MODEL I/III

SPECTACULATOR

CAT. NO.
26-1513

TM

Radio Shack TRS-80 SOFTWARE

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SPECTACULATOR®

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Introduction

Computer technology is responsible for many rapid advances in our turbulent and ever changing world. Its strength is the rapid, accurate computation of information. Mathematics can be a slow, laborious process bogged down by long calculations and recalculations of equations that rob you of vital think time, time you could be devoting to creativity or other important tasks. Spectaculator® takes care of the time-consuming calculations for you. Spectaculator turns your Model III or Model I Computer into a sophisticated calculator and your screen into a ''worksheet,'' divided into rows and columns. After entering formulas and numbers, Spectaculator calculates and displays the computed values automatically. Use Spectaculator for budgeting and forecasting purposes, statistics, math homework — and whatever other time-consuming mathematical applications you can think of. You'll save a lot of valuable time and become more productive.

Features

- Overtype for easy error correction.
- Delete or insert rows and columns of data.
- Save worksheet for later use.
- Prepare table format with formulas for easy recalculation to avoid constant retyping.
- Prints all or only part of a document.

Required Equipment

TRS-80® Model III or Model I Computer with 16K or larger memory, a cassette tape recorder, and a cassette interface cable.

Optional Equipment

Any Radio Shack Parallel Printer compatible with the TRS-80 Model III or Model I, and blank computer cassette tapes for saving data.

Overview

This manual is divided into five sections. Part I helps you get familiar with the computer. Basic terms and concepts unique to the Spectaculator program are introduced.

Part II provides a detailed explanation of each command and the various methods and options you can use. This section outlines the ''fine'' points and offers remedies if any problems should occur.

Part III is a ''sample session,'' using a step-by-step example. You create a simple addition table and learn how to save and print a worksheet.

Part IV contains more complicated examples involving budgets, statistics, and geometry. The advanced sessions include instructions on what formulas to enter and printouts of the worksheets.

Part V is a command and key summary for a quick reference.

Read Parts I and III to learn the ''basics'' and refer to Part II when you have a particular question involving a command. After becoming familiar with Spectaculator, you only need Part V — the command summary, which condenses all the information with no details.

Part I — Setting Up

To begin setting up, make sure that the cassette player is properly connected to the computer. If you are going to be using a printer, connect it to the computer now. Next, turn on the computer.

To load the Spectaculator program follow these steps:

1. Insert the program tape and rewind (be sure you select the side with the proper tape recording density: Model III, 1,500 BAUD; Model I, 500 BAUD). Press play.

2. **Model III:** After turning on the computer, this prompt appears:

   ```
   Cass?
   ```

   Press (ENTER). The screen shows:

   ```
   Memory Size?
   ```

   Press (ENTER).

   The screen now shows:

   ```
   Cass?
   Memory?
   Radio Shack Model III BASIC
   (c) '80 Tandy
   READY
   >
   ```

   Type:

   SYSTEM (ENTER)

   Model I: Follow the instructions for Model III users. The only difference is that there is no "Cass?" prompt.

3. The computer displays the prompt:

   ```
   *?
   ```

   Type in the Spectaculator program's file name:

   SP (ENTER)

   As the computer is loading, two asterisks appear on the upper right of the display.

4. After the program is loaded into memory, the prompt:

```
*?
```

reappears. To run the program, type:

/ (ENTER)

The worksheet now appears. It looks like this:

```
C>
COPYRIGHT 1983, TANDY CORP. -
ALL RIGHTS RESERVED SP.01.00.00

     1    2    3    4    5    6
 1 [    ]
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
```

This is just a small portion of a "worksheet" on which you can enter data. A worksheet can contain up to 99 columns and 99 rows. A column can contain from 1 to 59 characters.

The C> (the command mode prompt) marks the beginning of the prompt line. You enter commands and data on this prompt line. As you enter data, a blinking box, called the cursor, appears on the prompt line and tells you where the next character you type will be placed. The brackets are called the entry marker. After data is entered, it is displayed in the cell where the entry marker is positioned.

In command mode, you tell the computer which command you want to use. Type (?) to see the list of commands.

The screen shows:

```
C>

ET - ENTER TEXT                EN - ENTER NUMBERS
MM - MOVE MARKER               CW - CHANGE COLUMN WIDTH
CR - CLEAR ROW                 CC - CLEAR COLUMN
IR - INSERT ROW                IC - INSERT COLUMN
DR - DELETE ROW                DC - DELETE COLUMN
SA - SAVE ON TAPE              LO - LOAD FROM TAPE
LI - LIST TO PRINTER           PS - PARTIAL SAVE
RF - ROW FORMULA ENTRY         CF - COLUMN FORMULA ENTRY
CA - CALCULATE                 FR - DISPLAY FREE MEMORY
ZW - ZAP WORKSHEET             EX - EXIT
          SPECIAL KEYS:->
CLEAR - BACKSPACE              ? - HELP LIST
BREAK - ENTER COMMAND MODE
```

ENTER TEXT — Letters, numerals and all other upper and lower case characters (up to 59 characters). Only capital letters are displayed and printed on Model I. Labels (row and column headings) make a worksheet easier to read.

ENTER NUMBERS — Up to nine digits.

MOVE MARKER — Lets you view any portion of the worksheet.

CHANGE COLUMN WIDTH (the number of spaces a column contains) — Any value from 3 to 59. The default value (value built in the program) is 9.

CLEAR ROW — Deletes calculated numbers in a row, without deleting any formula associated with that row. Succeeding rows are not affected.

CLEAR COLUMN — Deletes calculated numbers in a column, without deleting any formula associated with that column. Succeeding columns are not affected.

INSERT ROW — Inserts rows, allowing you to enter data or create a blank row. Data in succeeding rows shift downward.

INSERT COLUMN — Inserts columns, allowing you to enter data or create a blank column. Data in succeeding columns shift to the right.

DELETE ROW — Erases data (text and numbers) in a row and any formula associated with that row. Data in succeeding rows shift upward.

DELETE COLUMN — Erases data (text and numbers) in a column and any formula associated with that column. Data in succeeding columns shift to the left.

SAVE ON TAPE — Saves the worksheet in memory on cassette tape.

LOAD FROM TAPE — Loads a file that was saved on tape, back into memory.

LIST TO PRINTER — Prints the worksheet (in memory) on a parallel printer.

PARTIAL SAVE — Allows you to save part of a worksheet on tape.

ROW FORMULA ENTRY — Specifies how a specific row in the worksheet is to be calculated from data in preceding rows.

COLUMN FORMULA ENTRY — Specifies how a specific column is to be calculated from data in preceding columns.

CALCULATE — The values in formula-defined rows and columns are calculated and displayed.

DISPLAY FREE MEMORY — Shows how much room you have in memory to store data. Each worksheet can contain up to 5,011 characters on a 16K computer and 21,395 characters for a 32K computer. The amount of free memory decreases as you enter data.

ZAP WORKSHEET — Erases the current worksheet on the screen so you can start a new one.

EXIT — Returns you to the BASIC monitor.

To enter a command, type the two-letter combination that stands for the command and press (ENTER). If you enter a command incorrectly, the message, COMMAND ERROR, appears below the command line. Edit or reenter the correct two-letter abbreviation.

Press the (BREAK) key to return to command mode. (Some commands are performed automatically, without any further instructions from you. After these commands are executed, you reenter command mode automatically.)

All commands (except the "automatic" ones) have a "help" list which gives instructions and examples on how to use the command. After you have entered the command, type (?) to see the Help List. Type (?) to return to the same command.

If you make a mistake when entering a command, numbers, text, or further instructions to the computer, press the (CLEAR) key to back space and erase the character that was previously there. Press (SHIFT), and without releasing (SHIFT), press the (←) key to retype the entire entry.

The data you enter on a worksheet is temporarily stored in the computer's memory. If you turn off or reset the computer (and have not saved the data on tape), the data is lost.

Part II — Commands

Move Marker

To move the entry marker brackets up and down or to the right and left, use the four arrow keys. The entry marker moves over data without erasing any characters. Press the (→) key 6 times to move the marker to Column 7. Note that now Columns 2-7 are visible. Next, press the (↓) key 13 times, so that Rows 2-14 are visible. The entry marker is currently at Cell 14,7 (Row 14, Column 7).

There is a much faster way to move the marker if you are entering data on a large worksheet. Type (M) (M) (for Move Marker) and press (ENTER). This command is indicated by MM: before the cursor. Type (?) to see the MOVE MARKER HELP list.

The screen shows:

```
MM;

MOVE MARKER HELP

 *  ENTER ROW NO.,COLUMN NO.
 *  PRESS ENTER
<ENTER> ALONE HOMES THE MARKER
```

Now type (2) (5) (,) (2) (5) (no spaces) and press (ENTER). (You can enter the cell coordinates while in the help screen or type (?) again to return to the worksheet.)

The screen shows:

```
C>

     25    26    27    28    29    30
25 [     ]
26
27
28
29
30
31
32
33
34
35
36
37
```

Note that not only has the marker moved to Row 25, Column 25, but a different portion of the worksheet is on the screen. The cell you entered occupies the upper

left-hand corner of the worksheet. After a cell is entered, the command mode prompt automatically reappears.

Next, we want to move the marker to the "home" cell (Cell 1,1). Type (M) (M) and press (ENTER) twice. The marker is now at Row 1, Column 1 and Rows 1-13 and Columns 1-6 are on display.

If you enter a cell incorrectly (for example, with a space before the comma), the message, SYNTAX ERROR, appears at the top of the screen. Press the (CLEAR) key to backspace the cursor, so that you can reenter the cell.

Enter Numbers

You can enter numbers of up to 16 digits (16 digits plus a decimal point). The column width is currently set at 9. To change the column width, see page 17.

Move the entry marker to the cell where you want to enter a number. In command mode, type (E) (N) (Enter Numbers) and press (ENTER). This command is indicated by EN: before the cursor. Type (?) to see the ENTER NUMBERS HELP list.

The screen shows:

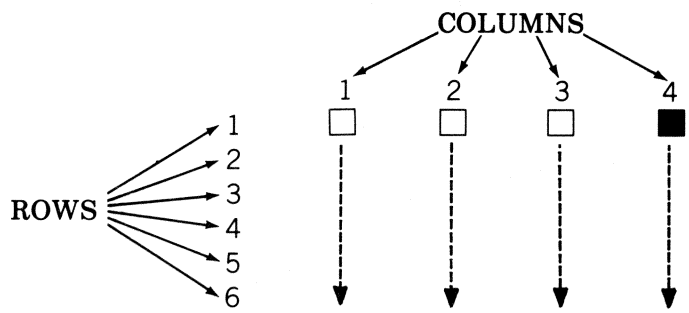
```
EN:

ENTER NUMBERS HELP

NUMBERS ARE ENTERED RIGHT-
JUSTIFIED INSIDE THE MARKER.
LIMITS:
* 16 DIGITS
* 6  DIGITS TO THE RIGHT OF
     THE DECIMAL POINT
```

Type (?) to return to the worksheet. After you type the number and press (ENTER), the number is displayed in the cell. (The number is aligned to the right inside the entry marker box.)

If you entered a wrong number, simply move the marker to the cell and reenter the correct number. The new number replaces the incorrect entry. To erase a number (and leave the cell blank), move the marker to the desired cell and press (ENTER). If you enter any character other than a number or decimal point, the message, SYNTAX ERROR, is displayed. Press (CLEAR) to move the cursor to the left to erase and replace the incorrect entry. When you are finished entering numbers, press (BREAK). The command mode prompt reappears.

Column Formula Entry

A column formula specifies how values, in the column where the entry marker is currently positioned, are calculated from data in preceding columns. For example, suppose you want to enter a column formula for Column 4 to add the numbers in Columns 1, 2, and 3. The calculated value in Cell 1,4 is the total of the numbers in Cells 1,1; 1,2; and 1,3. The calculated value in Cell 2,4 is the total of the numbers in Cells 2,1; 2,2; 2,3; etc.



To enter a column formula, move the entry marker to the column where you want the calculated value to appear. (The entry marker can be on any cell in the column.) Type (C) (F) and press (ENTER).

To see the COLUMN FORMULA HELP list, type (?).

The screen shows:

```
CF:

COLUMN FORMULA ENTRY HELP

EXAMPLE FORMULA:
(C1-C2)/2+5*SQR(C3)
OPERATORS:+ - * / ! ( )
FUNCTIONS: SUM SQR SMT
PRECEDE FORMULA WITH "I" OR
"D" FOR INTEGER OR DECIMAL RESULT
```

All mathematical operations are performed from left to right. Multiplication and division operations are done first, then addition and subtraction are performed (unless enclosed in parentheses). When parentheses occur within another pair of parentheses, operations are performed beginning with the innermost parentheses and working outward.

In the example above, the computer first subtracts the value in Column 2 from the value in Column 1 and then divides the resultant value by 2. Next, the square root of the value in Column 3 is multiplied by 5. Finally, these two values are added together.

(C1 − C2)/2 + 5*SQR(C3)
(T1)/2 + 5*SQR(C3)
T2 + 5*SQR(C3)
T2 + 5*T3
T2 + T4
T5

When you use the Calculate command, the computer calculates and displays the final value in the formula-defined column for each row. (See page 14.)

Multiplication is indicated by an asterisk, *, while division is indicated by a slash, /. Parentheses tell the computer to perform the enclosed operation first. SQR tells the computer to take the square root of the values in the specified column following the letters, SQR.

SUM stands for "sum" and tells the computer to add the values starting from the specified column to the column where the entry marker is positioned. For example, if the entry marker is positioned on Column 5 and you enter the formula, (S) (U) (M) (() (C) (1) ()), Spectaculator adds the numbers in Columns 1 through 4. (This is a short cut way of entering the formula, C1 + C2 + C3 + C4.) After you use the Calculate command, the total is displayed in Column 5.

SMT stands for "summation" and tells the computer to give the cumulative totals along with the final computed total value of the one specified column. For example, if the entry marker is positioned on Column 5 and you enter the formula, (S) (M) (T) (() (C) (1) ()), followed by the Calculate command, Spectaculator calculates and displays the cumulative sum of the numbers in Column 1. The calculated value in Cell 1,5 is the same value as in Cell 1,1. The sum of Cell 1,1 and Cell 2,1 is displayed in Cell 2,5. Cell 3,5 contains the sum of Cells 1,1; 2,1; 3,1; etc.

Note: The column you specify after the letters, SUM, must have a value in it. The SUM operation is not performed if there is no number in the specified column. However, a blank cell in a subsequent column is assumed to contain a value of 0 and a sum is calculated. In all other column formulas, calculations are not performed for those cells that are blank. This holds true for row sums and formulas, as well.

You can also specify whether you want the calculated value to be expressed as an integer or decimal number. Simply type (I) or (D) before the formula. If you specify (I), the calculated value is displayed, showing only the numbers to the left of the decimal. If you choose (D), the value is carried out to 6 decimal places. However, the computer automatically deletes trailing zeroes.

If you don't specify "I" or "D," the computer automatically calculates the formula, using a dollar and cents form, by carrying the values out to two decimal places. (This is particularly useful for financial data.)

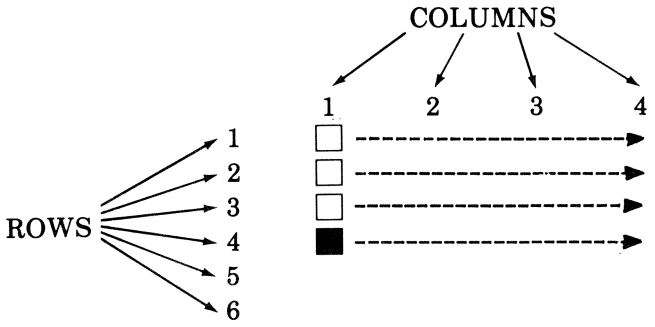
Type the formula and press (ENTER). Do not use spaces when you enter formulas. You can type the formula while in the Help screen or type (?) to return to the worksheet. If you are entering a decimal in a formula, precede the number with a leading zero. For example, to enter the formula: (Column 1 × Column 2)/.6, type: (( ) (C) (1) (*) (C) (2) ()) (/) (0) (.) (6) and press (ENTER).

The SYNTAX ERROR message appears if you enter a formula incorrectly or include spaces. Press the (CLEAR) key to backspace and type over the mistake. When you are finished entering formulas, press (BREAK) to return to command mode.

If you move the entry marker to a column where a formula has been entered, the formula is displayed at the top of the screen. Use the Calculate command to see the computed value.

Row Formula Entry

A row formula specifies how values in a specific row are to be calculated from data in preceding rows. For example, suppose you want to enter a row formula for Row 4 to add the numbers in Rows 1, 2, and 3. The calculated value in Cell 4,1 is the total of the numbers in Cell 1,1; 2,1; and 3,1. The calculated value in Cell 4,2 is the total of the numbers in Cells 1,2; 2,2; 3,2; etc.



To enter a row formula, move the entry marker to the row where you want the calculated value to appear. (The entry marker can be on any cell in the row.) Type (R) (F) and press (ENTER) at the command mode prompt.

Type the formula and press (ENTER). Row formulas are entered in the same way column formulas are. (The ROW and COLUMN FORMULA HELP screens are identical.) If the entry marker is on a cell where both a row and column formula have been entered, the row formula takes precedence although the column formula is displayed at the top of the screen. (The column formula is calculated first.) The numbers in the specified rows under each column are used to come up with the computed values.

Calculate

To have Spectaculator calculate and display the values in all formula-defined columns and rows, type (C) (A) and press (ENTER) at the command mode prompt. (If both a row and column formula are entered for the same cell, the value for the row formula is displayed.) This command is executed automatically without any further instructions from you. The command mode prompt reappears.

Spectaculator automatically adjusts the column width to display the entire calculated value. If a calculated value contains more than 16 digits, the message, OVERFLOW ERROR, may appear. The value is not displayed. Press (BREAK) to return to command mode. You can either change: 1) the formula from "D" to "I" or, 2) the values in the worksheet. Enter the Calculate command again to see the computed values.

Enter Text

A text entry can contain up to 60 characters. Letters, numerals, and all other upper and lower case characters can be used.

Move the entry marker to the cell where you want to enter text. In command mode, type (E) (T) and press (ENTER). After you type the text and press (ENTER), the text is displayed in the cell. The text is aligned to the left inside the entry marker box.

If you make a mistake, simply move the marker to the cell and reenter the text. The old entry is replaced with the correct text. (While entering text, use the CLEAR key to backspace.) Type (?) to see ENTER TEXT HELP list.

The screen shows:

```
ET:

ENTER TEST HELP

TEXT ENTRIES ARE LEFT-JUSTIFIED INSIDE
THE MARKER.
LIMIT:
 * 60 CHARACTERS
```

To center text over a column, simply press the space bar a few times before typing the text and pressing (ENTER). (You can also use the Change Column Width command to center text.)

When you are finished entering text, press (BREAK). The command mode prompt reappears.

Note: If numbers are entered with the Enter Text command instead of the Enter Numbers command, calculations are not performed.

Clear Row

To erase calculated values in a row, move the entry marker to the desired row. Only numbers are erased — if a formula has been entered for that row, it is not affected. Data in succeeding rows remain in the original rows.

Type (C) (R) and press (ENTER). The data is erased and the command mode prompt reappears. You can now enter new data and use the Calculate command to see the computed values.

Clear Column

To erase calculated values in a column (leaving the column formula intact), move the entry marker to the desired column. Type (C) (C) at the command mode prompt and press (ENTER). Data in succeeding columns remain in the original columns.

Note: Both the Clear Column and Clear Row commands are particularly useful when you want to reuse a worksheet and enter new values. You cannot use these commands if no data has been entered.

Change Column Width

You can change the column width (the number of spaces a column contains) from the default value of 9 to any value from 3 through 59. After the width has been changed, the worksheet is displayed (and printed) using the new width.

In command mode, type (C) (W) and press (ENTER). Type (?) to see the CHANGE COLUMN WIDTH HELP list.

The screen shows:

```
CW:

CHANGE COLUMN WIDTH HELP

ENTER COLUMN NUMBER,WIDTH
EXAMPLE - CW: 12,9
TYPE "ALL" FOR COLUMN NUMBER TO CHANGE THE
WIDTH OF ALL COLUMNS

LIMIT:
 * 3-59
```

You can enter the Change Column Width instructions while in the HELP screen, or type (?) to return to the Change Column Width command. To change the width of one column, type that column number and a comma (no space after the comma). Next, type the value representing the number of spaces wide you want the column to be and press (ENTER). The worksheet display changes automatically and the Change Column Width command mode prompt reappears.

To change the width of all columns, type (A) (L) (L) and a comma. Next, type the width and press (ENTER).

Be careful when using this command. If you make the width smaller and the data (numbers or text) contains more characters than the newly specified width, some of the characters are erased. Don't worry, however, because the original data is still in the computer's memory. If you change the width again to the original value, the data in its entirety is displayed.

Display Free Memory

To find out how much room you have in memory to store data, type (F) (R) and press (ENTER) in command mode prompt.

The amount of free memory decreases as you enter data. If there are no characters left in memory, the message, OUT OF MEMORY, appears at the top of the screen. (This can happen when you try to: enter numbers, text, formulas; use the Calculate command; change the column width; or insert rows or columns.) You must delete some data to continue using the same worksheet or you can save the worksheet. (See "Save on Tape" on page 21.)

Delete Row

To erase text and numbers in a row and any formula associated with that row, you must first position the entry marker on that row. Type (D) (R) and press (ENTER) in command mode. This is an "automatic" command, i.e., you do not have to enter any further instructions.

The data (and formula if entered) originally in that row is erased. The data (and formula) in the next row (the row below) shifts up to the row where the entry marker is positioned. The row numbers in formulas are changed so that the same values are used in calculations. Data (and formulas) in succeeding rows also shifts up one row. The command mode prompt automatically reappears.

Delete Column

To erase data in a column and any formula associated with that column, move the entry marker to that column. Type (D) (C) and press (ENTER). The data in the next column (the column to the right) shifts left to the column where the entry marker is positioned. Data (and formulas) in all succeeding columns shifts one column to the left. You return to command mode automatically.

Insert Row

To insert a row of data (or blank row), move the entry marker to the desired row. Type (I) (R) and press (ENTER). The data and formula originally in that row (and all succeeding rows) shift downward one row. The row numbers in formulas are changed so that the same values are used in calculations. If the row contained no data, another blank row is created. The command mode reappears, allowing you to enter text or numbers.

Insert Column

To insert a column of data (or a blank column), move the entry marker to the desired column. Type (I) (C) and press (ENTER). The data and formula originally in that column (and all succeeding columns) shift to the right one column. If the column did not contain data, another blank column is created. You return to command mode automatically.

Save on Tape

To save a worksheet on tape, type (S) (A) and press (ENTER) in command mode. Type (?) to see the TAPE SAVE HELP list.

The screen shows:

```
SA:

TAPE SAVE HELP

 * PLACE TAPE IN PLAYER
 * SET TAPE POSITION
 * KEY IN FILENAME AND PRESS ENTER
```

Follow the instructions on the screen. If you use a tape with a leader, you'll have to manually position the tape past the leader. We recommend using TRS-80 Certified Computer cassettes, which are leaderless.

A filename is like a title that the computer stores the worksheet under. The computer uses a tape just like you use a filing cabinet. Later, to find a file, the computer looks in the filing cabinet (the tape) for the file name and gets (loads) the file you want.

If you want to save more than one file on a tape (and the file contains different worksheets), it is recommended that you enter a different filename. (Later, when you load a file it is much faster if you specify a filename.) Type a filename (up to six characters) and press (ENTER).

The cursor disappears while recording is going on. The command mode prompt reappears after the file has been recorded. Press the "Stop" button. **Be sure to label the tape using the filename you entered and make a note of the counter number.**

It's a good idea to make at least one other copy of the file, either on the same tape or on another tape. An extra copy acts as a safety device to guard against accidental loss of data.

To save a file on the same tape that another file has been stored on, make sure you position the tape at least a couple of counter numbers past the last file. Follow the same instructions, but use a different filename. After the file has been recorded, make a note of the new filename and counter number on the tape label.

Load from Tape

To load a file from tape back into memory, type (L) (0) and press (ENTER). Type (?) to see the TAPE LOAD HELP list.

The screen shows:

```
LO:

TAPE LOAD HELP

 * SET TAPE POSITION
 * PRESS PLAY
 * KEY IN FILENAME AND PRESS ENTER
```

Follow the instructions on the screen. You can either return to the worksheet by typing (?) or continue while in the TAPE LOAD HELP screen.

Type the name of the file you want to load and press (ENTER). If you entered the name of a file that was recorded at a specfic counter number, the computer looks for and loads the specified file. The worksheet saved under that filename appears on the screen. You return to command mode automatically.

If you have trouble loading a file, check the filename spelling and the tape position. It is important that you carefully document both the exact filename and counter position.

If you interrupt the loading process by pressing (BREAK), the program operation will terminate and return to BASIC Ready. You may rerun Spectaculator by typing SYSTEM (ENTER), then / (ENTER).

List to Printer

A worksheet must be in memory to be printed. If you are not printing a worksheet that you have just entered, load the desired worksheet file from tape. Make sure the paper is properly aligned, the printer is ready and cursor is at Cell 1,1. In command mode, type (L) (I) and press (ENTER). To print an entire worksheet, press (ENTER) again. After printing, Spectaculator automatically returns to command mode.

If you want to print just part of a worksheet, move the entry marker to the cell where you want to start printing. Type (L) (I) and press (ENTER). Type (?) to see the PRINT HELP list.

The screen shows:

```
LI:

PRINT HELP

 * ENTER ROW NO.,COLUMN NO. OF
   THE LAST CELL THAT IS TO BE PRINTED
   OR
   POSITION MARKER ON THE LAST CELL TO
   BE PRINTED
 * PRESS ENTER
```

Refer to the HELP list instructions to print a section of the worksheet. Type (?) to return to the List to Printer command.

Next, type the row number, a comma, and then the column number of the cell where you want the printing to stop. Do not include spaces. This cell appears in the lower right-hand corner on the printed copy. When you press (ENTER), the printing begins.

If the message, PRINTER NOT READY, appears on the screen, check all cables and plugs. Once the printer is ready, press (BREAK).

To stop printing, hold down the (SHIFT) (↓) (Z) keys (cancel sequence) until the printing has stopped. (A couple of additional lines of text may be printed.)

To center a worksheet on a page, use the Insert Column command at Column 1 to create some blank columns on the left of the page. Usually three columns is sufficient.

Partial Save on Tape

To save part of a worksheet for use in SCRIPSIT ASCII Tape file format, move the entry marker to the first cell of the portion of the worksheet that you want to save. Type (P) (S) and press (ENTER) at the command mode prompt. This command may be useful when you just want to save data of one worksheet (without text or formulas) to be included in a SCRIPSIT file. Type (?) to see the PARTIAL SAVE HELP.

The screen shows:

```
PS:

PARTIAL SAVE HELP

 * TYPE ROW NO., COLUMN NO. OF THE LAST
   CELL TO BE SAVED
   OR
   POSITION MARKER ON THE LAST CELL TO
   BE SAVED
 * PRESS ENTER
```

Type (?) to return to the worksheet. Next, type the row number, a comma, and then the column number of the last cell that you want to save. Finally, press (ENTER). Do not include any spaces.

For example, suppose you wanted to save data between cells 3,1 and 10,8 under the filename, DATA. First position the entry marker on Cell 3,1. Type (P) (S) and press (ENTER). Now type: (1) (0) (,) (8) (.) (B) (.) (D) (A) (T) (A) and press (ENTER)

After the portion of the worksheet has been saved, the command mode prompt reappears. As a precautionary measure, save the file again using a different position on the tape.

Part III — Sample Session

To become familiar with Spectaculator you should go through this sample session involving the construction of a simple addition table. You also learn how to use the same table, enter new numbers, and see how Spectaculator recalculates all values. Finally, you can save and print the table.

First, make sure that you have followed the instructions for setting up (be sure to read the entire "Setting Up" section beginning on page 3 before you begin). When the program has loaded and the worksheet appears, you can begin this sample session.

First, we're going to enter numbers in the worksheet. At the command mode prompt, type (E) (N) (Enter Numbers) and press (ENTER). Type (1) and press (ENTER). Next, press the (→) key once to move the entry marker to Cell 1,2 (Row 1, Column 2). Type (2) and press (ENTER).

To move the cursor to Cell 2,1 press the (←) key once and then the (↓) key once. Type (3) and press (ENTER). Next, press the (→) key once to move the entry marker to Cell 2,2. Type (4) and press (ENTER). To move the cursor to Cell 3,1, press the (←) key once and then the (↓) key once. Type (5) and press (ENTER). Press the (→) key once to move the cursor to Cell 3,2. Type (6) and press (ENTER). The screen looks like this:

```
EN:
          1       2       3       4       5       6
 1            1       2
 2            3       4
 3            5     [ 6 ]
 4
 5
 6
 7
 8
 9
10Ø
11
12
13
```

Press (BREAK) to exit the EN command. Now we want to enter a formula in Column 3, so press (→) once. Type (C) (F) (Column Formula) and press (ENTER). To add the numbers in Column 1 and Column 2, type: (C) (1) (+) (C) (2) and press (ENTER).

Press (BREAK) to exit the CF command. Press (↓) to enter a formula in Row 4. Type (R) (F) (Row Formula) and press (ENTER). To add numbers in Rows 1, 2, and 3, type: (R) (1) (+) (R) (2) (+) (R) (3) and press (ENTER).

Press (BREAK) to return to command mode. Type (C) (A) (Calculate) and press (ENTER), to see the computed values.

The screen shows:

```
C>
   C1+C2
     1          2          3          4          5          6
 1       1          2      3.00
 2       3          4      7.00
 3       5          6     11.00
 4    9.00      12.00[    21.00]
 5
 6
 7
 8
 9
10
11
12
13
```

You want to label the table and have column and row headings, but first, you're going to have to insert some blank rows and columns.

Move the entry marker to the "home" cell (Cell 1,1) by typing (M) (M) (Move Marker) and pressing (ENTER). Press (ENTER) again. To insert three blank rows at the top of the table, type (I) (R) and press (ENTER). Repeat the Insert Row command two more times.

To insert a blank row between the main table and the calculated values, move the entry marker to Row 7. Type (I) (R) and press (ENTER).

To insert a blank column at the extreme left of the table, type (I) (C) (Insert Column) and press (ENTER). Now, to insert a blank column between the main table and the calculated values, move the entry marker to Column 4. Type (I) (C) and press (ENTER). The table looks like this:

```
C>
        1          2          3          4          5          6
 1
 2
 3
 4                        1          2              3.00
 5                        3          4              7.00
 6                        5          6             11.00
 7                                        [        ]
 8                     9.00      12.00             21.00
 9
10
11
12
13
```

To enter the title of the table, move the entry marker to Cell 1,2. Type (E) (T) and press (ENTER). Type: (A) (D) (D) (I) (T) (I) (O) (N) (␣) (T) (A) (B) (L) (E) and press (ENTER). Now, move the entry marker to Cell 3,5. Type: (R) (.) (T) (O) (T) (A) (L) and press (ENTER).

Move the entry marker to Cell 8,1. Type: (C) (.) (T) (O) (T) (A) (L) and press (ENTER).

The table looks like the one below.

```
ET:
   R4+R5+R6
      1          2          3          4          5          6
 1            ADDITION
 2
 3                                                R.TOTAL
 4                  1          2                     3.00
 5                  3          4                     7.00
 6                  5          6                    11.00
 7
 8[C.TOTAL]      9.00      12.00                    21.00
 9
10
11
12
13
```

Press (BREAK) to exit the ET command.

Type (C) (W) (Change Column Width) and press (ENTER). Type (?) to get the CHANGE COLUMN WIDTH HELP list. Now type (2) (,) (1) (4) and press (ENTER). To change the width of Column 3, type: (3) (,) (6) and press (ENTER). Finally, to change the width of the blank Column 4, type: (4) (,) (3) and press (ENTER). Now press (BREAK) to exit the CW command. The table looks like the one below.

```
C>
  R4+R5+R6
     1          2          3       4       5          6
 1       ADDITION TABLE
 2
 3                                        R.TOTAL
 4                 1          2              3.00
 5                 3          4              7.00
 6                 5          6             11.00
 7
 8[C.TOTAL   ]  9.00      12.00             21.00
 9
10
11
12
13
```

Next, you're going to save and print the table. Type (S) (A) (Save on Tape) and press (ENTER). Type (?) to see the TAPE SAVE HELP list. Follow the instructions on the screen. For the filename, type: (A) (D) (D) (T) (A) (B) and press (ENTER). To save a file on the same tape that another file has been stored on, make sure you position the tape at least a couple of counter numbers past the last file. After the file has been recorded, make a note of the filename and counter number on the tape label.

When you want to load the file at a later time, (the worksheet must be free of data) type (L) (O) and press (ENTER) in command mode. Type (?) to see the LOAD TAPE HELP list and follow the instructions. The addition table is displayed after the file has been loaded back into memory.

To print the addition table, first, move the entry marker to Cell 1,1 by typing (M) (M) and pressing (ENTER). Press (ENTER) again. Type (L) (I) (List to Printer) and press (ENTER) in command mode. Make sure the paper is properly aligned and the printer is ready. Using cursor direction keys, move the entry marker to the last cell to be printed and press (ENTER). After the printing is finished, the command mode prompt reappears. The printed copy looks like the one below. Note that only data is printed — row and column numbers do not appear on the printed copy.

```
                ADDITION TABLE

                                R.TOTAL
                   1       2      3.00
                   3       4      7.00
                   5       6     11.00

C.TOTAL         9.00   12.00     21.00
```

If the message PRINTER NOT READY appears on the screen, check all cables and plugs. Once the printer is ready, press (BREAK).

You can have Spectaculator use the same worksheet format and calculate the same formulas using different numbers. Press (BREAK) to return to command mode. Using the EN command, enter the following numbers. (Remember you can simply overtype the original numbers.)

1. (5) in Cell 4,2.
2. (6) in Cell 4,3.
3. (7) in Cell 5,2.
4. (8) in Cell 5,3.
5. (9) in Cell 6,2.
6. (1) (0) in Cell 6,3.

Press (BREAK), then enter the CA command, the new totals are displayed.

Move the entry marker to Column 6. Type (C) (F) and press (ENTER). For the column formula, type: (S) (M) (T) (() (C) (5) ()) and press (ENTER). Press (BREAK). Use the CA command to see the cumulative totals of Column 5. Note that the value in Cell 4,6 is the same value as in Cell 4,5. The cumulative sum of Cells 4,5; 5,5; and 6,5 is displayed in Cell 6,6.

The calculated value in Cell 8,6 was calculated using the original row formula, R1+R2+R3. Since we inserted three rows, the row numbers have changed to: R4+R5+R6. Remember that if both a column and row formula are entered for the same cell, the column formula is calculated and that resultant value is displayed.

Next, move the entry marker to Cell 3,6. Type (E) (T) and press (ENTER). Press the space bar four times and then type: (C) (.) (S) (U) (M) and press (ENTER). This stands for CUMULATIVE SUM.

The new table looks like the one below.

```
ET:
   SMT(C5)
      1          2            3     4      5         6
 1          ADDITION TABLE
 2
 3                                        R.TOTAL   [ C.SUM]
 4                    5        6              11.00   11.00
 5                    7        8              15.00   26.00
 6                    9       10              19.00   45.00
 7
 8 C.TOTAL        21.00    24.00              45.00   82.00
 9
10
11
12
13
```

If you want to save this new table, use the SA command, but enter a different filename and tape position.

Part IV — Advanced Sessions

Geometry

The following formulas are used to calculate the circumference and area of a circle, and the volume and surface area of a sphere:

Circumference $= 2\pi r$

Area of Circle $= \pi r^2$

Volume of Sphere $= 4/3\pi r^3$

Surface Area of Sphere $= 4\pi r^2$

where:

π = Pi(3.14159)
r = Radius

Note: When you are entering data, make sure that you are using the proper command. Remember that you must press (BREAK) to return to the command mode before you can enter a new command. If you fail to do this and you are using an erroneous command, a syntax error message appears on the prompt line. If this happens, press (BREAK) and begin again, making sure that you are using the correct command, and reenter your data. Refer to Part I, Setting Up if you have any questions.

To produce the printout on page 32 follow these steps using the radii values supplied in the printout.

1. Enter the following (C) (W) (Change Column Width) instructions:

   (1) (,) (6) (ENTER)
   (2) (,) (3) (ENTER)
   (3) (,) (1) (0) (ENTER)
   (4) (,) (3) (ENTER)
   (5) (,) (1) (0) (ENTER)
   (6) (,) (3) (ENTER)
   (7) (,) (1) (0) (ENTER)
   (8) (,) (3) (ENTER)
   (9) (,) (1) (0) (ENTER)

2. Press (BREAK) and then enter the values of the radii in Column 1 ((E) (N) command). (See printout on page 32.)

3. In column 3, enter the formula: (2) (*) (3) (.) (1) (4) (1) (5) (9) (*) (C) (1) ((C) (F) command).

4. In Column 5, enter the formula: (3) (.) (1) (4) (1) (5) (9) (*) (C) (1) (*) (C) (1) ((C) (F) command).

5. In column 7, enter the formula: (() (4) (/) (3) ()) (*) (3) (.) (1) (4) (1) (5) (9) (*) (C) (1) (!) (3) ((C) (F) command).

6. In Column 9, enter the formula: (4) (*) (3) (.) (1) (4) (1) (5) (9) (*) (C) (1) (*) (C) (1) ((C) (F) command).

7. Use the (C) (A) command (Calculate) to see the computed values.

8. Move the marker to Cell 1,1 and insert three rows ((I) (R) command).

9. Enter the heading, (R) (A) (D) (I) (U) (S) in Cell 1,1 ((E) (T) command).

10. Move the marker to Cell 1,3 and press the space bar three times before entering part of the heading, (C) (I) (R) (C) (U) (M) (–). Move the marker to Cell 2,3 and press the space bar three times. Enter the rest of the heading, (F) (E) (R) (E) (N) (C) (E) ((E) (T) command).

11. Move the marker to Cell 1,5 and press the space bar three times before entering (A) (R) (E) (A) (␣) (O) (F). Move the marker to 2,5 and press the space bar four times before entering the rest of the heading, (C) (I) (R)(C) (L) (E) ((E) (T) command).

12. Move the marker to Cell 1,7 and press the space bar once. Enter (V) (O)(L) (U) (M)(E) (␣) (O) (F) as part of the heading. Move the marker to Cell 2,7 and press the space bar four times. Enter (S) (P) (H) (E) (R) (E) as the rest of the heading ((E) (T) command).

13. Move the marker to Cell 1,9 press the space bar one time and enter (S)(U) (R) (F)(.) (A) (R) (E) (A) as part of the heading. Move the marker to Cell 2,9 and press the space bar one time, before entering the words, (O) (F) (␣) (S) (P) (H) (E)(R) (E) ((E)(T) command).

14. First, save the worksheet ((S) (A) command). Move the entry marker to Cell 1,1 and insert two columns to center the worksheet before printing ((I) (C) and (L) (I) commands). Later, you can overtype to enter new values for the radii ((E) (N) command). Spectaculator uses the formulas to recalculate and display the new values ((C) (A) command).

RADIUS	CIRCUM-FERENCE	AREA OF CIRCLE	VOLUME OF SPHERE	SURF.AREA OF SPHERE
1	6.28	3.14	4.19	12.57
5	31.42	78.54	523.60	314.16
7	43.98	153.94	1436.75	615.75
83	521.50	21642.41	2395092.81	86569.65
100	628.32	31415.90	4188785.00	125663.60

Personal Budget

The following example shows how to set up a simple home budget which compares the budgeted amounts for different expense categories with actual amounts spent. By using this general budget plan, you can easily see the areas where you are overspending. Follow the steps below, using the data in the printout on page 34.

1. Enter the following [C] [W] (Change Column Width) instructions:
   [3] [,] [1] [0] [ENTER]
   [4] [,] [3] [ENTER]
   [5] [,] [1] [0] [ENTER]
   [6] [,] [1] [0] [ENTER]
   [7] [,] [1] [0] [ENTER] [BREAK].

2. Move the marker to Cell 3,3 and enter the word, [B] [U] [D] [G] [E] [T]. Move the marker to Cell 4,3 and enter the word [C] [A] [T] [E] [G] [O] [R] [I] [E] [S] ([E] [T] command).

3. Move the marker to Cell 3,5 and press the space bar twice. Enter the word, [B] [U] [D] [G] [E] [T] [E] [D]. Move the marker to Cell 4,5, press the space bar twice, and enter the word, [A] [M] [O] [U] [N] [T] ([E] [T] command).

4. Move the marker to Cell 3,6 and press the space bar four times. Enter the word, [A] [C] [T] [U] [A] [L]. Move the marker to Cell 4,6, press the space bar four times and enter the word, [A] [M] [O] [U] [N] [T] ([E] [T] command).

5. Move the marker to Cell 3,7 and press the space bar four times. Enter the word [N] [E] [T]. Move the marker to Cell 4,7, press the space bar four times and enter the rest of the heading, [A] [M] [O] [U] [N] [T] ([E] [T] command).

6. Move the marker to Cell 6,3 and enter the first budget category, [A] [U] [T] [O]. In Column 3, enter the rest of the categories ([E] [T] command).

7. Move the marker to Cell 14,3 and enter the row heading, [T] [O] [T] [A] [L] ([E] [T] command).

8. Move the marker to Cell 6,5 and enter the budgeted amount of the car payment, [1] [7] [5] [.] [0] [0] for the category, AUTO. In Column 5, enter the rest of the budgeted amounts ([E] [N] command).

9. Move the marker to Cell 6,6 and enter the actual amount spent for the car payment, [1] [7] [5] [.] [0] [0], Enter the rest of the actual amounts in Column 6 ([E] [N] command).

10. Move the marker to Column 7 and enter the formula: [C] [5] [–] [C] [6] ([C] [F] command).

11. Move the marker to Row 14 and enter the formula: [S] [U] [M] [(] [R] [6] [)] ([R] [F] command).

12. Use the (C) (A) (Calculate) command to see the NET and TOTAL figures.

13. Move the marker to Cell 1,5 and enter the title, (B) (U) (D) (G) (E) (T) ( ) (F) (O) (R). Move the marker to Cell 1,6. Type a space and (A) (P) (R) (I) (L). Move the marker to Cell 1,7 and enter (1) (9) (8) (3) ((E) (T) command).

14. Print and save the worksheet ((L) (I) and (S) (A) commands). At the end of April, you can enter the new figures for the month by overtyping the values for the ACTUAL AMOUNT in Column 6 ((E) (N) command). Spectaculator recalculates and displays the new NET and TOTAL figures ((C) (A) command). Move the marker to Cell 1,6. Reenter the title and change the month ((E) (T) command).

BUDGET FOR APRIL 1983

BUDGET CATEGORIES	BUDGETED AMOUNT	ACTUAL AMOUNT	NET AMOUNT
AUTO	175.00	175.00	0.00
CAR CARE	35.00	110.00	-75.00
FOOD	150.00	125.00	25.00
GAS	60.00	75.00	-15.00
INSURANCE	15.00	15.00	0.00
RECREATION	75.00	190.00	-115.00
RENT	225.00	225.00	0.00
TOTAL	735.00	915.00	-180.00

Statistics

To calculate the chi-square statistic, the following formula is used:

$$X^2 = \sum \frac{(OF-EF)^2}{EF}$$

where:

X^2 = Chi-square (chi is a Greek letter)
Σ = Symbol meaning "the sum of"
OF = An observed frequency
EF = An expected frequency

To produce the printout on page 36, follow the steps below using the data supplied in the printout on page 36.

1. In Column 1, enter the observed frequencies (E N command). These are the numbers in the OF column.

2. In Column 2, enter the expected frequencies (E N command). These are the numbers in the EF column.

3. In Column 3, enter the formula: (C 1 − C 2) * (C 1 − C 2) (C F command).

4. In Column 4, enter the formula: D C 3 / C 2 (Decimal C F command).

5. Use the C A command to see the computed values.

6. Move the marker to Column 1 and insert a column (I C command).

7. Enter the following C W (Change Column Width) instructions: 1 , 9 ENTER 2 , 1 2 ENTER 3 , 1 2 ENTER 4 , 1 2 ENTER 5 , 1 8 ENTER.

8. In Row 10, enter the formula: D S U M (R 1) (Decimal R F command).

9. Use the C A command to see the computed values.

10. Move the marker to Row 1 and insert five rows (I R command).

11. Move the marker to Cell 1,4 (Row 1, Column 4) to enter the title of the table. Type: C H I − S Q U A R E and press ENTER. Move the marker to Cell 1,5 and type: S T A T I S T I C and press ENTER (E T command).

12. Move the marker to Cell 4,2 and press the space bar ten times before entering the Column 2 heading, (O) (F) ((E) (T) command).

13. Move the marker to Cell 4,3 and press the space bar ten times before entering the Column 3 heading, (E) (F) ((E) (T) command).

14. Move the marker to Cell 4,4 and press the space bar four times before entering the Column 4 heading, (() (O) (F) (–) (E) (F) ()) (2) ((E) (T) command). This stands for the formula to subtract the Expected Frequency from the Observed Frequency, and then, to square the difference.

15. Move the marker to Cell 4,5 and press the space bar seven times before entering the Column 5 heading, (() (O) (F) (–) (E) (F) ()) (2) (/) (E) (F) ((E) (T) command). This stands for the formula to divide the squared differences by the Expected Frequency.

16. Move the marker to Cell 15,2 and press (ENTER) while using the (E) (T) command to erase these unnecessary numbers. To erase the numbers in Cell 15,3 and 15,4 repeat this process.

17. In Cell 15,4 enter the label, (C) (H) (I) (–) (S) (Q) (U) (A) (R) (E) (␣) (=) ((E) (T) command).

18. After you print and save the worksheet ((L) (I) and (S) (A) commands), you can enter new values for the observed and expected frequencies in Column 2 and 3 ((E)(N) command). Spectaculator uses the formulas which are still intact to recalculate and display the new values ((C) (A) command).

CHI-SQUARE STATISTIC

OF	EF	(OF-EF)2	(OF-EF)2/EF
68	66	4.00	0.060606
75	80	25.00	0.3125
57	60	9.00	0.15
79	73	36.00	0.493150
32	34	4.00	0.117647
45	40	25.00	0.6250
33	30	9.00	0.30
31	37	36.00	0.972972
		CHI-SQUARE =	3.031877

The following formulas are used to calculate the mean, population variance, and the population standard deviation:

$$\mu = \frac{\Sigma X}{N} \qquad \theta^2 = \frac{\Sigma(X-\mu)^2}{N} \qquad \theta = \sqrt{\frac{\Sigma(X-\mu)^2}{N}}$$

where:

X = the observation
μ = the population mean
N = the total number of elements in the population
Σ = the symbol meaning the "sum of"
θ^2 = the population variance
θ = the population standard deviation

To produce the printout on page 39, follow these steps, using the data supplied in the printout on page 39.

1. In Column 1, enter the observations (E N command). These are the numbers in the (X) column.

2. Move the marker to Cell 17,1 and enter the formula: S U M (R 1). This formula totals the values of all the observations in the population (R F command).

3. Move the marker to Cell 18,1 and enter the formula: R 1 7 / 1 5. This formula divides the total by the number of elements in the population, giving the mean. Later, after the formula in Step 5 is entered, the population variance is caculated (R F command).

4. Use the Calculate command to see the computed values. (You are using the calculated mean value in step 5).

5. Move the marker to Cell 17,2. Enter the formula: (C 1 − 1 6 . 6 0) * (C 1 − 1 6 . 6 0). This formula squares the differences of the observations from the mean. The population variance and standard deviation is figured using this computed value (C F command).

6. Move the marker to Cell 19,2 and enter the formula: S Q R (R 1 8). This formula takes the square root of the average of the squared distances of the observations from the mean, giving the population standard deviation (R F command).

7. Use the Calculate command to see the computed values.

8. Move the marker to Cell 19,1 and press ENTER while using the E N command to erase the number.

9. Insert two columns (I C command).

10. Move the marker to Cell 19,4 and insert two columns (I C command0.

11. Move the marker to Cell 1,1 and insert five rows (I R command).

12. Move the marker to Cell 1,2 and press the space bar twice. Type: (M) (E) (A) (N) (,), press (ENTER). Move the marker to 1,3 and type (V) (A) (R) (I) (A) (N) (C) (E), press (ENTER). Move the marker to 1,4 and type (A) (N) (D). Move the marker to 1,5 and type (S) (T) (A) (N) (D) (A) (R) (D), press (ENTER). Move the marker to 1,6 and type (D) (E) (V) (I) (A) (T) (I) (O) (N), press (ENTER) ((E) (T) command).

13. Move the marker to Cell 4,3 and press the space bar six times before entering the Column 3 heading, (() (X) ()) ((E) (T) command).

14. Move the marker to Cell 4,6 and press the space bar three times before entering the Column 6 heading, (() (X) (–) (U) ()) (2) ((E) (T) command).

15. Move the marker to Cell 22,1 and enter the Row 22 heading, (C) (O) (L) (U) (M) (N), press (ENTER). Move the marker to 22,2 and enter (␣) (T) (O) (T) (A) (L) (␣) (=), press (ENTER) ((E) (T) command).

16. Move the marker to Cell 23,2 and press the space bar once, before entering the parameter label, (M) (E) (A) (N) (␣) (=) ((E) (T) command).

17. Move the marker to Cell 23,5 and press the space bar four times, before entering the parameter label, (V) (A) (R) (I) (A) (N) (C) (E) (␣) (=) ((E) (T) command).

18. Move the marker to Cell 24,5 and enter the parameter label, (S) (.) (␣) (D) (E) (V) (I) (A) (T) (I) (O) (N) (␣) (=) ((E) (T) command). Change column width of Column 5 to 14 ((C) (W) command).

19. Move the marker to Cell 1,1 and insert two columns ((I) (C) command).

20. After you print and save the worksheet ((L) (I) and (S) (A) commands), erase the (() (X) ()) values in Column 5 ((C) (C) command), enter new numbers ((E) (N) command), and then, use the Calculate command. Look at Cell 23,5 to see the new mean value and revise the Column 8 formula, using that figure. Use the Calculate command again to see the new values for the population variance and standard deviation. Move the cursor to Cell 24,5 and press (ENTER) while using the (E) (N) command to erase the number.

```
MEAN,  VARIANCE,   AND STANDARD DEVIATION

                (X)                    (X-U)2

                  4                    158.76
                  6                    112.36
                 12                     21.16
                 14                      6.76
                 14                      6.76
                 15                      2.56
                 17                      0.16
                 17                      0.16
                 18                      1.96
                 19                      5.76
                 21                     19.36
                 21                     19.36
                 22                     29.16
                 24                     54.76
                 25                     70.56

COLUMN TOTAL = 249.00                   509.60
        MEAN =  16.60        VARIANCE =  33.97
                          S. DEVIATION =   5.83
```

Part V — Key Summary

Key	Description
(?)	To see command set or specific command's HELP list. Type again to return to same command.
(BREAK)	To return to command mode.
(CLEAR)	Acts as a backspace key when entering commands, numbers, text, or formulas. Move cursor left one character and erases previous character.
(SHIFT) (←)	Moves cursor to beginning of entry line and erases all characters, allowing you to reenter command, number, text, or formula.
(ENTER)	After typing command, number, text, or formula, computer executes command or "enters" information in worksheet. Erases previous entry if pressed at entry line.
(→)	Moves entry marker to the cell on the right. Does not erase data.
(←)	Moves entry marker to the cell on the left. Does not erase data.
(↑)	Moves entry marker up to the cell in the previous row. Does not erase data.
(↓)	Moves entry marker down to the cell in the next row. Does not erase data.
(E) (X)	Exit — To exit the program and return to Basic.
(M) (M)	Move Marker — To move entry marker to specific cell, enter Row No. and Column No. Press (ENTER) to move marker to "home" cell. Returns to command mode.
(E) (N)	Enter Number — Position marker and enter number. Limits: sixteen digits total with maximum of six digits to the right of the decimal point.
(C) (F)	Column Formula Entry — Position marker and enter formula. Operation symbols include +, − and the nine operation symbols listed below Row Formula Entry.
(R) (F)	Row Formula Entry — Position marker and enter formula. Can include all operation symbols used in Column Formula Entry as well as variables.
(*)	Operation symbol for multiplication.

(/)	Operation symbol for division.
(() ())	Operation symbol to indicate which operation is to be performed first.
(!)	Operation symbol to indicate exponents, for example, 10 would be 10!2. The exponent (2 in this example) can only be a whole number.
(S) (Q) (R)	Operation symbol to indicate to take the square root of the number, column, or row following SQR.
(S) (U) (M)	Operation symbol to indicate to add the values starting from the column or row following SUM to the column or row where marker is positioned.
(S) (M) (T)	Operation symbol to indicate to give cumulative totals plus the final computed total of the row or column following SMT.
(I)	Operation symbol to indicate an integer calculated value which displays only the numbers to the left of the decimal. Type (I) before the formula.
(D)	Operation symbol to indicate a decimal calculated value carried out to six decimal places. Type (D) before the formula.

Note: If neither (D) nor (I) is given before the formula, the decimal calculated value is carried out to two decimal places.

(C) (A)	Calculate — After values are displayed, returns to command mode. Cannot use until formula has been entered.
(C) (C)	Clear Column — Position entry marker on desired column to erase all calculated values in that column. Cannot use until data has been entered. Stays in command mode.
(C) (R)	Clear Row — Position entry marker on desired row to erase all calculated values in that row. Cannot use until data has been entered. Stays in command mode.
(E) (T)	Enter Text — Position entry marker and enter text. Limit: 59 characters.
(F) (R)	Display Free Memory — To find out how much room in memory is left to enter data in worksheet. Stays in command mode.
(Z) (W)	Zap worksheet — Clears current worksheet from the screen and memory. Stays in command mode.

(D) (R)	Delete Row — Position marker on desired row to erase numbers, text, and formulas in that row. Other formulas change to reflect deletion. Cannot use until data has been entered. Stays in the command mode.
(D) (C)	Delete Column — Position entry marker on desired column to erase numbers, text, and formulas in that column. Other formulas change to reflect deletion. Cannot be used until data has been entered. Stays in command mode.
(I) (R)	Insert Row — Position entry marker on desired row where you want to enter new data. Data and formula previously in that row shift downward. Other formulas change to reflect insertion. Cannot use until data has been entered. Stays in command mode.
(I) (C)	Insert Column — Position entry marker on desired column where you want to enter new data. Data and formula previously in that column shift to the right. Other formulas change to reflect insertion. Cannot use until data has been entered. Stays in command mode.
(C) (W)	Change Column Width — To change column width, enter Column No. and width. Type (A) (L) (L) to change width of all columns (limits for column width: 3-59).
(S) (A)	Save on Tape — Type file name (up to six characters) and press (ENTER). Returns to command mode.
(P) (S)	Partial Save — Before giving the command (P) (S), position the entry marker on the first cell to be saved, then enter Row No., Column No. of last cell to be saved. Returns to command mode.
(L) (O)	Load from Tape — To load a worksheet from tape, type filename (up to six characters) position the tape, press play on the recorder, then press (ENTER) on the keyboard. The program starts searching for the file from that position.
(L) (I)	List to Printer — Before giving the command (L) (I), move the entry marker to the first cell to be printed, then enter Row No., Column No. of last cell to be printed.
(SHIFT) (↓) (Z)	To abort LO, SA, PS, and LI commands, hold down the (SHIFT) and (↓) keys while pressing (Z). Do not release these keys until the command has been aborted.

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