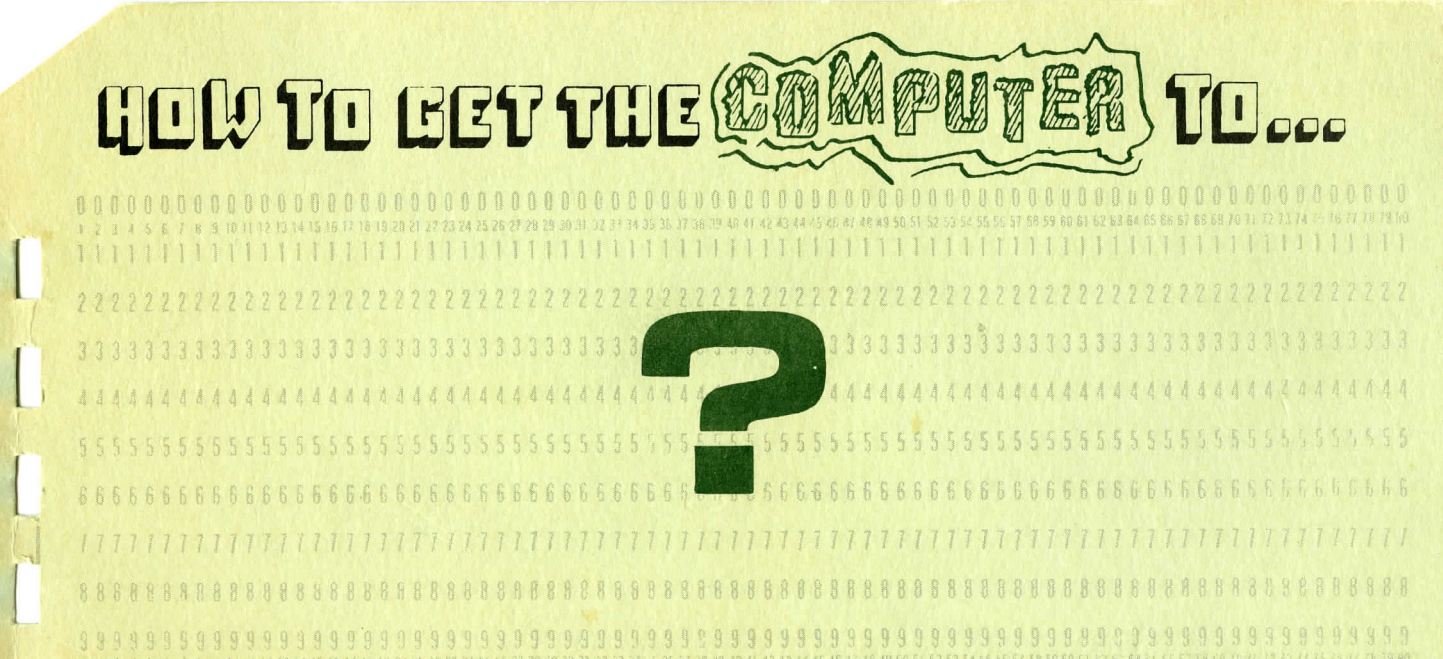
HOW TO GET THE COMPUTER TO...



HOW TO GET A COMPUTER TO . . . .

(FOR THOSE WHO DON'T KNOW THE FIRST THING ABOUT COMPUTERS)

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If you have ever had to compute a statistic, you know that much time ususally is spent accomplishing such a feat. If you are one of those individuals who have been trying to avoid using statistics, or even if you have gone through the painstaking efforts of learning how, pay heed! The purpose of this pamphlet is to show you how you can cut the work time involved in doing certain tasks which ordinarily take weeks to accomplish down to about ten minutes. Tasks like program audits, arranging in alphabetical order and printing lists of certain or all of your clients, tabulating the number and percentage of certain or all of your clients and listing those frequency distributions, without understanding the intricacies of statistics — just receiving the information you want.

For those of you who are a bit skeptical at this point, yes, there is one slight catch: You must be at a location where there is a computer available, specifically a computer that has what is called "SAS" (Statistical Analysis System) installed. To find this out without experiencing the usual anxiety of not being sure of what you are talking about, use the following procedure:

1. Find the telephone number of the Computer Center in your departmental or university phone book.

2. Call the computer center and say the following:

YOU (Optional): "Hello".
THEM (Also optional): "Hello".
YOU: "Is our computer equipped to handle SAS programs?"
THEM (Either): "Yes", "No", or "I don't know. I'll check, hold on".
YOU: "Thank you".
THEM (Optional): "You're welcome".

Then hang up quickly. If their answer is no, file this pamphlet somewhere in case your computer center ever does get SAS. If their answer is yes, you're in luck — read on!

All statistical problems are solved by plugging numbers into a mathematical formula. You could do that yourself, possibly using an adding machine when the problem proved to be too complex. For example, if you had obtained both the heights and the weights of ten people and you wanted to know if there was a relationship between the group's height and weight, the formula you would use (if you didn't use a computer) would be:

Multiply the sum of the heights of the 10 people times the sum of the weights of the 10 people;

Subtract this quantity from the number of people in your sample times the sum of the products of each person's height and weight;

Divide this entire quantity by the square root of the product of the quantity of the number of people in your sample times the sum of their squared heights minus the square of the sum of their heights times the quantity of the number of people in your sample times the sum of their squared weights minus the square of the sum of their weights.

How could a computer solve the problem for you? Let's begin by getting an understanding of what a computer can do. A few years ago someone from the International Business Machines Corporation (IBM), in an effort to explain what a computer does, said it was much like a washing machine. You input your dirty clothes, program the machine (i.e., by setting a dial, you tell it to use warm water, hard washing action, three rinses, a deep rinse, and lastly a long spin), and your output will be clean clothes (unless you forgot to add the correct amount of detergent). On some machines the program might only amount to setting one dial to a location marked "heavy duty wash cycle", while other machines might require you to tell it exactly what to do, step by step. Rather than being able to wash, rinse and spin clothes, a computer can add, subtract, multiply, divide, obtain square roots, logarithms, powers and trigonometric functions of numbers. It is not much more than an elaborate adding machine. What makes it elaborate is that it can remember numbers and names that might be associated with those numbers (e.g., a person's name, social security number, sex, etc.). Even more importantly it can remember the instructions that tell it what to do with the numbers you give it. It can also tell if one number is greater than (>), less than (<), or equal to (=) another number. It can arrange names alphabetically and put numbers in numerical order It can

establish and remember new variables that you might want to create and, by telling the computer what to do when certain conditions are met, you can make it assign values to new or existing variables, or perform other operations which you might want it to do. What makes it so valuable though is its speed — the time it saves you. The speed at which a computer functions is hard to imagine.

Try to Beat the Computer

Can you do addition as fast as a computer can? Add the following numbers: 7218 + 3122 + 9999 + 1111.

How long did it take you? Ten seconds? Would you believe that during the same time a medium-sized computer can add over a million such numbers and without making any mistakes.

Did you get 21,450 in adding your four numbers?

The computer won't make any mistakes! You've undoubtedly heard of the computer that billed some poor soul $1,927.00 for just one month's electricity in his home. If that's the

number that was originally put into the computer, it's the only number the computer had to work with. If you were to accidentally put a dirty old rag in a washing machine, you'd get an old rag back again — a clean old rag, but an old rag nonetheless. Likewise, a computer doesn't care if the numbers you give it have mistakes or not. It will still give you a very intelligent-looking answer; wrong, but intelligent-looking. The computer will forgive you for giving it the wrong numbers, but it will not forget them.

One of the primary ways used to tell a computer what the data will be, and what it is supposed to do with the data, is through putting that information on IBM cards. Those are the cards you probably love so dearly, especially when you read the words, "DO NOT BEND, FOLD, SPINDLE, OR MUTILATE", as you weep over your monthly telephone bill. It isn't necessary that you understand the intricacies of an IBM card, but you will probably find it quite helpful to know something about one. Each card has 80 columns. Each column is capable of representing any, but only one character (letter, number, or sign) at a time. A key-punch is a typewriter that records information on IBM cards by punching holes in them. For example, if you were to type the letters L, Y and T in the first three columns of an IBM

card, the resulting card would have a number of holes punched out of its first three columns. To the computer this means that there are holes punched in rows 11 and 3 of column 1, holes punched in rows 0 and 8 of column 2, and holes punched in rows 0 and 3 of column 3. A computer cannot think, but rather performs mathematical operations and prints information at lightning speed. To it, the letters L, Y and T are numbers. The machine is designed to assign and remember certain values depending upon which holes, if any, are punched in the columns of the cards. There are 12 rows in each of the 80 columns, so through punching different combinations of holes, the machine could theoretically identify up to 4,096 different characters per column, although only one character could be represented in any column at any particular time. Since there are only 26 letters in the alphabet, 10 digits and about 10 special characters, the capacity of the computer will probably never be fully utilized. This is why some computer companies have started using smaller cards with only six rows. Even with six rows, the capacity exists to represent up to 64 characters, one at a time in any column, which is more than enough to represent our language.

But now for a word of relief — for our concerns it doesn't make a difference how many rows, holes, or combinations of holes are used. The keypunch translates our language into a

form which the computer understands and the computer translates the information back into a form which is meaningful to us when it prints our results. And if you want to simplify matters even further, you could always use the Really Easy Method of getting computers to work — Prerequisite: One keypunch operator who will punch some IBM cards for you. (Anywhere computers are found, keypunch operators are usually hanging around somewhere nearby and willing to help you out). If not, the Almost as Easy Keypunch Your Own IBM Cards Method isn't really all that hard to learn.

There are three basic steps to take in getting a computer to function — the same basic three steps as there were with the washing machine. First, you give the computer the numbers it is to work with and any names that might be associated with those numbers (input the data). Then you tell the computer what to do with that information (program the computer). The computer then processes the information for you and prints the answer(s) you were looking for (the output or readout).

Like washing machines, some computers have to be told exactly what to do step by step. The SAS (Statistical Analysis System) is to a computer as a "heavy duty wash cycle" setting is to a washing machine. It is but one of a number of packaged computer programs. These packages, called "software" among computer people are sold commercially to computer centers. They are designed to meet most consumer needs and they are available for almost anything you might want to use the computer for.

Can You Do This?

Do you remember the example given earlier about finding whether there is a relationship between the heights and weights of ten people? Here's the entire SAS pogram you would have to type on IBM cards to find out what the answer is; each line represents one card:

```
//XXXX JOB 'XXXXXXXX,P=XXXX,T=(2),R=128,L=10','YOURLASTNAME'
//EXEC SAS
//SAS.SYSIN DD *
INPUT HEIGHT 1-2   WEIGHT 3-5;
CARDS;
60110
62125
73237
65152
56  98
5599
64198
75195
72180
66111
PROC CORR;
TITLE 'THAT'S ALL THERE IS TO IT — HERE'S YOUR ANSWER!"
/*
```

What does all of that nonsense mean? The first card tells the computer who you are, that is is to start a new problem, how much time it has to allow to solve the problem, how much of its memory capacity is going to be needed to solve the problem and the maximum number of lines it can expect to have to print.

The second and third cards tell the computer that it will be using a SAS program.

The fourth card tells the computer how to read the data cards that are to follow. What it does, in effect, is tell the computer to take the number that is in the first two columns of each card and call it "height", and to take the number that is in the third fourth and fifth columns and call it "weight".

The fifth card tells the computer that the data is to follow, the data being on cards six thru fifteen. The computer would then establish the following in its memory bank:

Observation	Height	Weight
1	60	125
2	62	125
3	73	237
4	65	152
5	56	98
6	55	99
7	64	198
8	75	195
9	72	180
10	66	111

The sixteenth card tells the computer to calculate and print the average height and weight, the smallest and largest heights and weights, the standard deviation of the group's height and weight, and the correlation between height and weight, along with the probability of that correlation occurring by chance alone.

The seventeenth card tells the computer to print the words "THAT'S ALL THERE IS TO IT — HERE'S YOUR ANSWER!" at the top of each page that it prints.

The last card tells the computer that the problem is completed. The reason this card is required is because you can have the computer do as many procedures with the data that you might want it to. For example, you might want a graph plotted, the data listed, or any one of a number of statistics computed. These could have been accomplished by adding just one more card to the program for each additional procedure you wished the computer to do (e.g., PROC WHATEVER).

How large should a job be before you would benefit from using the computer? In doing statistics you would probably always benefit from using a computer. A good rule of thumb is: If the computer will save you some time, use it! No job is too small for the computer, because there's plenty of room in it for everyone.

On the other hand, if it is going to take you more time to do the job by using a computer than it would if you were to do the job by hand, do the job by hand. For example, you might want to print 200 gummed address labels (yes, the computer can even do that), but were only going to use the mailing list once, or didn't need the names or zip codes ordered then do it by hand. But if using the computer will save you time, by all means go ahead and use it.

Are you at the point now of wanting more information? There is a manual currently available for $3.95 (plus postage and handling) that describes what the SAS can do and how you get a computer to do it. It is titled "A User's Guide to the Statistical Analysis System", by Jolayne Service and is available through the Student Supply Stores, North Carolina State University, Raleigh, North Carolina, 27607.

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