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STAT HELPER I Student Version

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STAT HELPER 1

STUDENT VERSION

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INTRODUCTION

- Stat Helper 1 is an **interactive program** which is designed to guide you through the process of statistical problem solving. It differs from many other statistical software packages in that it does not allow the manipulation of raw data.
- **Assumptions:** we have assumed that you have some knowledge of: 1) the general operations of the Macintosh, and 2) statistical terminology and notation.
- The **goals** of this program are to help you learn to structure the way you read problems, to identify key elements of problems, and to recognize the types of problems that arise in Statistics.
- The **basic concept** behind this program is the notion that problem solving need not be a mysterious intuitive process. An experienced statistician approaches problems by asking a sequence of fairly simple questions, and is then able to identify or classify a problem. Once this process is completed, the few bits of information which are hidden in the wording of the problem must be organized. The skill at this second phase is knowing what bits to look for and how to organize them.
- At the heart of this software is a **Decision Tree**, which leads you through the problem identification phase. The tree was designed to give you tools to develop your problem solving ability.
- You are also able to work through some self-correcting **Word Problems** in the decision tree, which will guide you to the correct answers.
- The software also features **Input Screens**, which will help you organize the numerical information which you have extracted from a problem.

FILE MENU

Word Problems

- this option will allow you to work through a set of **self-correcting** word problems in a decision tree
- once you select this option you will see an **item selection box**, which you can use to choose the word problem you wish to work through
- the **word problem** will be shown in a box on the top of the screen
- a **set of questions** will be shown below the word problem, and you should click in the box which, in the context of this problem, can be answered "yes"
 - if you click in the correct box, you will see the next set of questions
 - if you do not click in the correct box, you will see an alert box which will guide you to the correct choice
- you will be guided in a similar manner through a series of sets of questions, leading to a box indicating the **type of problem** with which you're working
- the decision tree **scrolls**, so you can see the sequence of questions which lead to a particular type of problem
- next, click on the "**continue**" button to solve the problem
- enter the **appropriate values in the boxes** indicated and click on the "solve" button - the word problem will continue to be shown at the top of the screen and the problem solution will be calculated.

Decision Tree

- problem identification**: the decision tree option will help you identify types of statistics problems by allowing you to answer a series of questions - the program will then classify the problem.

- there are **3 ways** to use the decision tree option:
 - use it to work through a problem from your textbook
 - use it to look for the sequence of questions which indicates a certain type of problem (e.g., how to determine a sample size problem)
 - use it to see where a certain sequence of questions leads
- you will see a **set of questions**, and you should click in the box which contains the question to which you want to answer "yes"
- your response leads you to another set of questions, to be answered in a similar manner, leading eventually to a box indicating the **type of problem** with which you're working
- the decision tree **scrolls**, so you can see the sequence of questions which lead to a particular type of problem
 - next, click on the "**continue**" button if you want to solve a problem
 - enter the **appropriate values in the boxes** indicated and click on the "solve" button - the problem solution will then be calculated.

COUNTING PROBLEMS MENU

Permutations

- enter the number of items from which the ordered subset is to be selected
- enter the number of items to be ordered or arranged in the subset
- click the "solve" button to determine the number of permutations possible.

Permutations of Like Objects

- enter the number of classes of items which are to be arranged, and then click the "OK" button
- enter the number of items in the population of each class type
- click the "solve" button to find the number of possible permutations.

Combinations

- enter the number of items from which the subset is to be selected
- enter the number of items in the subset
- click the "solve" button to find the number of combinations possible.

Hypergeometric Counting

- enter the number of classes of items from which the subset is to be selected, and then click the "OK" button
- enter the number of items in the population of each class type
- enter the number of items of each class type to be included in the subset
- click the "solve" button to determine the number of possible subsets.

BASIC PROBABILITY MENU

Simple Probability

- this option will allow you to conduct a variety of **simple probability** calculations
- first, you will calculate the **numerator** and then you will calculate the **denominator**
- you have **2 ways** to determine the numerator and denominator values:
 - you can enter a number directly
 - you can compute the number by using the options in the counting problems menu - click on the appropriate button (e.g., combinations or permutations) to work through the calculations
- once the value has been determined, click the "solve" button to enter the value into the numerator or denominator
- the solution (the probability) is shown on the screen.

Probability Tree

- this option allows you to solve some **sequential joint probability** problems
- it is set up to work with **2 events**, labeled A and B
- enter a marginal probability, a conditional probability or a joint probability and then hit either the "**tab**," "**return**," or "**enter**" key
- the value entered will be shown in the **tree**, and any other values which can be computed will also be entered automatically
- continue** until you have entered all of the values given in the problem or until the tree is completed
- then, click the "**done**" button and a message will evaluate the validity of the values entered in the tree.

2 X 2 Probability Table

- this option allows you to solve some **non-sequential joint probability** problems
- it is set up to work with **2 events**, labeled A and B
- enter a marginal probability or a joint probability and then hit either the "**tab**," "**return**," or "**enter**" key
- the value entered will be shown in the **table**, and any other values which can be computed will also be entered automatically
- continue** until you have entered all of the values given in the problem or until the table is completed
- then**, click the "done" button and a message will evaluate the validity of the values entered in the table.

Expectations

- this option will let you find the **expected value and variance** of some probability distributions
- an **initial box** will ask you to enter the number of values which the random value can take (there is a maximum of 4)
- you will then see a **table** containing input boxes where you can enter the values of the random variable and the probability of each value occurring
- click on the button at the bottom of the screen indicating whether you want to compute the expected value alone or the expected value and the variance
- click the "**solve**" button and the value(s) you have selected will be computed and shown in the table.

DISCRETE PROBABILITY DISTRIBUTIONS MENU

- Stat Helper 1 will provide probabilities and plots of various discrete probability distributions

Binomial Distribution

- enter the number in the **sample**
- enter the population **proportion**, or the probability of a "success" in an experimental trial
- enter the value for x, which is the **number of successes** in the problem
- click on the "**solve**" button
- then, a box will appear in which you can select the "**sense**" of the probability in the problem ($<, \leq, =, \geq, >$)
- you will then see another screen which will indicate the **probability** (the solution to the problem) and will **plot** the appropriate binomial probability distribution, with the area of interest shaded in.

Poisson Distribution

- enter the **arrival rate** or rate of occurrence
- enter the value for **x**, which is the **number of occurrences** or arrivals of interest in the problem
- click on the "solve" button
- a box will then appear in which you can select the "sense" of the probability in the problem (<,≤,=,≥,>)
- you will then see another screen which will indicate the **probability** (the solution to the problem) and will **plot** the appropriate Poisson probability distribution, with the area of interest shaded in.

Hypergeometric Distribution

- this option determines hypergeometric probabilities for **two classes** of data
- enter the total number of items in the **population**
- enter the number of items in the population which belong to one of the two classes
- enter the total number of items in the **sample**
- enter the number of items in the sample which belong to one of the two classes
- click on the "solve" button
- then, a box will appear in which you can select the "sense" of the probability in the problem (<,≤,=,≥,>)
- you will then see another screen which will indicate the **probability** (the solution to the problem) and will **plot** the appropriate hypergeometric probability distribution, with the area of interest shaded in.

CONTINUOUS PROBABILITY DISTRIBUTION MENU

Introduction

- Stat Helper 1 will provide **plots** of various continuous probability distributions, and will solve problems related to these distributions. You can print out any plot by clicking the "print" button.
- Probabilities Given Cutoffs:** the options in this menu can be used to find probabilities or areas under a curve if you are given one or more cutoff values for the distribution
 - click on the "area given cutoff" button, which will enable the input boxes on the lower left side of the screen
 - click on the appropriate representation of the area you are interested in finding (the probability of a value greater than the cutoff, a value less than the cutoff, or values between two cutoffs)
 - click on the "solve" button
 - you will then see a plot of the continuous probability distribution, with the appropriate area shaded in and the solution to the problem (the probability) shown above the plot.
- Cutoffs Given Probabilities:** the options in this menu can also be used to find one or more cutoff values for the distribution if you are given a probability or area under a curve
 - click on the "cutoff given area" button, which will enable the input boxes on the lower right side of the screen
 - click on the appropriate representation of the cutoff value(s) you are interested in finding (the cutoff such that the probability is to the left of it, to the right of it, or between two values)
 - click on the "solve" button
 - you will then see a plot of the continuous probability distribution, with

the appropriate area shaded in and the solution to the problem [the cutoff value(s)] shown above the plot.

Exponential Distribution

- enter the value of the arrival or occurrence rate
- select the "area given cutoff" or "cutoff given area" button and proceed as described in the introduction above.
- note: the scale of the plot is marked in units of the exponential distribution.

Normal Distribution

- enter the value of the population mean
- enter the value of the population standard deviation
- select the "area given cutoff" or "cutoff given area" button and proceed as described in the introduction above.
- note: the scale of the plot is marked in units of the standard normal distribution (z values).

p Distribution

- enter the value of the population proportion
- enter the sample size
- enter the size of the population, if it is known
- select the "area given cutoff" or "cutoff given area" button and proceed as described in the introduction above.
- note: the scale of the plot is marked in units of the standard normal distribution (z values).

Chi-Square Distribution

- enter the **sample size**
- enter the value of the population **variance**
- select** the "area given cutoff" or "cutoff given area" button and proceed as described in the introduction above.
- note:** the scale of the plot is marked in units of the chi-square random variable.

x-bar Distribution

- enter the value of the population **mean**
- enter the value of the population **standard deviation**
- enter the **sample size**
- enter the size of the **population**, if it is known
- select** the "area given cutoff" or "cutoff given area" button and proceed as described in the introduction above.
- note:** the scale of the plot is marked in units of the standard normal distribution (z values).

t Distribution

- enter the value of the population **mean**
- enter the value of the sample **standard deviation**
- enter the **sample size**
- enter the size of the **population**, if it is known
- select** the "area given cutoff" or "cutoff given area" button and proceed as described in the introduction above.
- note:** the scale of the plot is marked in units of the t distribution.

SAMPLE SIZE MENU

Sample Size - Means

- enter the **confidence level** that you want for the sample results
- enter the estimate of the population **standard deviation**
- enter the **precision** desired from the sample results
- click on the "solve" button and you'll see the required sample size for the data you've entered
- you'll also see a **plot** of a normal curve and a representation of the confidence interval which you'll be determining with the sample results.

Sample Size - Proportions

- enter the **confidence level** that you want for the sample results
- enter the estimate of the population **proportion**
- enter the **precision** desired from the sample results
- click on the "solve" button and you'll see the required sample size for the data you've entered
- you'll also see a **plot** of a normal curve and a representation of the confidence interval which you'll be determining with the sample results.

ESTIMATION MENU

Estimation With Proportion

- this option allows the calculation of a **confidence interval for a proportion**
 - enter the point estimate of the population proportion, obtained from a sample
 - enter the confidence level desired for the interval
 - enter the sample size
 - click on the "solve" button to see the appropriate confidence interval.

Estimation With Variance

- this option allows the calculation of a **confidence interval for a variance**
 - enter the point estimate of the population variance, obtained from a sample
 - enter the sample size
 - enter the confidence level desired for the interval
 - click on the "solve" button to see the appropriate confidence interval.

t Estimation

- this option allows the calculation of a **confidence interval for a mean**
 - enter the point estimate of the population mean, obtained from a sample
 - enter the value of the sample standard deviation
 - enter the sample size
 - enter the confidence level desired for the interval
 - click on the "solve" button to see the appropriate confidence interval

z Estimation

- this option allows the calculation of a confidence interval for a mean
 - enter the point estimate of the population mean, obtained from a sample
 - enter the value of the population standard deviation
 - enter the sample size
 - enter the confidence level desired for the interval
 - click on the "solve" button to see the appropriate confidence interval

Confidence Interval

• this option allows the calculation of a confidence interval for a variance

Estimation

• this option allows the calculation of a confidence interval for a mean

• enter the point estimate of the population mean, obtained from a sample

• enter the value of the population standard deviation

• enter the sample size

• enter the confidence level desired for the interval

• click on the "solve" button to see the appropriate confidence interval

