE 5,1: K7=6
 9100 PRINT"      Problem 6.  Any score scale having a fixed mean and a fixed"
 9110 PRINT""
 9120 PRINT"                  standard deviation is called?"
 9130 PRINT""
 9140 PRINT"                           a. a percentile rank scale"
 9150 PRINT"                           b. a t-score scale"
 9160 PRINT"                           c. a raw-score scale"
 9170 PRINT"                           d. a standard-score scale
 9180 PRINT"                           e. none of the above"
 9190 PRINT""
 9200 PRINT"                  Type a, b, c, d, or e for your answer and press"
 9210 PRINT""
 9220 INPUT"                  enter key.";Q7$
 9230 PRINT""
 9240 IF J76 = 0 THEN C76$ = Q7$
 9250 IF J76 = 1 THEN D76$ = Q7$
 9260 IF Q7$ = "a" OR Q7$ = "A" OR Q7$ = "b" OR Q7$ = "B" OR Q7$ = "c" OR Q7$ = "
C" OR Q7$ = "d" OR Q7$ = "D" OR Q7$ = "e" OR Q7$ = "E" THEN 9330 ELSE 9270
 9270 LOCATE 15,1
 9280  PRINT"
   "
 9290  PRINT"
   "
 9300  PRINT"
   "
 9310 LOCATE 15,1
 9320 GOTO 9200
 9330 IF Q7$ = "d" OR Q7$ = "D" THEN 9340 ELSE 9370
 9340 P76 = 1
 9350 PRINT"                  Your response is correct."
 9360 GOTO 9470
 9370 IF J76 = 1 GOTO 9430
 9380 PRINT"                  Your response is incorrect. Press the enter key"
 9390 PRINT""
 9400 PRINT"                  for further information."
 9410 AS = INKEY$: IF AS = "" GOTO 9410
 9420 J76 = 1: P=P+1: GOTO 360
 9430 Q76 = 1
 9440 PRINT"                  Your response is incorrect. The correct answer"
 9450 PRINT""
 9460 PRINT"                  is d."
 9470 LOCATE 23,58: PRINT"Press the enter key."
 9480 AS=INKEY$: IF AS="" GOTO 9480
 9490 GOSUB 7210
 9500 IF Q7$ = "y" OR Q7$ = "Y" GOTO 9510 ELSE 11280
 9510 'screen 31
 9520 SCREEN 0,1: COLOR 15,1,6: CLS
 9530 LOCATE 1,32: PRINT"Unit 7:  Screen 31"
 9540 LOCATE 5,1: K7=7
 9550 PRINT"      Problem 7.  The mean and standard deviation of the Wechsler"
 9560 PRINT""
 9570 PRINT"                  IQ scales are :"
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9580 PRINT""
9590 PRINT"                              a. 0 and 1, respectively."
9600 PRINT""
9610 PRINT"                              b. 10 and 50, respectively."
9620 PRINT""
9630 PRINT"                              c. 50 and 10, respectively."
9640 PRINT""
9650 PRINT"                              d. 100 and 15, respectively."
9660 PRINT""
9670 PRINT"                    Type a, b, c, or d for your answer and press"
9680 PRINT""
9690 INPUT"                    the enter key.";Q7$
9700 PRINT""
9710 IF J77 = 0 THEN C77$ = Q7$
9720 IF J77 = 1 THEN D77$ = Q7$
9730 IF Q7$ = "a" OR Q7$ = "A" OR Q7$ = "b" OR Q7$ = "B" OR Q7$ = "c" OR Q7$ = "
C" OR Q7$ = "d" OR Q7$ = "D" THEN 9800 ELSE 9740
9740 LOCATE 17,1
9750  PRINT"
   "
9760  PRINT"
   "
9770  PRINT"
   "
9780 LOCATE 17,1
9790 GOTO 9670
9800 IF Q7$ = "d" OR Q7$ = "D" THEN 9810 ELSE 9840
9810 P77 = 1
9820 PRINT"                    Your response is correct."
9830 GOTO 9940
9840 IF J77 = 1 GOTO 9900
9850 PRINT"                    Your response is incorrect. Press the enter key"
9860 PRINT""
9870 PRINT"                    for further information."
9880 A$ = INKEY$: IF A$ = "" GOTO 9880
9890 J77 = 1: P=P+1: GOTO 3880
9900 Q77 = 1
9910 PRINT"                    Your response is incorrect. The correct answer"
9920 PRINT""
9930 PRINT"                    is d."
9940 LOCATE 23,58: PRINT"Press the enter key."
9950 A$=INKEY$: IF A$="" GOTO 9950
9960 GOSUB 7210
9970 IF Q7$ = "y" OR Q7$ = "Y" GOTO 9980 ELSE 11280
9980 'screen 32
9990 SCREEN 0,1: COLOR 15,1,6: CLS
10000 LOCATE 1,32: PRINT"Unit 7:  Screen 32"
10010 LOCATE 5,1: K7=8
10020 PRINT"      Problem 8.  The mean and standard deviation of a normal "
10030 PRINT""
10040 PRINT"                    population are 94 and 8, respectively. What"
10050 PRINT""
10060 PRINT"                    is the T-score for the raw-score of 114?"
10070 PRINT""
10080 PRINT"                    Type in your answer (e.g. 83) and press the"
10090 PRINT""
10100 INPUT"                    enter key.";Q7$
10110 PRINT""
10120 IF J78=0 THEN C78$=Q7$
10130 IF J78=1 THEN D78$=Q7$
10140 IF Q7$="75" OR Q7$="75." OR Q7$ = "75.0" THEN 10150 ELSE 10180
10150 P78=1
10160 PRINT"                    Your response is correct."
10170 GOTO 10280
10180 IF J78=1 GOTO 10240
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10190 PRINT"                    Your response is incorrect. Press the enter key"
10200 PRINT""
10210 PRINT"                    for further explanation."
10220 AS=INKEYS: IF AS="" GOTO 10220
10230 J78=1: P=P+1: GOTO 2270
10240 Q78=1
10250 PRINT"                    Your response is incorrect. The correct answer is"

10260 PRINT""
10270 PRINT"                    75."
10280 LOCATE 23,58: PRINT"Press the enter key."
10290 AS=INKEYS: IF AS="" GOTO 10290
10300 GOSUB 7210
10310 IF Q7$ = "y" OR Q7$ = "Y" GOTO 10320 ELSE 11280
10320 'screen 33
10330 SCREEN 0,1: COLOR 15,1,6: CLS
10340 LOCATE 1,32: PRINT"Unit 7:  Screen 33"
10350 LOCATE 5,1: K7=9
10360 PRINT"      Problem 9.  What percent of scores falls below the T-score"
10370 PRINT""
10380 PRINT"                    of 42?"
10390 PRINT""
10400 PRINT"                    Type in your answer (e.g. 32.23%) and press the"
10410 PRINT""
10420 INPUT"                    enter key.";Q7$
10430 PRINT""
10440 IF J79=0 THEN C79$=Q7$
10450 IF J79=1 THEN D79$=Q7$
10460 IF Q7$="21.19%" OR Q7$="21.19" THEN 10470 ELSE 10500
10470 P79=1
10480 PRINT"                    Your response is correct."
10490 GOTO 10630
10500 IF J79=1 GOTO 10560
10510 PRINT"                    Your response is incorrect. Press the enter key"
10520 PRINT""
10530 PRINT"                    for further explanation."
10540 AS=INKEYS: IF AS="" GOTO 10540
10550 J79=1: P=P+1: GOTO 3130
10560 Q79=1
10570 PRINT"                    Your response is incorrect. The correct answer is"

10580 PRINT""
10590 PRINT"                    21.19%."
10600 LOCATE 23,58: PRINT"Press the enter key."
10610 AS=INKEYS: IF AS="" GOTO 10610
10620 GOSUB 7210
10630 IF Q7$ = "y" OR Q7$ = "Y" GOTO 10640 ELSE 11280
10640 'screen 34
10650 SCREEN 0,1: COLOR 15,1,6: CLS
10660 LOCATE 1,32: PRINT"Unit 7:  Screen 34"
10670 LOCATE 3,1: K7=10
10680 PRINT"     Problem 10.  Which of the following reflects the best"
10690 PRINT""
10700 PRINT"                    performance on a group of tests?
10710 PRINT""
10720 PRINT"                              a. Test A: z-score = +1.50"
10730 PRINT""
10740 PRINT"                              b. Test B: a percentile rank of 90"
10750 PRINT""
10760 PRINT"                              c. Test C: T-score = 64"
10770 PRINT""
10780 PRINT"                              d. Test D: Wechsler IQ  score = 116"
10790 PRINT""
10800 PRINT"                              e. Test E: 1 standard deviation above th
e mean"
10810 PRINT""
10820 PRINT"                    Type a, b, c, d, or e for your answer and press"
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10830 PRINT""
10840 INPUT"                    the enter key.";Q7$
10850 PRINT""
10860 IF J710 = 0 THEN C710$ = Q7$
10870 IF J710 = 1 THEN D710$ = Q7$
10880 IF Q7$ = "a" OR Q7$ = "A" OR Q7$ = "b" OR Q7$ = "B" OR Q7$ = "c" OR Q7$ =
"C" OR Q7$ = "d" OR Q7$ = "D" OR Q7$ = "e" OR Q7$ = "E" THEN 10950 ELSE 10890
10890 LOCATE 17,1
10900  PRINT"
    "
10910  PRINT"
    "
10920  PRINT"
    "
10930 LOCATE 17,1
10940 GOTO 10820
10950 IF Q7$ = "a" OR Q7$ = "A" THEN 10960 ELSE 10990
10960 P710 = 1
10970 PRINT"                    Your response is correct."
10980 GOTO 11090
10990 IF J710 = 1 GOTO 11050
11000 PRINT"                    Your response is incorrect. Press the enter key"
11010 PRINT""
11020 PRINT"                    for further information."
11030 A$ = INKEY$: IF A$ = "" GOTO 11030
11040 J710 = 1: P=P+1: GOTO 11120
11050 Q710 = 1
11060 PRINT"                    Your response is incorrect. The correct answer"
11070 PRINT""
11080 PRINT"                    is a."
11090 LOCATE 23,58: PRINT"Press the enter key."
11100 A$=INKEY$: IF A$="" GOTO 11100
11110 GOTO 11280
11120 'screen 34a
11130 CLS
11140 LOCATE 1,32: PRINT"Unit 7: Screen 34a"
11150 LOCATE 5,1
11160 PRINT"              One way to solve this problem is to convert each"
11170 PRINT""
11180 PRINT"          score to its percentile rank equivalent. For example,"
11190 PRINT""
11200 PRINT"          the percentile rank of the T-score of 60 is 84.13."
11210 PRINT""
11220 PRINT"          Then compare the percentile ranks to see which score"
11230 PRINT""
11240 PRINT"          yield the largest percentile rank."
11250 LOCATE 23,58: PRINT"Press the enter key."
11260 A$ = INKEY$: IF A$ = "" GOTO 11260
11270 GOTO 10640
11280 'screen 35
11290 CLS: LOCATE 1,32: PRINT"Unit 7:  Screen 35"
11300 LOCATE 8,1
11310 PRINT"                    Turn the printer on and press the enter key."
11320 A$ = INKEY$: IF A$ = "" GOTO 11320
11330 IF K7=0 GOTO 11490
11340 P7 = P71+P72+P73+P74+P75+P76+P77+P78+P79+P710
11350 Q7 = Q71+Q72+Q73+Q74+Q75+Q76+Q77+Q78+Q79+Q710
11360 SEC7 = P7+Q7-P
11370 PRINT""
11380 PRINT"                    The number of correct exercises is"; FIRST7
11390 PRINT""
11400 PRINT"                    The number of incorrect exercises is"; 7-FIRST7
11410 PRINT""
11420 PRINT"                    The number of correct exercises after remediation i
s";R-W7
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11430 PRINT""
11440 PRINT"                    The number of correct problems is"; SEC7
11450 PRINT""
11460 PRINT"                    The number of incorrect problems is"; K7-SEC7
11470 PRINT""
11480 PRINT"                    The number of correct problems after remediation is
";P-Q7
11490 LPRINT"                                   Unit 7:  Standard Scores"
11500 LPRINT""
11510 LPRINT""
11520 LPRINT"                    "NAMS,NOS,T7$
11530 LPRINT""
11540 LPRINT"                    The number of correct exercises is";FIRST7
11550 LPRINT""
11560 LPRINT"                    The number of incorrect exercises is"; 7-FIRST7"
11570 LPRINT""
11580 LPRINT"                    The number of correct exercises after remediation
is";R-W7
11590 IF K7=0 GOTO 11660
11600 LPRINT"                                ";TIMES
11610 LPRINT"                    The number of correct problems is";SEC7
11620 LPRINT""
11630 LPRINT"                    The number of incorrect problems is"; K7-SEC7"
11640 LPRINT""
11650 LPRINT"                    The number of correct problems after remediation i
s";P-Q7
11660 LPRINT""
11670 IF I71=1 GOTO 11700
11680 LPRINT"   Exercise 1 response was correct.",A71S:GOTO 11720
11690 LPRINT""
11700 LPRINT"   Exercise 1 response was incorrect.",A71$,B71$
11710 LPRINT""
11720 LPRINT"": IF I72=1 GOTO 11750
11730 LPRINT"   Exercise 2 response was correct.",A72S:GOTO 11770
11740 LPRINT""
11750 LPRINT"   Exercise 2 response was incorrect.",A72S,B72S
11760 LPRINT""
11770 LPRINT"": IF I73=1 GOTO 11800
11780 LPRINT"   Exercise 3 response was correct.",A73S:GOTO 11820
11790 LPRINT""
11800 LPRINT"   Exercise 3 response was incorrect.",A73S,B73S
11810 LPRINT""
11820 LPRINT"": IF I74=1 GOTO 11850
11830 LPRINT"   Exercise 4 response was correct.",A74S:GOTO 11870
11840 LPRINT""
11850 LPRINT"   Exercise 4 response was incorrect.",A74S,B74S
11860 LPRINT""
11870 LPRINT"": IF I75=1 GOTO 11900
11880 LPRINT"   Exercise 5 response was correct.",A75S: GOTO 11920
11890 LPRINT""
11900 LPRINT"   Exercise 5 response was incorrect.",A75S,B75S
11910 LPRINT""
11920 LPRINT"": IF I76=1 GOTO 11950
11930 LPRINT"   Exercise 6 response was correct.",A76S: GOTO 11970
11940 LPRINT""
11950 LPRINT"   Exercise 6 response was incorrect.",A76S,B76S
11960 LPRINT""
11970 LPRINT"": IF I77=1 GOTO 12000
11980 LPRINT"   Exercise 7 response was correct.",A77S: GOTO 12020
11990 LPRINT""
12000 LPRINT"   Exercise 7 response was incorrect.",A77S,B77S
12010 LPRINT""
12020 IF K7<1 GOTO 12620
12030 LPRINT"": IF J71=1 GOTO 12060
12040 LPRINT"   Problem 1 response was correct.",C71S: GOTO 12080
12050 LPRINT""
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12060 LPRINT"   Problem 1 response was incorrect.",C71$,D71$
12070 LPRINT""
12080 IF K7<2 GOTO 12620
12090 LPRINT"": IF J72=1 GOTO 12120
12100 LPRINT"   Problem 2 response was correct.",C72$: GOTO 12140
12110 LPRINT""
12120 LPRINT"   Problem 2 response was incorrect.",C72$,D72$
12130 LPRINT""
12140 IF K7<3 GOTO 12620
12150 LPRINT"": IF J73=1 GOTO 12180
12160 LPRINT"   Problem 3 response was correct.",C73$: GOTO 12200
12170 LPRINT""
12180 LPRINT"   Problem 3 response was incorrect.",C73$,D73$
12190 LPRINT""
12200 IF K7<4 GOTO 12620
12210 LPRINT"": IF J74=1 GOTO 12240
12220 LPRINT"   Problem 4 response was correct.",C74$: GOTO 12260
12230 LPRINT""
12240 LPRINT"   Problem 4 response was incorrect.",C74$,D74$
12250 LPRINT""
12260 IF K7<5 GOTO 12620
12270 LPRINT"": IF J75=1 GOTO 12300
12280 LPRINT"   Problem 5 response was correct.",C75$: GOTO 12320
12290 LPRINT""
12300 LPRINT"   Problem 5 response was incorrect.",C75$,D75$
12310 LPRINT""
12320 IF K7<6 GOTO 12620
12330 LPRINT"": IF J76=1 GOTO 12360
12340 LPRINT"   Problem 6 response was correct.",C76$: GOTO 12380
12350 LPRINT""
12360 LPRINT"   Problem 6 response was incorrect.",C76$,D76$
12370 LPRINT""
12380 IF K7<7 GOTO 12620
12390 LPRINT"": IF J77=1 GOTO 12420
12400 LPRINT"   Problem 7 response was correct.",C77$: GOTO 12440
12410 LPRINT""
12420 LPRINT"   Problem 7 response was incorrect.",C77$,D77$
12430 LPRINT""
12440 IF K7<8 GOTO 12620
12450 LPRINT"": IF J78=1 GOTO 12480
12460 LPRINT"   Problem 8 response was correct.",C78$: GOTO 12500
12470 LPRINT""
12480 LPRINT"   Problem 8 response was incorrect.",C78$,D78$
12490 LPRINT""
12500 IF K7<9 GOTO 12620
12510 LPRINT"": IF J79=1 GOTO 12540
12520 LPRINT"   Problem 9 response was correct.",C79$: GOTO 12560
12530 LPRINT""
12540 LPRINT"   Problem 9 response was incorrect.",C79$,D79$
12550 LPRINT""
12560 IF K7<10 GOTO 12620
12570 LPRINT"": IF J710=1 GOTO 12600
12580 LPRINT"   Problem 10 response was correct.",C710$: GOTO 12620
12590 LPRINT""
12600 LPRINT"   Problem 10 response was incorrect.",C710$,D710$
12610 LPRINT""
12620 CLS
12630 LOCATE 4,1
12640 PRINT"                    This is the end of this lesson. Thank you for"
12650 PRINT""
12660 PRINT"           your participation and have a nice day."
```

APPENDIX B

AREAS AND ORDINATES OF THE UNIT NORMAL DISTRIBUTION

TABLE B: AREAS AND ORDINATES OF THE UNIT NORMAL DISTRIBUTION

z	Area Below	Area Above	Ordinate
-3.00	.0013	.9987	.0044
-2.99	.0014	.9986	.0046
-2.98	.0014	.9986	.0047
-2.97	.0015	.9985	.0048
-2.96	.0015	.9985	.0050
-2.95	.0016	.9984	.0051
-2.94	.0016	.9984	.0053
-2.93	.0017	.9983	.0055
-2.92	.0018	.9982	.0056
-2.91	.0018	.9982	.0058
-2.90	.0019	.9981	.0060
-2.89	.0019	.9981	.0061
-2.88	.0020	.9980	.0063
-2.87	.0021	.9979	.0065
-2.86	.0021	.9979	.0067
-2.85	.0022	.9978	.0069
-2.84	.0023	.9977	.0071
-2.83	.0023	.9977	.0073
-2.82	.0024	.9976	.0075
-2.81	.0025	.9975	.0077
-2.80	.0026	.9974	.0079
-2.79	.0026	.9974	.0081
-2.78	.0027	.9973	.0084
-2.77	.0028	.9972	.0086
-2.76	.0029	.9971	.0088
-2.75	.0030	.9970	.0091
-2.74	.0031	.9969	.0093
-2.73	.0032	.9968	.0096
-2.72	.0033	.9967	.0099
-2.71	.0034	.9966	.0101
-2.70	.0035	.9965	.0104
-2.69	.0036	.9964	.0107
-2.68	.0037	.9963	.0110
-2.67	.0038	.9962	.0113
-2.66	.0039	.9961	.0116
-2.65	.0040	.9960	.0119
-2.64	.0041	.9959	.0122
-2.63	.0043	.9957	.0126
-2.62	.0044	.9956	.0129
-2.61	.0045	.9955	.0132
-2.60	.0047	.9953	.0136
-2.59	.0048	.9952	.0139
-2.58	.0049	.9951	.0143
-2.57	.0051	.9949	.0147
-2.56	.0052	.9948	.0151
-2.55	.0054	.9946	.0154
-2.54	.0055	.9945	.0158
-2.53	.0057	.9943	.0163
-2.52	.0059	.9941	.0167
-2.51	.0060	.9940	.0171

z	Area Below	Area Above	Ordinate
-2.50	.0062	.9938	.0175
-2.49	.0064	.9936	.0180
-2.48	.0066	.9934	.0184
-2.47	.0068	.9932	.0189
-2.46	.0069	.9931	.0194
-2.45	.0071	.9929	.0198
-2.44	.0073	.9927	.0203
-2.43	.0075	.9925	.0208
-2.42	.0078	.9922	.0213
-2.41	.0080	.9920	.0219
-2.40	.0082	.9918	.0224
-2.39	.0084	.9916	.0229
-2.38	.0087	.9913	.0235
-2.37	.0089	.9911	.0241
-2.36	.0091	.9909	.0246
-2.35	.0094	.9906	.0252
-2.34	.0096	.9904	.0258
-2.33	.0099	.9901	.0264
-2.32	.0102	.9898	.0270
-2.31	.0104	.9896	.0277
-2.30	.0107	.9893	.0283
-2.29	.0110	.9890	.0290
-2.28	.0113	.9887	.0297
-2.27	.0116	.9884	.0303
-2.26	.0119	.9881	.0310
-2.25	.0122	.9878	.0317
-2.24	.0125	.9875	.0325
-2.23	.0129	.9871	.0332
-2.22	.0132	.9868	.0339
-2.21	.0136	.9864	.0347
-2.20	.0139	.9861	.0355
-2.19	.0143	.9857	.0363
-2.18	.0146	.9854	.0371
-2.17	.0150	.9850	.0379
-2.16	.0154	.9846	.0387
-2.15	.0158	.9842	.0396
-2.14	.0162	.9838	.0404
-2.13	.0166	.9834	.0413
-2.12	.0170	.9830	.0422
-2.11	.0174	.9826	.0431
-2.10	.0179	.9821	.0440
-2.09	.0183	.9817	.0449
-2.08	.0188	.9812	.0459
-2.07	.0192	.9808	.0468
-2.06	.0197	.9803	.0478
-2.05	.0202	.9798	.0488
-2.04	.0207	.9793	.0498
-2.03	.0212	.9788	.0508
-2.02	.0217	.9783	.0519
-2.01	.0222	.9778	.0529

z	Area Below	Area Above	Ordinate	z	Area Below	Area Above	Ordinate
-2.00	.0228	.9772	.0540	-1.50	.0668	.9332	.1295
-1.99	.0233	.9767	.0551	-1.49	.0681	.9319	.1315
-1.98	.0239	.9761	.0562	-1.48	.0694	.9306	.1334
-1.97	.0244	.9756	.0573	-1.47	.0708	.9292	.1354
-1.96	.0250	.9750	.0584	-1.46	.0721	.9279	.1374
-1.95	.0256	.9744	.0596	-1.45	.0735	.9265	.1394
-1.94	.0262	.9738	.0608	-1.44	.0749	.9251	.1415
-1.93	.0268	.9732	.0620	-1.43	.0764	.9236	.1435
-1.92	.0274	.9726	.0632	-1.42	.0778	.9222	.1456
-1.91	.0281	.9719	.0644	-1.41	.0793	.9207	.1476
-1.90	.0287	.9713	.0656	-1.40	.0808	.9192	.1497
-1.89	.0294	.9706	.0669	-1.39	.0823	.9177	.1518
-1.88	.0301	.9699	.0681	-1.38	.0838	.9162	.1539
-1.87	.0307	.9693	.0694	-1.37	.0853	.9147	.1561
-1.86	.0314	.9686	.0707	-1.36	.0869	.9131	.1582
-1.85	.0322	.9678	.0721	-1.35	.0885	.9115	.1604
-1.84	.0329	.9671	.0734	-1.34	.0901	.9099	.1626
-1.83	.0336	.9664	.0748	-1.33	.0918	.9082	.1647
-1.82	.0344	.9656	.0761	-1.32	.0934	.9066	.1669
-1.81	.0351	.9649	.0775	-1.31	.0951	.9049	.1691
-1.80	.0359	.9641	.0790	-1.30	.0968	.9032	.1714
-1.79	.0367	.9633	.0804	-1.29	.0985	.9015	.1736
-1.78	.0375	.9625	.0818	-1.28	.1003	.8997	.1758
-1.77	.0384	.9616	.0833	-1.27	.1020	.8980	.1781
-1.76	.0392	.9608	.0848	-1.26	.1038	.8962	.1804
-1.75	.0401	.9599	.0863	-1.25	.1056	.8944	.1826
-1.74	.0409	.9591	.0878	-1.24	.1075	.8925	.1849
-1.73	.0418	.9582	.0893	-1.23	.1093	.8907	.1872
-1.72	.0427	.9573	.0909	-1.22	.1112	.8888	.1895
-1.71	.0436	.9564	.0925	-1.21	.1131	.8869	.1919
-1.70	.0446	.9554	.0940	-1.20	.1151	.8849	.1942
-1.69	.0455	.9545	.0957	-1.19	.1170	.8830	.1965
-1.68	.0465	.9535	.0973	-1.18	.1190	.8810	.1989
-1.67	.0475	.9525	.0989	-1.17	.1210	.8790	.2012
-1.66	.0485	.9515	.1006	-1.16	.1230	.8770	.2036
-1.65	.0495	.9505	.1023	-1.15	.1251	.8749	.2059
-1.64	.0505	.9495	.1040	-1.14	.1271	.8729	.2083
-1.63	.0516	.9484	.1057	-1.13	.1292	.8708	.2107
-1.62	.0526	.9474	.1074	-1.12	.1314	.8686	.2131
-1.61	.0537	.9463	.1092	-1.11	.1335	.8665	.2155
-1.60	.0548	.9452	.1109	-1.10	.1357	.8643	.2179
-1.59	.0559	.9441	.1127	-1.09	.1379	.8621	.2203
-1.58	.0571	.9429	.1145	-1.08	.1401	.8599	.2227
-1.57	.0582	.9418	.1163	-1.07	.1423	.8577	.2251
-1.56	.0594	.9406	.1182	-1.06	.1446	.8554	.2275
-1.55	.0606	.9394	.1200	-1.05	.1469	.8531	.2299
-1.54	.0618	.9382	.1219	-1.04	.1492	.8508	.2323
-1.53	.0630	.9370	.1238	-1.03	.1515	.8485	.2347
-1.52	.0643	.9357	.1257	-1.02	.1539	.8461	.2371
-1.51	.0655	.9345	.1276	-1.01	.1562	.8438	.2396

z	Area Below	Area Above	Ordinate	z	Area Below	Area Above	Ordinate
-1.00	.1587	.8413	.2420	-0.50	.3085	.6915	.3521
-0.99	.1611	.8389	.2444	-0.49	.3121	.6879	.3538
-0.98	.1635	.8365	.2468	-0.48	.3156	.6844	.3555
-0.97	.1660	.8340	.2492	-0.47	.3192	.6808	.3572
-0.96	.1685	.8315	.2516	-0.46	.3228	.6772	.3589
-0.95	.1711	.8289	.2541	-0.45	.3264	.6736	.3605
-0.94	.1736	.8264	.2565	-0.44	.3300	.6700	.3621
-0.93	.1762	.8238	.2589	-0.43	.3336	.6664	.3637
-0.92	.1788	.8212	.2612	-0.42	.3372	.6628	.3653
-0.91	.1814	.8186	.2637	-0.41	.3409	.6591	.3668
-0.90	.1841	.8159	.2661	-0.40	.3446	.6554	.3683
-0.89	.1867	.8133	.2685	-0.39	.3483	.6517	.3697
-0.88	.1894	.8106	.2709	-0.38	.3520	.6480	.3712
-0.87	.1922	.8078	.2732	-0.37	.3557	.6443	.3725
-0.86	.1949	.8051	.2756	-0.36	.3594	.6406	.3739
-0.85	.1977	.8023	.2780	-0.35	.3632	.6368	.3752
-0.84	.2005	.7995	.2803	-0.34	.3669	.6331	.3765
-0.83	.2033	.7967	.2827	-0.33	.3707	.6293	.3778
-0.82	.2061	.7939	.2850	-0.32	.3745	.6255	.3790
-0.81	.2090	.7910	.2874	-0.31	.3782	.6217	.3802
-0.80	.2119	.7881	.2897	-0.30	.3821	.6179	.3814
-0.79	.2148	.7852	.2920	-0.29	.3859	.6141	.3825
-0.78	.2177	.7823	.2943	-0.28	.3897	.6103	.3836
-0.77	.2206	.7794	.2966	-0.27	.3936	.6064	.3847
-0.76	.2236	.7764	.2989	-0.26	.3974	.6026	.3857
-0.75	.2266	.7734	.3011	-0.25	.4013	.5987	.3867
-0.74	.2297	.7703	.3034	-0.24	.4052	.5948	.3876
-0.73	.2327	.7673	.3056	-0.23	.4090	.5910	.3885
-0.72	.2358	.7642	.3079	-0.22	.4129	.5871	.3894
-0.71	.2389	.7611	.3101	-0.21	.4168	.5832	.3902
-0.70	.2420	.7580	.3122	-0.20	.4207	.5793	.3910
-0.69	.2451	.7549	.3144	-0.19	.4247	.5753	.3918
-0.68	.2483	.7517	.3166	-0.18	.4286	.5714	.3925
-0.67	.2514	.7486	.3187	-0.17	.4325	.5675	.3932
-0.66	.2546	.7454	.3209	-0.16	.4364	.5636	.3939
-0.65	.2578	.7422	.3220	-0.15	.4404	.5596	.3945
-0.64	.2611	.7389	.3251	-0.14	.4443	.5557	.3951
-0.63	.2643	.7357	.3271	-0.13	.4483	.5517	.3956
-0.62	.2676	.7324	.3292	-0.12	.4522	.5478	.3961
-0.61	.2709	.7291	.3312	-0.11	.4562	.5438	.3965
-0.60	.2743	.7257	.3332	-0.10	.4602	.5398	.3970
-0.59	.2776	.7224	.3352	-0.09	.4641	.5359	.3973
-0.58	.2810	.7190	.3372	-0.08	.4681	.5319	.3977
-0.57	.2843	.7157	.3391	-0.07	.4721	.5279	.3980
-0.56	.2877	.7123	.3410	-0.06	.4761	.5239	.3982
-0.55	.2912	.7088	.3429	-0.05	.4801	.5199	.3984
-0.54	.2946	.7054	.3448	-0.04	.4840	.5160	.3986
-0.53	.2981	.7019	.3467	-0.03	.4880	.5120	.3988
-0.52	.3015	.6985	.3485	-0.02	.4920	.5080	.3989
-0.51	.3050	.6950	.3503	-0.01	.4960	.5040	.3989

z	Area Below	Area Above	Ordinate
0.00	.5000	.5000	.3989
0.01	.5040	.4960	.3989
0.02	.5080	.4920	.3989
0.03	.5120	.4880	.3988
0.04	.5160	.4840	.3986
0.05	.5199	.4801	.3984
0.06	.5239	.4761	.3982
0.07	.5279	.4721	.3980
0.08	.5319	.4681	.3977
0.09	.5359	.4641	.3973
0.10	.5398	.4602	.3970
0.11	.5438	.4562	.3965
0.12	.5478	.4522	.3961
0.13	.5517	.4483	.3956
0.14	.5557	.4443	.3951
0.15	.5596	.4404	.3945
0.16	.5636	.4364	.3939
0.17	.5675	.4325	.3932
0.18	.5714	.4286	.3925
0.19	.5753	.4247	.3918
0.20	.5793	.4207	.3910
0.21	.5832	.4168	.3902
0.22	.5871	.4129	.3894
0.23	.5910	.4090	.3885
0.24	.5948	.4052	.3876
0.25	.5987	.4013	.3867
0.26	.6026	.3974	.3857
0.27	.6064	.3936	.3847
0.28	.6103	.3897	.3836
0.29	.6141	.3859	.3825
0.30	.6179	.3821	.3814
0.31	.6217	.3783	.3802
0.32	.6255	.3745	.3790
0.33	.6293	.3707	.3778
0.34	.6331	.3669	.3765
0.35	.6368	.3632	.3752
0.36	.6406	.3594	.3739
0.37	.6443	.3557	.3725
0.38	.6480	.3520	.3712
0.39	.6517	.3483	.3697
0.40	.6554	.3446	.3683
0.41	.6591	.3409	.3668
0.42	.6628	.3372	.3653
0.43	.6664	.3336	.3637
0.44	.6700	.3300	.3621
0.45	.6736	.3264	.3605
0.46	.6772	.3228	.3589
0.47	.6808	.3192	.3572
0.48	.6844	.3156	.3555
0.49	.6879	.3121	.3538
0.50	.6915	.3085	.3521
0.51	.6950	.3050	.3503
0.52	.6985	.3015	.3485
0.53	.7019	.2981	.3467
0.54	.7054	.2946	.3448
0.55	.7088	.2912	.3429
0.56	.7122	.2877	.3410
0.57	.7157	.2843	.3391
0.58	.7190	.2810	.3372
0.59	.7224	.2776	.3352
0.60	.7257	.2743	.3332
0.61	.7291	.2709	.3312
0.62	.7324	.2676	.3292
0.63	.7357	.2643	.3271
0.64	.7389	.2611	.3251
0.65	.7422	.2578	.3230
0.66	.7454	.2546	.3209
0.67	.7486	.2514	.3187
0.68	.7517	.2483	.3166
0.69	.7549	.2451	.3144
0.70	.7580	.2420	.3123
0.71	.7611	.2389	.3101
0.72	.7642	.2358	.3079
0.73	.7673	.2327	.3056
0.74	.7704	.2296	.3034
0.75	.7734	.2266	.3011
0.76	.7764	.2236	.2989
0.77	.7794	.2206	.2966
0.78	.7823	.2177	.2943
0.79	.7852	.2148	.2920
0.80	.7881	.2119	.2897
0.81	.7910	.2090	.2874
0.82	.7939	.2061	.2850
0.83	.7967	.2033	.2827
0.84	.7995	.2005	.2803
0.85	.8023	.1977	.2780
0.86	.8051	.1949	.2756
0.87	.8078	.1922	.2732
0.88	.8106	.1894	.2709
0.89	.8133	.1867	.2685
0.90	.8159	.1841	.2661
0.91	.8186	.1814	.2637
0.92	.8212	.1788	.2613
0.93	.8238	.1762	.2589
0.94	.8264	.1736	.2565
0.95	.8289	.1711	.2541
0.96	.8315	.1685	.2516
0.97	.8340	.1660	.2492
0.98	.8365	.1635	.2468
0.99	.8389	.1611	.2444

z	Area Below	Area Above	Ordinate	z	Area Below	Area Above	Ordinate
1.00	.8413	.1587	.2420	1.50	.9332	.0668	.1295
1.01	.8438	.1562	.2396	1.51	.9345	.0655	.1276
1.02	.8461	.1539	.2371	1.52	.9357	.0643	.1257
1.03	.8485	.1515	.2347	1.53	.9370	.0630	.1238
1.04	.8508	.1492	.2323	1.54	.9382	.0618	.1219
1.05	.8531	.1469	.2299	1.55	.9394	.0606	.1200
1.06	.8554	.1446	.2275	1.56	.9406	.0594	.1182
1.07	.8577	.1423	.2251	1.57	.9418	.0582	.1163
1.08	.8599	.1401	.2227	1.58	.9429	.0571	.1145
1.09	.8621	.1379	.2203	1.59	.9441	.0559	.1127
1.10	.8643	.1357	.2179	1.60	.9452	.0548	.1109
1.11	.8665	.1335	.2155	1.61	.9463	.0537	.1092
1.12	.8686	.1314	.2131	1.62	.9474	.0526	.1074
1.13	.8708	.1292	.2107	1.63	.9484	.0516	.1057
1.14	.8729	.1271	.2083	1.64	.9495	.0505	.1040
1.15	.8749	.1251	.2059	1.65	.9505	.0495	.1023
1.16	.8770	.1230	.2036	1.66	.9515	.0485	.1006
1.17	.8790	.1210	.2012	1.67	.9525	.0475	.0989
1.18	.8810	.1190	.1989	1.68	.9535	.0465	.0973
1.19	.8830	.1170	.1965	1.69	.9545	.0455	.0957
1.20	.8849	.1151	.1942	1.70	.9554	.0446	.0940
1.21	.8869	.1131	.1919	1.71	.9564	.0436	.0925
1.22	.8888	.1112	.1895	1.72	.9573	.0427	.0909
1.23	.8907	.1093	.1872	1.73	.9582	.0418	.0893
1.24	.8925	.1075	.1849	1.74	.9591	.0409	.0878
1.25	.8944	.1056	.1826	1.75	.9599	.0401	.0863
1.26	.8962	.1038	.1804	1.76	.9608	.0392	.0848
1.27	.8980	.1020	.1781	1.77	.9616	.0384	.0833
1.28	.8997	.1003	.1758	1.78	.9625	.0375	.0818
1.29	.9015	.0985	.1736	1.79	.9633	.0367	.0804
1.30	.9032	.0968	.1714	1.80	.9641	.0359	.0790
1.31	.9049	.0951	.1691	1.81	.9649	.0351	.0775
1.32	.9066	.0934	.1669	1.82	.9656	.0344	.0761
1.33	.9082	.0918	.1647	1.83	.9664	.0336	.0748
1.34	.9099	.0901	.1626	1.84	.9671	.0329	.0734
1.35	.9115	.0885	.1604	1.85	.9678	.0322	.0721
1.36	.9131	.0869	.1582	1.86	.9686	.0314	.0707
1.37	.9147	.0853	.1561	1.87	.9693	.0307	.0694
1.38	.9162	.0838	.1539	1.88	.9699	.0301	.0681
1.39	.9177	.0823	.1518	1.89	.9706	.0294	.0669
1.40	.9192	.0808	.1497	1.90	.9713	.0287	.0656
1.41	.9207	.0793	.1476	1.91	.9719	.0281	.0644
1.42	.9222	.0778	.1456	1.92	.9726	.0274	.0632
1.43	.9236	.0764	.1435	1.93	.9732	.0268	.0620
1.44	.9251	.0749	.1415	1.94	.9738	.0262	.0608
1.45	.9265	.0735	.1394	1.95	.9744	.0256	.0596
1.46	.9279	.0721	.1374	1.96	.9750	.0250	.0584
1.47	.9292	.0708	.1354	1.97	.9756	.0244	.0573
1.48	.9306	.0694	.1334	1.98	.9761	.0239	.0562
1.49	.9319	.0681	.1315	1.99	.9767	.0233	.0551

z	Area Below	Area Above	Ordinate
2.00	.9772	.0228	.0540
2.01	.9778	.0222	.0529
2.02	.9783	.0217	.0519
2.03	.9788	.0212	.0508
2.04	.9793	.0207	.0498
2.05	.9798	.0202	.0488
2.06	.9803	.0197	.0478
2.07	.9808	.0192	.0468
2.08	.9812	.0188	.0459
2.09	.9817	.0183	.0449
2.10	.9821	.0179	.0440
2.11	.9826	.0174	.0431
2.12	.9830	.0170	.0422
2.13	.9834	.0166	.0413
2.14	.9838	.0162	.0404
2.15	.9842	.0158	.0396
2.16	.9846	.0154	.0387
2.17	.9850	.0150	.0379
2.18	.9854	.0146	.0371
2.19	.9857	.0143	.0362
2.20	.9861	.0139	.0355
2.21	.9864	.0136	.0347
2.22	.9868	.0132	.0339
2.23	.9871	.0129	.0332
2.24	.9875	.0125	.0325
2.25	.9878	.0122	.0317
2.26	.9881	.0119	.0310
2.27	.9884	.0116	.0303
2.28	.9887	.0113	.0297
2.29	.9890	.0110	.0290
2.30	.9893	.0107	.0283
2.31	.9896	.0104	.0277
2.32	.9898	.0102	.0270
2.33	.9901	.0099	.0264
2.34	.9904	.0096	.0258
2.35	.9906	.0094	.0252
2.36	.9909	.0091	.0246
2.37	.9911	.0089	.0241
2.38	.9913	.0087	.0235
2.39	.9916	.0084	.0229
2.40	.9918	.0082	.0224
2.41	.9920	.0080	.0219
2.42	.9922	.0078	.0213
2.43	.9925	.0075	.0208
2.44	.9927	.0073	.0203
2.45	.9929	.0071	.0198
2.46	.9931	.0069	.0194
2.47	.9932	.0068	.0189
2.48	.9934	.0066	.0184
2.49	.9936	.0064	.0180
2.50	.9938	.0062	.0175
2.51	.9940	.0060	.0171
2.52	.9941	.0059	.0167
2.53	.9943	.0057	.0163
2.54	.9945	.0055	.0158
2.55	.9946	.0054	.0154
2.56	.9948	.0052	.0151
2.57	.9949	.0051	.0147
2.58	.9951	.0049	.0143
2.59	.9952	.0048	.0139
2.60	.9953	.0047	.0136
2.61	.9955	.0045	.0132
2.62	.9956	.0044	.0129
2.63	.9957	.0043	.0126
2.64	.9959	.0041	.0122
2.65	.9960	.0040	.0119
2.66	.9961	.0039	.0116
2.67	.9962	.0038	.0113
2.68	.9962	.0037	.0110
2.69	.9964	.0036	.0107
2.70	.9965	.0035	.0104
2.71	.9966	.0034	.0101
2.72	.9967	.0033	.0099
2.73	.9968	.0032	.0096
2.74	.9969	.0031	.0093
2.75	.9970	.0030	.0091
2.76	.9971	.0029	.0088
2.77	.9972	.0028	.0086
2.78	.9973	.0027	.0084
2.79	.9974	.0026	.0081
2.80	.9974	.0026	.0079
2.81	.9975	.0025	.0077
2.82	.9976	.0024	.0075
2.83	.9977	.0023	.0073
2.84	.9977	.0023	.0071
2.85	.9978	.0022	.0069
2.86	.9979	.0021	.0067
2.87	.9979	.0021	.0065
2.88	.9980	.0020	.0063
2.89	.9981	.0019	.0061
2.90	.9981	.0019	.0060
2.91	.9982	.0018	.0058
2.92	.9982	.0018	.0056
2.93	.9983	.0017	.0055
2.94	.9984	.0016	.0053
2.95	.9984	.0016	.0051
2.96	.9985	.0015	.0050
2.97	.9985	.0015	.0048
2.98	.9986	.0014	.0047
2.99	.9986	.0014	.0046
3.00	.9987	.0013	.0044

APPENDIX C

STUDENT EVALUATION FORM

Please use the following scale to respond to each item.

SA - Strongly Agree

A - Agree

N - Neither Agree nor Disagree

D - Disagree

SD - Strongly Disagree

Please circle the appropriate response for each question.

Objectives and Pretest

1. I understood the objectives of this lesson.

   a. SA b. A c. N d. D e. SD

2. The objectives helped me understand what I had to learn.

   a. SA b. A c. N d. D e. SD

3. The pretest helped me identify the parts of the lesson I already knew.

   a. SA b. A c. N d. D e. SD

Content

4. The content of this lesson was given in a logical order.

   a. SA b. A c. N d. D e. SD

5. The lesson was given at the right level of depth.

   a. SA b. A c. N d. D e. SD

6. There was enough information given in this lesson.

a. SA b. A c. N d. D e. SD

7. The language used in this lesson was difficult to understand.

a. SA b. A c. N d. D e. SD

8. The examples were helpful to understand the concepts.

a. SA b. A c. N d. D e. SD

9. There were enough examples given.

a. SA b. A c. N d. D e. SD

10. Directions for question response were clear.

a. SA b. A c. N d. D e. SD

11. Information given in this lesson will probably be useful in the future.

a. SA b. A c. N d. D e. SD

Questions during the lessons

12. The questions helped gauge whether I knew the concepts.

a. SA b. A c. N d. D e. SD

13. There were enough questions.

a. SA b. A c. N d. D e. SD

14. Explanations given after my responses helped me understand concepts.

a. SA b. A c. N d. D e. SD

Posttest

15. The posttest questions asked different things than had been taught.

a. SA b. A c. N d. D e. SD

16. Posttest questions were clearly worded.

a. SA b. A c. N d. D e. SD

17. Posttest questions covered all the important points in the lesson.

a. SA b. A c. N d. D e. SD

18. Posttest questions were generally fair.

a. SA b. A c. N d. D e. SD

Technical

19. The screens were easy to read.

a. SA b. A c. N d. D e. SD

20. There were too many words on the screens.

a. SA b. A c. N d. D e. SD

21. The graphics reinforced the concepts.

a. SA b. A c. N d. D e. SD

22. The colors were distracting.

a. SA b. A c. N d. D e. SD

General

23. I generally liked studying this lesson.

a. SA b. A c. N d. D e. SD

24. I generally found the terminal easy to use.

    a. SA b. A c. N d. D e. SD

25. The prerequisites were appropriate for this lesson.

    a. SA b. A c. N d. D e. SD

26. What did you like most about the lesson?

27. What did you dislike most about the lesson?

28. What parts were confusing?

29. What parts were boring?

30. Did you have any specific problems operating the terminal?

31. Write any additional comments about this lesson.

APPENDIX D

THE NORMAL DISTRIBUTION FAMILY AND STANDARD SCORES

POSTTEST

P. Dinkins Name _____

Place the letter of the option that best answers each of the following in the blank space provided on the answer sheet.

___ 1. Which of these is not a characteristic of a normal distribution?

a. a bell-shaped graph
b. one mode
c. its median is never smaller than its mode
d. graph is asymptotic to the horizontal axis
e. its mean is sometimes smaller than its mode

___ 2. One normal distribution A has a mean of 80 and a standard deviation of 14. A second normal distribution B has a mean of 80 and a standard deviation of 15. If the graphs of the two distributions are approximated by the same formula, then:

a. curve A is flatter than curve B
b. curve B is flatter than curve A
c. curve A and curve B coincide
d. the comparative shapes of the two curves cannot be determined from the information given

___ 3. A normal distribution has a mean of 69 and a standard deviation of 8. The points of inflection of its graph occur at x = ?

a. 8 and 69
b. 8 and 77
c. 61 and 69
d. 61 and 77
e. 69 and 77

___ 4. The mean and standard deviation of the unit normal distribution are:

a. 0 and -1, respectively
b. 0 and 1, respectively
c. 1 and 0, respectively
d. 1 and -1, respectively

___ 5. The height of the unit normal curve at z = -1.07 is?

a. .1423
b. .2251
c. .8577
d. 1.0000
e. none of the above

___ 6. If the ordinate on the unit normal curve equals .1919, then:

a. z = -1.21
b. z = +1.21
c. z = +1.91
d. z = +1.92
e. a and b

___ 7. A normal distribution of raw scores has a standard deviation of 8. If the raw-score of 63 in the normal distribution has a z-score of -1.50, what is the mean of the raw-scores?

a. 51
b. 55
c. 71
d. 75
e. none of the above

___ 8. A normal distribution has a mean of 94 and a standard deviation of 6. What is the corresponding raw-score if the z-score = -2.50?

a. 78
b. 85
c. 94
d. 109
e. none of the above

___ 9. The z-score provides information regarding how far a given raw-score is:

a. from the mean in units of standard deviation
b. from the mean in percentage units
c. from the lowest score in percentile units
d. from the highest score in standard deviation units
e. from the standard deviation in units of mean

___ 10. Assume that IQ scores are normally distributed with mean = 100 and standard deviation = 15. Approximately, what percent of a tested population is expected to have an IQ score below 79?

a. 7.92%
b. 8.08%
c. 15.00%
d. 21.00%
e. 91.92%

___ 11. Assume that men's heights are normally distributed with mean = 68.5 in. and standard deviation of 2.6 in. Approximately, how many men in 1000 are expected to have a height of 71.1 in. or taller.

a. 159
b. 161
c. 711
d. 841
e. none of the above

___ 12. Which of these reflects the poorest performance on a test?

a. z-score = -1.01
b. raw-score is 1 standard deviation below the mean
c. a percentile rank of 11.51
d. z-score = 0
e. raw-score is 0.2 standard deviation above the mean

___13. What is the proportion of the area under the unit normal curve lying between z = -1.48 and z = -0.20?

a. 0.3429
b. 0.3513
c. 0.6487
d. 1.2800
e. none of the above

___ 14. Determine the percent of area under the unit normal curve lying below z = -0.11 and above z = 1.21.

a. 11.37%
b. 43.07%
c. 45.62%
d. 56.93%
e. 61.29%

___ 15. The area under the unit normal curve lying between z1 and z2 is .1113. If z2 is greater than z1 and the area below z2 equals 0.5517, then z1 = ?

a. -0.15
b. -0.13
c. +0.13
d. +0.15
e. +0.44

___ 16. A group of test scores are normally distributed with mean = 85 and standard deviation = 4. Approximately, what percent of the scores should lie between 81 and 91?

a. 10.00%
b. 15.87%
c. 22.55%
d. 77.45%
e. 93.32%

___ 17. A group of observations are normally distributed with mean = 100 and standard deviation = 16. Approximately, what is the proportion of observations falling below 84 and above 108?

a. 0.1587
b. 0.3085
c. 0.4672
d. 0.5328
e. none of the above

___ 18. Which of the following is <u>not</u> true?

a. The mean and standard deviation of the z-score system are 0 and 1, respectively
b. The mean and standard deviation of the T-score system are 50 and 10, respectively
c. The mean and standard deviation of the Wechsler Intelligence Scales are 100 and 20, respectively
d. The percentile rank of the Wechsler IQ score of 100 is 50

___ 19. Which of the following reflects the best performance on a test?

a. Test A: z-score = +0.50
b. Test B: T-score = 60
c. Test C: a percentile rank of 60
d. Test D: Wechsler IQ score = 110

___ 20. A given raw-score has a z-score value of +1.40. What is the corresponding T-score of this raw-score?

a. 36
b. 46
c. 64
d. 74
e. none of the above

VITA

Preston Dinkins, son of Horace and Myrtis L. Dinkins, was born in Grand Cane, Louisiana on November 18, 1944. After graduating from DeSoto High School in 1962, he entered Southern University in Baton Rouge, Louisiana.

In 1966, he received a Bachelor of Science degree in the Department of Mathematics at Southern University, Baton Rouge campus. In 1968, he received a Master of Arts degree in the Department of Mathematics at the University of Oklahoma in Norman, Oklahoma. In 1968, he accepted a position as instructor of Mathematics at Southern University in Baton Rouge, Louisiana.

From 1969-71, he served as a commissioned officer in the U.S. Army Air Defense Artillery Corp, eventually obtaining the rank of captain. In 1971, he returned to Southern University in Baton Rouge, Louisiana as an Instructor of Mathematics.

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DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Preston Dinkins

Major Field: Educational Research

Title of Dissertation: Development of a Computer-Assisted Instruction Courseware Package in Statistics and a Comparative Analysis of Three Management Strategies for this Courseware

Approved:

Richard G. Lomax
Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

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Date of Examination:

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