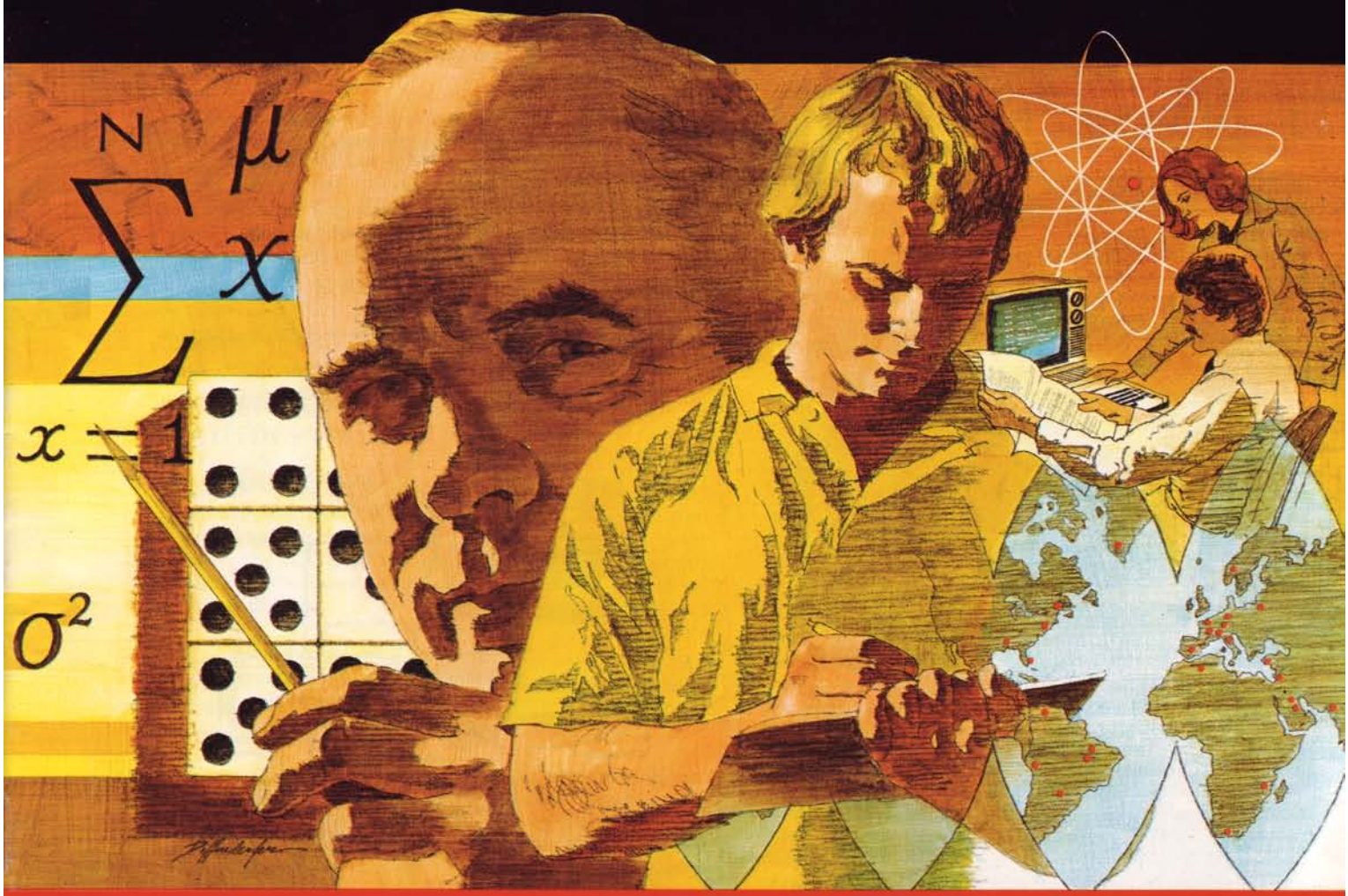
ATARI® 400/800™

COMPUTER PROGRAM

STATISTICS I



ATARI®

A Warner Communications Company

Model CX4103
Use with
ATARI® 400™ or ATARI 800™
PERSONAL COMPUTER SYSTEMS

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1 INTRODUCTION

The **ATARI®** **STATISTICS I** program determines general statistics from data entries. You get mean, mode, median, standard deviation, variance, skewness, kurtosis and root mean square in a single process. The unique data editing feature lets you replace erroneous data inputs quickly. You have the option of saving and loading your data points from cassette or diskette. **ATARI STATISTICS I** requires a minimum of 16K of RAM. Adding more memory allows you to analyze more data points.

In recent years statistics has grown from simple chart and graph making, usually referred to as *descriptive statistics,* to a better method of examining data in order to reach a decision about that data. This method, sometimes called *inductive statistics,* is based on the mathematical manipulation of data and on probability theory. The actual math is trivial but often extremely tedious to perform. Repetitive, tedious operation is one area in which computers are excellent tools. They are accurate, fast, and, apparently, are never bored doing the same thing again and again.

Of course, not all decisions need statistical treatment; some can be made immediately and intuitively, at first glance. Some conclusions are obvious, but a quick look at data is sometimes deceptive. Often a first assumption is thrown out when all the statistical facts are known.

For example, take a case of two young men who attend different schools, and who both took a midterm math examination. The first, Jim, got a score of 78, while his friend Bob scored 86. Well, it's clear, isn't it, that Bob is the better student in math? It seems that way at first glance, but what if you knew that Jim's class averaged 60 with a standard deviation of 12, while Bob's class averaged 74 with a standard deviation of 10? You could then say that Jim's grade was (78-60)/12=1.5 standard deviations above the class average, whereas Bob's grade was (86-74)/10=1.2 standard deviations above his class average. Therefore, Jim's academic standing relative to his class is better than Bob's. What happened to our intuitively obvious conclusion to the contrary? Maybe there was a difference in examination difficulty, or a difference in content. The point is that with additional information and a method of examining it, better, more meaningful conclusions may be reached.

The use of statistics depends completely on data. Proper collection of data is essential if any meaningful conclusions are to be drawn from the data. For example, if you want to figure the probability that a horse will win a particular race, based on past performance, you should only include races of the same type in which the horse actually participated.

Data can be anything at all which is numeric, but it is usually a value or how much (*magnitude*), or a number or how many (*frequency*).

It is sometimes desirable to derive *frequency data* from *magnitude data.* This may be done by evenly dividing the entire range of data points or values into groups called class intervals. Then simply count the number of points which fall by value into each class interval. This count is the *frequency data point.*

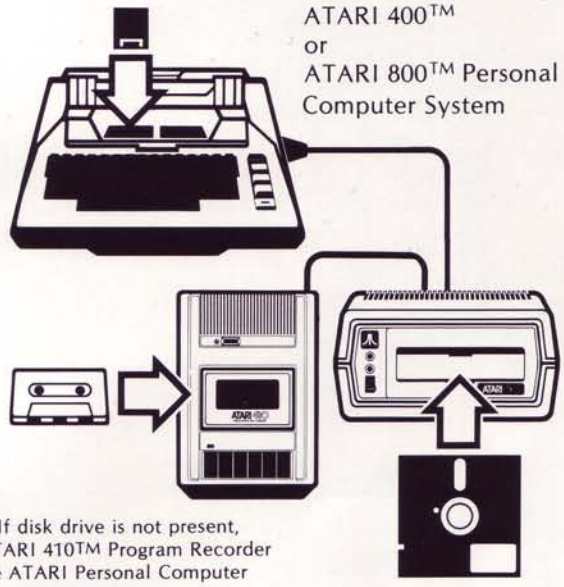
For the purpose of the **ATARI STATISTICS I** program, the data are always assumed to have a normally random, or normal distribution, sometimes called a bell-curve. The normal distribution is the most widely used in applied probability theory. The equations used in the calculations are presented with explanations in **Appendix A. ATARI STATISTICS I** uses standard and accepted equations for statistical testing. If a calculator or another statistical method gives a different result for a statistical test, the equations should be compared.

2 LOADING THE PROGRAM

The **ATARI STATISTICS I** program cassette will run on the **ATARI 400™** or the **ATARI 800™ Personal Computer System** with a minimum of 16K RAM (Random Access Memory). Instructions for using it with Disk Operating Systems (DOS) follows cassette loading procedures.

Select side **1** for use with an **ATARI 410™ Program Recorder.**

Select side **2** for use with the **ATARI Disk Operating System** (requires 24K of RAM and an **ATARI Disk Drive**).



NOTE: If disk drive is not present, plug ATARI 410™ Program Recorder into the ATARI Personal Computer System.

LOADING PROGRAM CASSETTE

1. Insert an **ATARI BASIC** Computing Language Cartridge (CXL4002) into the left computer console cartridge slot.
2. Make sure the **ATARI 410 Program Recorder** is properly connected to the computer console, and to a wall or power outlet.

   (See your **Program Recorder** Owner's Manual for further details if necessary).

3. Turn your television on.
4. Power up the computer console by pressing the **POWER** switch on the right side of the console to **ON.**
5. If all equipment is properly connected and powered up, your television screen should be displaying the **READY** prompt, with the white square "cursor" just below.
6. Insert side **1** of the **ATARI STATISTICS I** Program Cassette into the **ATARI 410 Program Recorder.** Rewind the tape all the way to the beginning if it is not already at that position. When the tape stops, push **STOP (STOP/EJECT).**
7. Type **CLOAD** on the computer keyboard and hit RETURN. The "beep" sound is a reminder to press **PLAY** on the **Program Recorder**. Hit RETURN again on the computer console. You will notice through the window of the **Program Recorder** that the tape is turning, which indicates that the beginning of the program is being loaded into the computer.
8. When the **READY** prompt is again displayed on the screen, type **RUN** on the keyboard and hit RETURN.
9. The screen display will now show the **ATARI** logo while loading the **STATISTICS I** program. The program will run automatically and the menu will be displayed. The **ATARI STATISTICS I** options are ready to be entered from your keyboard.

NOTE: If you have problems loading the program, and if you have peripherals that you are not using (a printer, for example) attached to the computer console, you should try disconnecting those peripherals and connecting the ones you are using directly to the console to isolate the problem. If loading problems persist, consult the appropriate operator's manual.

The more memory your system has, the more data points you can store. You can store 53 data points with 16K of RAM memory—this is sufficient for many applications.

DISKETTE LOADING FROM SIDE 2 OF STATISTICS I

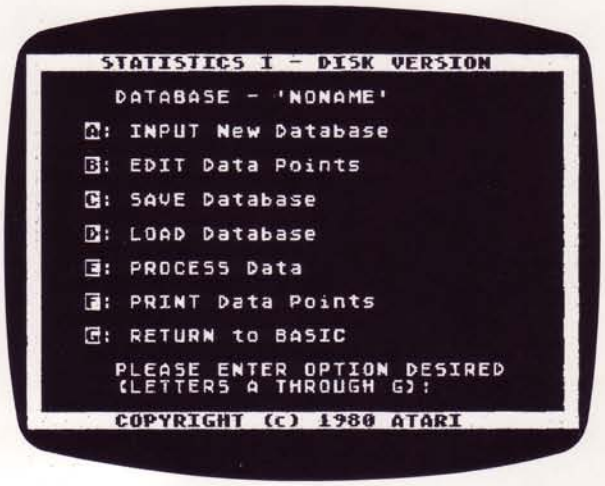
Saving the **ATARI STATISTICS I** program onto a diskette allows you to LOAD the program from that diskette in the future, which is faster than loading the program from cassette. The **STATISTICS I** program on side **2** of the program cassette also includes a provision to SAVE and LOAD data points on diskette.

In order to save the **STATISTICS I** program onto diskette, the **Disk Drive** must be on and the **Disk Operating System** must be loaded into RAM before the **STATISTICS I** program is loaded from cassette. Use the following procedure:

1. Make sure your **Disk Drive** and the **ATARI 410 Program Recorder** are properly connected to the computer console (refer to their operator's manuals for specific instructions). Insert a **BASIC Computing Language Cartridge (CXL4002)** into the left computer console cartridge slot. Turn on disk drive (do not turn on computer console yet). Wait for **busy** light to go out. Insert a **Master Diskette** into the **Disk Drive** (see **Disk Drive** Operator's Manual for proper insertion instructions) and close disk drive door. Turn on computer console and TV. The **Disk Operating System programs** on the **Master Diskette** will automatically load into RAM. The **READY** prompt will appear on the screen when the loading is complete.
2. Follow the cassette loading procedures using side **2** of the **ATARI STATISTICS I** program cassette.
3. Remove Master Diskette and insert a blank diskette. Type DOS RETURN to display the DOS menu on the screen. Type **I** RETURN to format the blank diskette. Type **Y** RETURN in response to TYPE "Y" TO FORMAT DRIVE 1 message. If you wish to have the **Disk Operating System** files on this diskette, type **H** RETURN . Type **Y** RETURN in response to TYPE "Y" TO WRITE NEW DOS FILES? message. The message WRITING NEW DOS SYS FILE displays on the screen. When SELECT ITEM appears, the DOS file is written. Having DOS on this diskette will save you the step of inserting the Master Diskette the next time you want to use the **STATISTICS I** program from this diskette. (Don't forget to label the diskette for your future reference.)
4. Type **B** RETURN for **RUN CARTRIDGE** or press SYSTEM RESET. To save the **STATISTICS I** program onto the diskette, type **SAVE"D:STAT"** RETURN. The computer will reply with a **READY** prompt when the save is complete.
5. Type **RUN"D:STAT"** RETURN to run the program. The **ATARI STATISTICS I** program has built-in routines to **SAVE** and **LOAD** databases.

3 OPERATION

The program begins execution by displaying the **ATARI** logo with the program name and copyright information. Then, after a brief delay, a menu of seven selectable optional functions is displayed. These options are:



An option may be selected by typing its corresponding letter followed by pressing RETURN on the keyboard. Each database will be called **'NONAME'** until it has been saved on cassette or diskette. Only during a database save may a name of 10 characters or less be given to the database, and it will be referred to by that name thereafter, whenever it is loaded from the cassette or diskette.

MENU OPTIONS

The selectable options on the menu will be discussed in the order in which they appear on the menu.

A: INPUT New Database

Selection of this option allows entry of a new set of data points for analysis. If data is being entered for the first time since loading the program, the display will be changed to accommodate data entry. If the program has been in operation, and old data is present in memory, then four beeps will sound and a verification question is asked to reduce the chance of accidentally erasing useful data.

If this question is answered **Y** RETURN, the old data is discarded and the **INPUT** Display is presented. If the question is answered **N** RETURN, the old data is retained and the **MENU** display is presented.

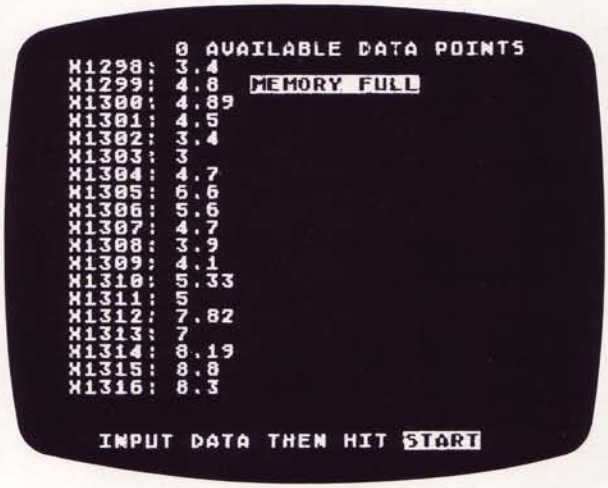
The **INPUT** display is presented as follows:

NOTE: 1355 is the number of data points available and the exact value will depend on the amount of RAM in your **ATARI Personal Computer System.** The program requires 16K of RAM to run.

The cursor is positioned just to the right of the **X1**. The first data point may be typed in, followed by RETURN. As each data point is entered, the **X** number is increased by one, and the number of available data points is reduced by one. When 20 points have been entered, the **X** identifiers begin to scroll upward. When all the data have been entered, press START to return to the **MENU** display.

Every data point entered must be followed by the RETURN key. If a non-numeric key is accidentally typed during data entry, a buzz is emitted and an **INVALID INPUT** message is displayed near the top of the display screen. Any number which is valid for **BASIC** is valid for the **ATARI STATISTICS I** program. However, since the numbers are squared or cubed during calculation, the data value should not exceed 5E + 24, nor be less than -5E + 24.

If all of the available space has been used, any attempt to enter another number will cause a buzzing sound and a message will be displayed near the top of the display screen:



No more data can be entered without first deleting some existing data.

B. EDIT Data Points

EDIT allows additions, deletions, and modifications to existing data. When the **EDIT** option is selected, the display screen is changed to a listing of existing data. The format is as follows:

The display gives the total number of data points used in the data set and will change as additions or deletions are made.

Only 9 data points may be viewed at a time with this display. In order to examine additional data a **PAGE FORWARD** option has been provided. To see the next 9 data points in sequence, press SELECT. Since the next data points are displayed in ascending sequence, this is referred to as **PAG**ing **FORWARD**. If the data being viewed is at the end of the data set and you wish to examine the previous data, the paging direction may be reveresed by pressing the OPTION key. This will put the display into a **PAGE REVERSE** mode, which will allow the data points to be viewed in descending sequence. You may not **PAGE** past either end of the data.

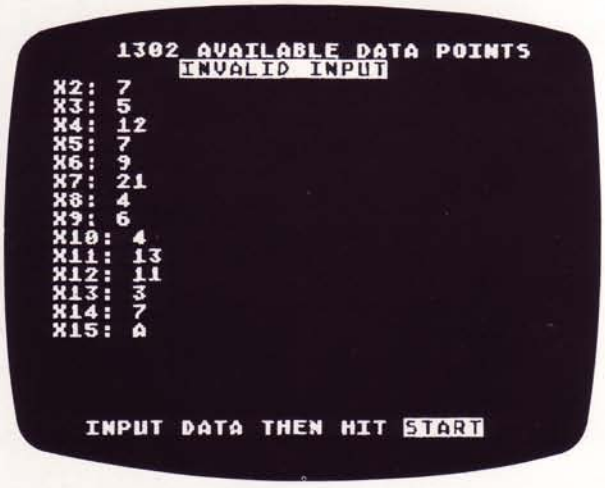
Pressing any key other than OPTION, SELECT, or START, will change the display from listing mode to **DATA EDIT** mode. Data may be changed either by:

1. Using the cursor control keys to position the cursor over the data to be changed and typing in the new value, and RETURN.
   or
2. Typing in the **X** reference number of the data point to be changed, followed by a space, then the new value, and RETURN.

NOTE: RETURN must be pressed after each change in order for it to be recognized by the computer.

New data points may also be added with method 2. Simply type **X** and the next reference number in sequence beyond the current last data point, followed by a space and the value to be added, and RETURN.

If the space is not typed between the **X** reference and the data value, or if a non-numeric character is typed as part of the data value (other than the **E** for exponent), then a message is written at the top of the display, and a buzz is sounded.



The current data is not changed when this happens, so simply repeat the operation, this time correctly.

Data points may be deleted by typing the **X** reference of the point such as **X5**, followed by RETURN. This will cause data point **X5** to be deleted, and the data points which follow will scroll up in sequence; the data that was at point **X6** will become the new **X5** value, **X7** will become **X6**, and so on. The last reference number in the sequence will be deleted, and the number of points used will be reduced by one. If a data point is deleted by mistake, it may be added back to the set, but only at the end. New data cannot be inserted into the set; it can only be added at the end. This rearrangement of the data will not affect any of the statistic calculations. If the order of data is important to you, one way to put the points back into a particular order is to begin modifying each point in sequence, from the point in error. Or, go back to the **MENU**, select **INPUT** mode, destroy the existing data, and reenter the entire set of data points.

C. SAVE Database on Cassette or Diskette

SAVE on Cassette

We recommend that you **SAVE** your databases on a separate cassette from the **STATISTICS I** program cassette. That way you eliminate the risk of overwriting the program and ensure that you will be able to find the data easily later.

There are several reasons why you might wish to **SAVE** a database for future reference; its size, repetitive processing (with returns to **BASIC** between runs), for additions at a later time, etc. Whatever the reason, when option **C** is selected, the screen displays the following:

If you wish to return to the **MENU**, type **EXIT** RETURN. If you want to name the database, this is where you may do so. Type in the new name of 10 characters or less and this set of data points will be referred to by that name from then on. When the name is typed in, press RETURN.

Any characters typed in excess of 10 are ignored.

The screen will display:

Since the **Program Recorder RECORD** key will not stay depressed when operated singly, you must depress both the **RECORD** and the **PLAY** keys together to save the database on tape. Two beeps sound to remind you to press both keys. After you press RETURN and the **SAVE** begins, check the cassette viewing window to make sure the tape is moving. When the database has been written on the tape, the screen will display:

This display will remain for a short time, then the **MENU** display will be renewed on the screen.

NOTE: Be sure that the tape has been positioned correctly so other data will not be overwritten accidentally, and that the **RECORD** and **PLAY** keys are depressed before striking RETURN.

SAVE on Diskette

To **SAVE** on diskette press option **C** and RETURN. The screen will display:

At this point you can choose to **SAVE** your data points on a new diskette or **SAVE** them on the **STATISTICS I** diskette. After creating and entering a name, the display will read:

This display will remain for a short time, after which the **MENU** will return to the screen.

D. LOAD Database from Cassette or Diskette

LOAD from Cassette

If you previously **SAVE**d a dataset with the **ATARI 410 Program Recorder**, selecting the **LOAD** option will allow it to be reloaded into memory for listing, editing, or processing. If there is currently data in memory when this option is selected, the same message to prevent accidental loss of data is displayed as for **INPUT** mode selection:

An **N** answer will cause a return to the **MENU** display thereby preserving the data currently in memory. A **Y** answer will immediately cause a buzz to be sounded, and the following three lines will be displayed:

Position the tape to the beginning of the database to be **LOAD**ed by using the **Program Recorder ADVANCE** key and the footage counter, if you know where the database is on the tape. Otherwise, position the tape to the beginning with the **REWIND** key and begin **LOAD**ing with the first database on the tape. You will have to **LOAD** each one in succession until you get the one you want. Begin the **LOAD** operation by pressing the RETURN key, once the tape is positioned.

When the database has been successfully **LOAD**ed, the screen display will read:

If the tape data does not **LOAD** properly for some reason, this message will be displayed:

In either case, the **MENU** will again be displayed for selection. If the database did not **LOAD** successfully, carefully reposition the tape and retry **LOAD**ing.

LOAD from Diskette

The **LOAD**ing of a database from diskette is almost identical to **LOAD**ing from cassette. In the case of the diskette, however, there is a name selection step instead of tape positioning. Press **D** and RETURN. If there is data in memory you will see:

An **N** will cause a return to the **MENU**.
A **Y** will give the display:

After entering a name for a database you have **SAVE**d and pressing RETURN, the display will read:

This display will remain for a short time, the **MENU** will then return to the screen.

E. PROCESS Data

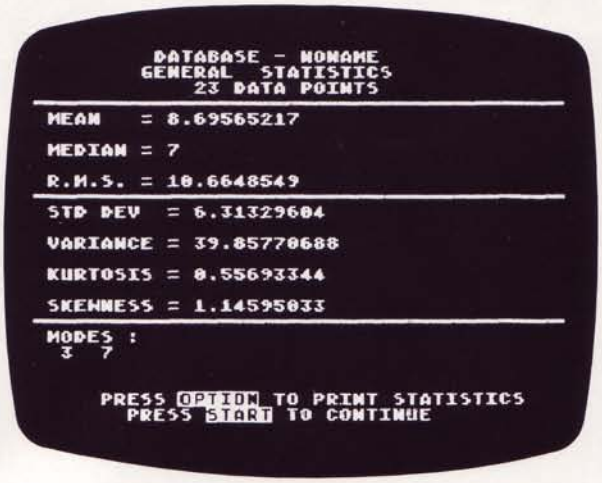
Selecting this option causes statistical calculations to be performed on the data in memory. You will know that this work is being done during the time it actually takes to perform the calculation, since the screen displays:

There are **6** phases and the display is updated as they progress. Some will take longer than others, with phases **4** and **5** generally taking the longest. Ordering the data points by value will cause a longer process time because of the sorting algorithm used. The algorithm was chosen to optimize performance for unordered data, anticipating the expected majority of cases.

The **6** phases roughly correspond to the following processes:

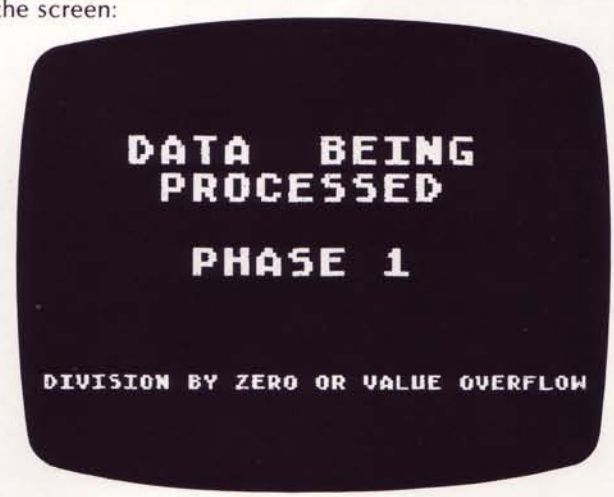
1. Calculation of the **MEAN**.
2. Calculation of **R.M.S.** (Root Mean Square), **STANDARD DEVIATION, VARIANCE,** and **KURTOSIS.**
3. Setup of array for sorting.
4. Sorting of data.
5. Looking for **MODES.**
6. Finding the **MEDIAN** and calculating **SKEWNESS.**

With a large number of data points the computer may take some time to compute the statistics. After 9 minutes have passed without a keyboard input the computer will begin a color cycling process. This "attract mode" can be stopped by pressing any key on the keyboard. When phase **6** has been completed the screen will display the result:



If you have an **ATARI Printer**, pressing OPTION will cause the **PROCESS** result to be printed. The printout has the same format as the display.

If there are no data points or only one data point, or a number which is too large (or small) is used as a data point, a message will be displayed against a red field at the bottom of the screen:



After a pause the program will return to the **MENU**.

F. PRINT Data Points

Selection of this option will cause the data points in memory to be printed on the **ATARI Printer.** The printout format is as shown below: (**LISTING DATA** is displayed on the screen).

```
LISTING FOR DATABASE 'NONAME'

X1: 3
X2: 7
X3: 5
X4: 12
X5: 7
X6: 9
X7: 21
X8: 4
X9: 6
X10: 4
X11: 13
X12: 11
X13: 3
X14: 7
X15: 8
X16: 18
X17: 10
X18: 14
X19: 2
X20: 2
X21: 3
X22: 26
X23: 5
```

If you want to stop the printing after it has begun, simply press the START key.

If OPTION is pressed and there is no Printer available, a buzz is emitted to indicate an error.

If no Printer is connected or available, the screen displays:

After a few seconds, the screen is returned to the **MENU** display.

G. RETURN to BASIC

When this option is selected from the **MENU**, there is an immediate exit from the **ATARI STATISTICS I** program and BASIC is again in control of the computer system. **All data in memory for the ATARI STATISTICS I program is lost unless it has previously been SAVEd on cassette tape or diskette.**

APPENDIX A

Statistic calculations in this program are based on the following formulas:

1. **MEAN**

   $\overline{X} = (X1 + X2 + X3 + \ldots + Xn) / N,$

   where **X1, X2,** etc., are the data points and **N** is the number of data points.

2. **MEDIAN**
   After arranging the data points in order from lowest to highest, the **MEDIAN** is the value of the middle data point if there is an odd number of data points. The value midway between the two middle data points is the **MEDIAN** when there is an even number of data points.

3. **MODE**
   The **MODE** is the value or values which occur the most often. There may be multiple modes, or none if all of the values occur only once.

4. **R.M.S.**
   The **R.M.S.** or Root Mean Square value is the square root of the sum of all of the **X** terms, squared, and divided by the number of **X** terms, **N**.

$$\text{R.M.S.} = \sqrt{\frac{\sum_{i=1}^{N} (x_i)^2}{N}}$$

5. **STANDARD DEVIATION**
   The **STANDARD DEVIATION** is the square root of the sum of all of the differences between each data point and the **MEAN**, squared, and divided by the number of data points minus one.

NOTE: Samples of populations use **N-1** in the denominator. Statistics are largely performed on a sample rather than a whole population (all possible data points).

$$s = \sqrt{\frac{\sum_{i=1}^{N} (x_i - \overline{x})^2}{N-1}}$$

6. **VARIANCE**
The **VARIANCE** is the square of the **STANDARD DEVIATION.**

$$s^2 = \frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N-1}$$

7. **KURTOSIS**
KURTOSIS is the amount of peakedness relative to a normal distribution. The **NORMAL** curve is usually considered to have a relative peak of 3. Therefore, a distribution with a peak greater than 3 is said to have a **KURTOSIS** greater than the normal, and is referred to as **Leptokurtic**. If the peak is less than 3, the curve is referred to as **Platykurtic**. An exactly normal distribution is referred to as **Mesokurtic**, and has a **KURTOSIS** of zero. **KURTOSIS** is defined mathematically as a function of the fourth moment about the **MEAN** and is calculated by summing the difference between each **X** term and the **MEAN,** raised to the fourth power, dividing the result by the number of **X** terms, then dividing that result by the **STANDARD DEVIATION** raised to the fourth power, and subtracting 3 from that for a final result.

$$a_4 = \left[\frac{\sum_{i=1}^{N} (x_i - \bar{x})^4}{N \cdot s^4} \right] - 3$$

8. **SKEWNESS**
SKEWNESS is a measure of the non-symmetry of the distribution as compared to a normal distribution, and is calculated as the third moment about the **MEAN**. It is equal to the sum of the difference between each **X** term and the **MEAN**, for all **X** terms, raised to the third power and divided by the number of **X** terms. This result is then divided by the **STANDARD DEVIATION** raised to the third power. For a normal curve, this value is zero. A positive **SKEWNESS** means that most of the data points lie to the left of the mean. A negative value indicates that the data points are clustered to the right of the **MEAN**.

$$a_3 = \frac{\sum_{i=1}^{N} (x_i - \bar{x})^3}{N \cdot s^3}$$

APPENDIX B

Example 1

The following is an example of one way to use the **STATISTICS I** program.

Let us suppose you operate a small business, for example, an archery equipment store. You've noticed that your customers come into the store in different numbers throughout the day, and at times, there are so many people in the store that there is considerable delay in handling all of the transactions, and in making sure that they all get good service. You could hire another person to help you handle the peak activity but you don't know if the business will support the additional expense. There are a lot of questions to be answered before this issue can be decided.

You are open for business from 7:00 a.m. to 11:00 p.m. Does it really pay to be open so long? Do you do enough business in the early morning and late evening hours to justify being open? How many customers in the store on the average throughout the day? How would that average change, and to what extent, if you were open for a shorter time period each day? How much time do you spend with each customer on the average? How much money does each sale bring in on the average? How many of the people in the store at any given time are actually paying customers?

There are more questions, but since all of them may be examined in a similar way, suppose we look at two in detail.

The following list of data points represents the number of customers in the store for each hour of a representative sixteen-hour business day.

The quantities that you are most interested in are the **MEAN**, the **STANDARD DEVIATION**, the **SKEWNESS**, and the **KURTOSIS**.

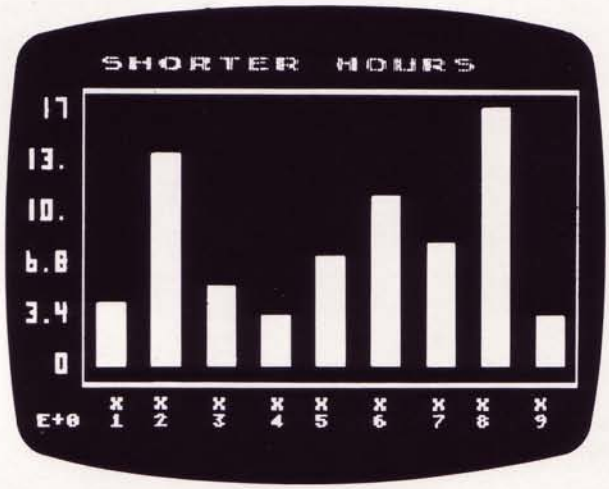
The **MEAN** indicates that there are an average of 6 customers per hour in the store, but the **STANDARD DEVIATION** of 4.6 is large as compared to the **MEAN**. This means that there is significant variation in the number of customers from hour to hour. The **KURTOSIS** of -.31 indicates that the peak of the curve is flatter than that of a normal curve, but the customer load is somewhat distributed across the whole day. The **SKEWNESS** of .858 shows that the curve's peak is not centered; most of the customers come in early with respect to the day's midpoint at 3 p.m.

```
LISTING FOR DATABASE 'D:CUSTOMER'

X1: 2
X2: 6
X3: 4
X4: 14
X5: 5
X6: 3
X7: 7
X8: 11
X9: 8
X10: 17
X11: 3
X12: 6
X13: 1
X14: 9
X15: 1
X16: 3
```

```
        DATABASE - D:CUSTOMER
      GENERAL  STATISTICS
         16 DATA POINTS

MEAN   = 6.25

MEDIAN = 5.5

R.M.S. = 7.68927825

STD DEV  = 4.6260134

VARIANCE = 21.39999997

KURTOSIS = -0.30509181

SKEWNESS = 0.8579832608

MODE : 3
```

This is a graph of the number of customers per hour for a full business day—7:00 a.m. to 11:00 p.m. Data plotted as a graph is often helpful in visualizing trends, peaks, etc. The graphs which are presented in this **APPENDIX** were generated using the ATARI GRAPH IT™ program (CX4109).

Now suppose that you opened at 9:00 a.m. and only stayed open until 6:00 p.m. on that day:



Graphical representation of shortened business hours—9:00 a.m. to 6:00 p.m.

After entering and processing the set of data points corresponding to only these hours, we find the changes below:

```
LISTING FOR DATABASE 'D:CUSTOMER'

X1: 4
X2: 14
X3: 5
X4: 3
X5: 7
X6: 11
X7: 8
X8: 17
X9: 3
```

```
DATABASE - D:CUSTOMER
GENERAL STATISTICS
9 DATA POINTS

MEAN   = 8

MEDIAN = 7

R.M.S. = 9.29755045

STD DEV  = 5.02493781

VARIANCE = 25.24999999

KURTOSIS = -1.33985774

SKEWNESS = 0.5517037917

MODE : 3
```

Now, the **MEAN** of customers per hour has risen from 6 to 8. The **STANDARD DEVIATION** has risen to 5.0 which is much less significant to 8 than 4.6 was to 6. The **KURTOSIS** has dropped to -1.34, indicating that the curve of customers per hour has flattened still further. Notice also, the **SKEWNESS** has dropped from .858 to .552, which means that the 'peak' of the curve is now closer to being centered; before, the peak was indicated as being farther to the left of the **MEAN**. Of course, this is also because the day's midpoint has shifted to 1-2 p.m. These results indicate that by restricting your open hours in each day you increase your expected number of customers per hour by:

$$\frac{8\text{-}6.25}{6} = 29.17\%$$

Of course, this is not the whole picture, but the purpose of the discussion was to illustrate the process, and was not intended to be a complete solution.

Example 2

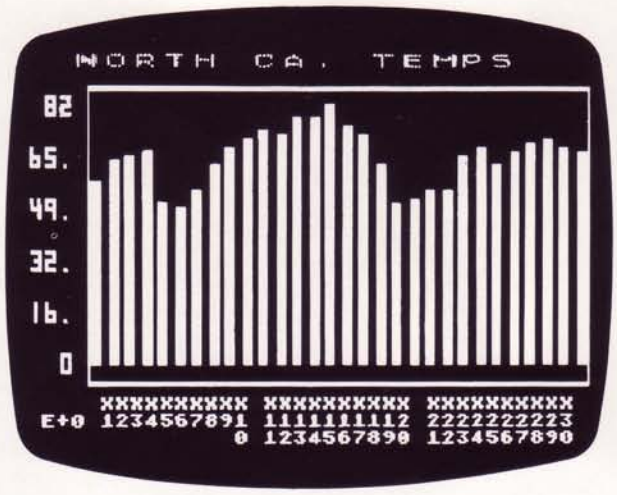
Suppose you are planning a camping and fishing trip to Northern California and you want to go in April for the season opening. You are concerned about the chances for good weather, however. One of the factors you might want to know about could be the average temperature and the amount of typical variation.

The temperatures presented are representative of a typical California April and are the daily average temperature for each day of the month.

You will be mostly interested in the **MEAN** and the **STANDARD DEVIATION**.

After entering all of the data and running the **OPTION E: PROCESS DATA**, you find that the mean temperature for an average April is 65.3 degrees and the **STANDARD DEVIATION** is 8.98 degrees. This indicates that a representative April is cool but mild, with few or no large temperature swings. This does not mean that all Aprils are mild, however, and this one could be the exception, but your probable experience is indicated as good. Based on statistics you can reasonably expect 65 degree temperatures. Will it rain on your camping trip? The **ATARI STATISTICS I** tests run on rainfall data for April will tell you what to expect.

```
LISTING FOR DATABASE 'D:CALTEMPS'

X1: 58
X2: 64
X3: 66
X4: 67
X5: 51
X6: 49
X7: 55
X8: 63
X9: 69
X10: 71
X11: 74
X12: 73
X13: 78
X14: 78.5
X15: 82
X16: 75
X17: 73
X18: 63
X19: 50
X20: 51.3
X21: 54
X22: 55
X23: 66
X24: 68
X25: 63
X26: 67
X27: 70
X28: 71
X29: 68
X30: 66.8
```



Graphical representation of April temperatures in Northern California.

```
DATABASE - D:CALTEMPS
GENERAL STATISTICS
30 DATA POINTS

MEAN   = 65.32

MEDIAN = 66.9

R.M.S. = 65.91387815

STD DEV  = 8.97910985

VARIANCE = 80.62441369

KURTOSIS = -0.91550317

SKEWNESS = -0.2628555067

MODE : 63
```

APPENDIX C

REFERENCES

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6. Freund, John E., : *STATISTICS (A First Course),* Prentice-Hall, Inc., New Jersey, 1970.

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