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TI Programmable 58/59

Applied Statistics

Quick Reference Guide

CONTENTS

CALCULATING NOTES

Low Battery Indication

If the display flashes erratically, fades out, gives incorrect results or is inconsistent in any way, recharge the battery. Calculator operation can be resumed after several minutes of recharging.

Algebraic Hierarchy

Operations and functions are performed automatically in following order.

1. Math Functions (x^2, cos, etc.)
2. Exponentiation (y^x) and Roots ($\sqrt[x]{y}$)
3. Multiplication, Division
4. Addition, Subtraction
5. Equals

Order applies to each set of parentheses. You can use up to 8 pending operations and 9 open parentheses, except where noted.

Flashing Display

A display flashing off and on indicates that an invalid key sequence has taken place or that the limits of the display have been exceeded. See Appendix B in *Personal Programming* for possible causes.

CONVERSIONS

Angle Formats

[2nd] [D.MS] — **DEGREES, MINUTES, SECONDS TO DECIMAL DEGREES** — Converts an angle measured in degrees, minutes and seconds to its decimal degrees equivalent. [INV] [2nd] [D.MS] reverses this conversion. Also used for time conversions. **Operates on display value only.** Submit 2 digits each for minutes and seconds. Entry and display format is DD.MMSSsss where DD is degrees, MM is minutes, SS is whole seconds and sss is fractional seconds.

Polar to Rectangular

R [x:t] Θ [2nd] [P→R] → **y**; [x:t] → **x**

Rectangular to Polar

x [x:t] **y** [INV] [2nd] [P→R] → Θ; [x:t] **R**

Only 4 pending operations are available for other uses when using D.MS or Polar/Rectangular conversions.

Angular Conversions

FROM \ TO	Degrees	Radians	Grads
Degrees		$\times \frac{\pi}{180}$	÷ 0.9
Radians	$\times \frac{180}{\pi}$		$\times \frac{200}{\pi}$
Grads	× 0.9	$\times \frac{\pi}{200}$	

STATISTICS

Initialize: [2nd] [Prgm] 1 [SBR] [CLR]
Data Entry: x_i [x:t] y_i [2nd] [Σ+]
Data Entry Removal: x_i [x:t] y_i [INV] [2nd] [Σ+]
Trendline Data Entry: x_1 [x:t], y_1 [2nd] [Σ+], y_2 [2nd] [Σ+], etc.
Trendline Point Removal: [x:t] [−] 1 [=] [x:t] y_i [INV] [2nd] [Σ+]

Calculations	Key Sequence
Mean of y-array	[2nd] [x̄]
then x-array	[x:t]
Standard Deviation	
(N − 1 Weighting) of y-array	[INV] [2nd] [x̄]
then x-array	[x:t]
(N Weighting) of y-array	[INV] [2nd] [Op] 11 [√]
then x-array	[x:t] [√]
Variance	
(N Weighting) of y-array	[2nd] [Op] 11
then x-array	[x:t]
(N − 1 Weighting) of y-array	[2nd] [x̄] [x²]
then x-array	[x:t] [x²]
Y-Intercept	[2nd] [Op] 12
Slope after y-intercept	[x:t]
Correlation Coefficient	[2nd] [Op] 13
y′ for new x	[2nd] [Op] 14
x′ for new y	[2nd] [Op] 15

SPECIAL CONTROL OPERATIONS

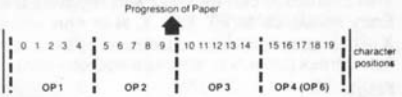
Each special control operation is called by pressing [2nd] [ ] **nn** where **nn** is the 2-digit code assigned to each operation (short form addressing can be used here). These operations use up to 4 pending operations and 1 subroutine level.

Code nn	Function
00*	Initialize print register.
01*	Alphanumerics for far left quarter of print column.
02*	Alphanumerics for inside left quarter of print column.
03*	Alphanumerics for inside right quarter of print column.
04*	Alphanumerics for far right quarter of print column.
05*	Print the contents of the print register.
06*	Print last 4 characters of OP 04 with current display.
07*	Plot ÷ in column 0-19 as specified by the display.
08*	List the labels currently used in program memory.
09	Bring specified library program into program memory.
10	Apply signum function to display register value.
11	Calculate variances.
12	Calculate slope and intercept.
13	Calculate correlation coefficient.
14	Calculate new y prime (y') for an x in the display.
15	Calculate new x prime (x') for a y in the display.
16	Display current partition of memory storage area.
17	Repartition memory storage area.
18	If no error condition exists in a program, set flag 7.
19	If an error condition exists in a program, set flag 7.
20-29	Increment a data register 0-9 by 1.
30-39	Decrement a data register 0-9 by 1.

*Designed specifically for use with optional PC-100A Print Cradle.

ALPHANUMERIC PRINT CODES

The first seven control operations allow you to create and print out alphanumeric messages. Twenty characters can be printed on each line. They are assembled and stored in groups of 5 characters at a time as shown below.



Each printed character is represented by a two-digit, row-column address code according to the following table:

	0	1	2	3	4	5	6	7
0		0	1	2	3	4	5	6
1	7	8	9	A	B	C	D	E
2	-	F	G	H	I	J	K	L
3	M	N	O	P	Q	R	S	T
4	.	U	V	W	X	Y	Z	+
5	×	*	[	π	e	(	)	,
6	↑	%	]	/	=	'	∝	x̄
7	≥	?	÷	!	Σ	∴	Π	Σ

For instance, A is code 13 and + is code 47

PROGRAMMING NOTES

Labels

Any key on the keyboard can be used as a label except [2nd], [LRN], [Ins], [Del], [SST], [BST], [Ind] and the numbers 0-9.

DSZ

This instruction can be used with registers 0-9. Entry sequence is [2nd] [Dsz] **X, N** or **nnn** where X is the data register used followed by the transfer address (label N or absolute address nnn).

Flags

Ten flags are available (0-9). Entry sequence for setting, resetting or testing flags is the flag instruction, flag number, then transfer address (testing only).

MEMORY PARTITIONING

Memory area is partitioned in sets of 10 registers where each register can hold a data value or 8 program instructions. To check placement of current partition, press [2nd] [Op] **16.** To repartition, enter number of sets (N) of 10 data registers needed and press [2nd] [Op] **17.**

N	Program/Data TI-58	TI-59
N < 0 = N		
0	479/00	959/00
1	399/09	879/09
2	319/19	799/19
3	**239/29***	719/29
4	159/39	639/39
5	079/49	559/49
6	000/59	**479/59***
7	Flashing	399/69
8	Flashing	319/79
9	Flashing	239/89
10	Flashing	159/99
N > 10	Flashing	159/99

*Partition when calculator is turned on.

PROGRAM KEY CODES

Key Code	Key	Key Code	Key	Key Code	Key
00	0	39	cos	72*	STO Ind
↓	↓	40	Ind	73*	RCL Ind
09	9	42	STO	74*	SUM Ind
10	E	43	RCL	75	−
11	A	44	SUM	76	Lbl
12	B	45	y^x	77	x≥t
13	C	47	CMs	78	x^2
14	D	48	Exc	79	$\bar{x}$
15	E	49	Prd	80	Grad
16	A	50	Lx	81	RST
17	B	52	EE	83*	GTO Ind
18	C	53	(	84*	Op Ind
19	D	54	)	85	+
20	CLR	55	÷	86	St flg
22	INV	57	Eng	87	If flg
23	ln x	58	Fix	88	DMS
24	CE	59	Int	89	π
25	CLR	60	Deg	90	List
27	INV	61	GTO	91	R/S
28	log	62*	Pgm Ind	92*	INV SBR
29	10^x	63*	Exc Ind	93	.
30	tan	64*	Prd Ind	94	+/−
32	x:t	65	×	95	=
33	x^2	66	Paus	96	Write
34	$\sqrt{x}$	67	x≥t	97	Dsz
35	$1/x$	68	Nop	98	Adv
36	Pgm	69	Op	99	Prt
37	P→R	70	Rad		
38	sin	71	SBR		

*Merged codes

RECORDING MAGNETIC CARDS (TI-59 Only)

Display When Write Pressed, Card Entered	Calculator Response
1, 2, 3, 4	Writes a card side with this number from the bank of this number (program and/or data) and records current partition on card.
−1, −2, −3, −4	Writes and protects card side with this number from the bank with this number. Also records current partition on card.
Any other number	Card is passed but not recorded. Rightmost two integer digits of display are flashed.

If the display is flashing any value when trying to read or record a card, the card is passed but not read or recorded and the rightmost two integers in the display are flashed.

The calculator should be in standard display format when reading or recording cards.

Only the integer portion of the display is recognized, i.e., 1.234 = 1.

READING MAGNETIC CARDS (TI-59 Only)

Display When Card Entered	Calculator Response
0	Reads information into bank number listed on card if current partition matches that on card. If partition incorrect, card is passed, but not read — display flashes card side passed.
1, 2, 3, 4	Expects card with this side number to be read — displays that side number. If another side is entered or if partition is incorrect, card is passed but not read — display flashes card side passed.
−1, −2, −3, −4	Forces side to be read into this bank number regardless of the partition or the number on the card. A protected program cannot be forced into any bank or alternate partition.
Any other number	Card is passed but not read — rightmost two integers in display flash.

LIBRARY USER INSTRUCTIONS

The remainder of this booklet contains the User Instructions for each program of the library.

REMOVING AND INSTALLING MODULES. The library module can easily be removed or replaced with another. It is a good idea to leave the module in place in the calculator except when replacing it with another module. Be sure to follow these instructions when you need to remove or replace a module.

CAUTION

Be sure to touch some metal object before handling a module to prevent possible damage by static electricity.

1. Turn the calculator OFF. Loading or unloading the module with the calculator ON may cause the keyboard or display to lock out. Also, shorting the contacts can damage the module or calculator.
2. Slide out the small panel covering the module compartment at the bottom of the back of the calculator.
3. Remove the module. You may turn the calculator over and let the module fall out into your hand.
4. Insert the module, notched end first with the labeled side up into the compartment. The module should slip into place effortlessly.
5. Replace the cover panel, securing the module against the contacts.

STATISTICS LIBRARY DIAGNOSTIC

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	Diagnostic/Module Check			
1a	Select Program		[2nd] [Pgm] 01	
1b	Run Diagnostic		[SBR] [=]	2.[1]
	or			
1c	Library Module Check		[SBR] [2nd] [R/S]	2.[2]
	Initialize Linear Regression			
2a	Select Program		[2nd] [Pgm] 01	
2b	Initialize Linear Regression		[SBR] [CLR]	0.

NOTES:

1. This output is obtained if the calculator is operating properly
2. The number 2 indicates the Statistics Library.
3. The Statistics Library programs are numbered 1 through 22. Program number 0 is the calculator's program memory.

RANDOM NUMBER GENERATOR

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 02	No Change
2	Initialize		[2nd] [E′]	0.
3	Enter random number seed ($0 \leq$ Seed ≤ 199017)	Seed†	[E]	Seed
	For Uniform Distribution			
4	Enter lower limit	x_{min}†	[A]	x_{min}
5	Enter upper limit	x_{max}†	[B]	x_{max}
6	Generate random number† (Repeat Step 6 as needed)		[C]	Random Number†
	For Normal Distribution			
7	Enter desired mean	μ†	[A]	μ
8	Enter desired standard deviation	σ†	[B]	σ
9	Generate random number† (Repeat Step 9 as needed)		[D]	Random Number†
	For Either Distribution			
10	Compute actual mean of generated numbers		[2nd] [$\bar{x}$]	$\bar{x}$
11	Compute actual standard deviation of generated numbers		[INV] [2nd] [$\bar{x}$]	s
12	Display number of random numbers generated		[RCL] 03	n
	For Range of (0, 1)			
13	Generate random number† (Repeat Step 13 as needed)		[SBR] [2nd] [D.MS]	Random Number

NOTES: 1. Only the first five digits may be considered random.

† Printed when PC-100A is used.

UNIVARIATE DATA (UNGROUPED)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 03	No Change
2	Initialize Data Base[1]		[E]	1.
3	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
4	Enter data (repeat for each x_i)[2]	x_i†	[A]	i
	If Raw Data Base is filled:			
5a	Record raw data on magnetic card(s) if desired[3]			
5b	Reset Raw Data Pointer[4] and go to Step 4 to enter additional data		[C]	31.
6	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
7	Read raw data card(s)	Card	[CLR]	0. Bank No.
8	Reset Raw Data Pointer[4]		[C]	31.
9	Compile Intermediate Data Base (raw data is printed)[6]		[D]	Last i
10	For additional data cards – go to Step 7			
	To delete data[7]:			
11	Enter unwanted data	x_i	[2nd] [A′]	x_i
12	Initialize Data Base[1]		[E]	1.
13	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
14	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		[D]	Last i
15	Reenter raw data that has been overwritten using either Steps 4-6 or 7-10			
16	Continue entering new data			

NOTES: See Data Entry Notes.

*For TI-58, repartition by pressing 6 [2nd] [Op] 17.

UNIVARIATE DATA (GROUPED)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 03	No Change
2	Initialize Data Base[1]		[2nd] [E′]	1.
3	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
4a	Enter frequency[8]	f_i†	[B]	f_i
4b	Enter data (repeat Step 4 for each x_i)[2]	x_i†	[A]	i
	If Raw Data Base if filled:			
5a	Record raw data on magnetic card(s) if desired[3]			
5b	Reset Raw Data Pointer[4] and go to Step 4 to enter additional data		[2nd] [C′]	32.
6	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
7	Read raw data card(s)	Card	[CLR]	0 Bank No.
8	Reset Raw Data Pointer		[2nd] [C′]	32.
9	Compile Intermediate Data Base (raw data is printed)[6]		[2nd] [D′]	Last i
10	For additional data cards – go to Step 7			
	To delete data[7]:			
11a	Enter frequency	f_i	[2nd] [B′]	f_i
11b	Enter unwanted x_i	x_i	[2nd] [A′]	x_i
12	Initialize Data Base[1]		[2nd] [E′]	1.
13	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
14	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		[2nd] [D′]	Last i
15	Reenter raw data that has been overwritten using either Steps 4-6 or 7-10			
16	Continue entering new data			

NOTES: See Data Entry Notes for 1-7.

8. The frequency should be a positive integer. The display flashes for negative entries and zero; but no test is made for noninteger entries.

† Printed when PC-100A is used.

*For TI-58, repartition by pressing 6 [2nd] [Op] 17.

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 04	No Change
2	Initialize Data Base[1]		[2nd] [E′]	0.
3	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
4a	Enter x_i	x_i†	[A]	i
4b	Enter y_i	y_i†	[B]	i
	(Repeat Step 4 for each data pair)[2]			
	If Raw Data Base is filled:			
5a	Record raw data on magnetic card(s) if desired[3]			
5b	Reset Raw Data Pointer[4] and go to Step 4 to enter additional data		[D]	32.
6	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
7	Read raw data card(s)	Card	[CLR]	0 Bank No.
8	Reset Raw Data Pointer		[D]	32.
9	Compile Intermediate Data Base (raw data is printed)[6]		[2nd] [D′]	Last i
10	For additional data cards – go to Step 7			
	To delete data[7]:			
11a	Enter unwanted x_i	x_i	[2nd] [A′]	x_i
11b	Enter unwanted y_i	y_i	[2nd] [B′]	y_i
12	Initialize Data Base[1]		[2nd] [E′]	0.
13	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
14	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		[2nd] [D′]	Last i
15	Reenter raw data that has been overwritten using either Steps 4-6 or 7-10			
16	Continue entering new data			

NOTES: See Data Entry Notes.

† Printed when PC-100A is used.

*For TI-58, repartition by pressing 6 [2nd] [Op] 17.

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 05	No Change
2	Initialize Data Base[1]		[2nd] [E′]	0.
3	Repartition if needed	n	[2nd] [Op] 17	Steps, Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
4a	Enter x_i	x_i†	[A]	i
4b	Enter y_i	y_i†	[B]	i
4c	Enter z_i	z_i†	[C]	i
	(Repeat Step 4 for each data triplet)[2]			
	If Raw Data Base is filled:			
5a	Record raw data on magnetic card(s) if desired[3]			
5b	Reset Raw Data Pointer[4] and go to Step 4 to enter additional data		[D]	33.
6	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
7	Read raw data card(s)	Card	[CLR]	0 Bank No.
8	Reset Raw Data Pointer		[D]	33.
9	Compile Intermediate Data Base (raw data is printed)[6]		[2nd] [D′]	Last i
10	For additional data cards — go to Step 7			
	To delete data[7]**:**			
11a	Enter unwanted x_i	x_i	[2nd] [A′]	x_i
11b	Enter unwanted y_i	y_i	[2nd] [B′]	y_i
11c	Enter unwanted z_i	z_i	[2nd] [C′]	z_i
12	Initialize Data Base[1]		[2nd] [E′]	0.
13	Repartition if needed	n	[2nd] [Op] 17	Steps, Regs
14	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		[2nd] [D′]	Last i
15	Reenter raw data that has been overwritten using either Steps 4-6 or 7-10			
16	Continue entering new data			

NOTES: See Data Entry Notes.

† Printed when PC-100A is used.

*For TI-58, repartition by pressing 6 [2nd] [Op] 17.

ANALYSIS OF VARIANCE DATA (ONE-WAY)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 06	No Change
2	Initialize Data Base[1]		[2nd] [E']	0.
3	Repartition if needed	n	[2nd] [Op] 17	Steps, Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
4	Enter data for Treatment Group i (repeat for each j)[2]	x_{ij}†	[A]	j
	If Raw Data Base is filled:			
5a	Record raw data on magnetic card(s) if desired[3]			
5b	Reset Raw Data Pointer[4] and go to Step 4 to complete entry of data for Current Treatment Group		[D]	31.
6	Calculate $\bar{x}$ for Current Treatment Group		[2nd] [B']	$\bar{x}$†
7	Display s^2 for Current Treatment Group		[2nd] [C']	s^2†
8	Go to Step 4 for Next Treatment Group[8]			
9	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
10	Read raw data card(s) for Treatment Group i	Card	[CLR]	0. Bank No.
11	Reset Raw Data Pointer[4]		[D]	31.
12	Compile Intermediate Data Base (raw data is printed)[6]		[2nd] [D']	Last j
13	To enter additional data cards for Current Treatment Group – go to Step 10			
14	Calculate $\bar{x}$ for Current Treatment Group		[2nd] [B']	$\bar{x}$†
15	Display s^2 for Current Treatment Group		[2nd] [C']	s^2†
16	Go to Step 10 for Next Treatment Group			

	To delete data[7]:			
17	Enter unwanted data	x_{ij}	**[2nd] [A′]**	x_{ij}
18	Initialize Data Base[1]		**[2nd] [E′]**	0.
19	Repartition if needed	n	**[2nd] [Op] 17**	Steps, Regs
20	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		**[2nd] [D′]**	Last j
21	Continue entering data for Current Treatment Group			
22	Reenter data for Current Treatment Group that has been overwritten			
23	Calculate $\bar{x}$ for Current Treatment Group		**[2nd] [B′]**	$\bar{x}$ †
24	Display s^2 for Current Treatment Group		**[2nd] [C′]**	s^2 †
25	Reenter raw data for previous Treatment Groups using either Steps 4-9 or 10-16			
26	Enter data for New Treatment Groups			

NOTES: See Data Entry Notes for 1-7.

8. If you are recording your raw data on magnetic cards, each Treatment Group should be recorded on separate sets of cards. To do this, simply reset the Raw Data Pointer here. Also, data deletion procedures are invalidated unless this pointer is reset.

† Printed when PC-100A is used.

• For TI-58, repartition by pressing 6 **[2nd] [Op] 17**.

ANALYSIS OF VARIANCE DATA (TWO-WAY)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 06	No Change
2	Initialize Data Base[1]		[E]	0.
3	Enter number of rows[8]	R†	[B]	R
4	Enter number of columns[8]	C†	[C]	C
5	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
6	Enter data for row i (repeat for each j)[2]	x_{ij}†	[A]	j
	If Raw Data Base is filled:			
7a	Record raw data on magnetic card(s) if desired[3]			
7b	Reset Raw Data Pointer[4] and go to Step 6 to enter additional data		[D]	31.
	(Repeat 6-7 for each row)[9]			
8	Calculate $\bar{x}$[10]		[2nd] [B′]	$\bar{x}$†
9	Display s^2		[2nd] [C′]	s^2†
10	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
11	Read raw data card(s)	Card	[CLR]	0 Bank No.
12	Reset Raw Data Pointer[4]		[D]	31.
13	Compile Intermediate Data Base (raw data is printed)[6]		[2nd] [D′]	Last j
14	For additional data cards – go to Step 11			
15	Calculate $\bar{x}$[10]		[2nd] [B′]	$\bar{x}$†
16	Display s^2		[2nd] [C′]	s^2†

	To delete data[7]:			
17	Enter unwanted data[9]	x_{ij}	**[2nd] [A']**	x_{ij}
18	Initialize Data Base[1]		**[E]**	0.
19	Enter number of rows[8]	R†	**[B]**	R
20	Enter number of columns[8]	C†	**[C]**	C
21	Repartition if needed	n	**[2nd] [Op] 17**	Steps. Regs
22	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		**[2nd] [D']**	Last j
23	Reenter raw data that has been overwritten using either Steps 6-9 or 11-16			
24	Continue entering new data			

NOTES: See Data Entry Notes for 1-7.

8. R + C may not exceed 15.
9. Data deletion procedures may be invalidated unless the Raw Data Pointer is reset between rows.
10. This step may be performed only after all raw data is entered.

† Printed when PC-100A is used.

* For TI-58, repartition by pressing 6 **[2nd] [Op] 17**.

HISTOGRAM DATA

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program*		[2nd] [Pgm] 07	No Change
2	Initialize Data Base[1]		[2nd] [E']	0.
3	Enter number of cells[8]	Cells†	[B]	Cells
4	Enter lower limit	x_{min}†	[2nd] [B']	x_{min}
5	Enter cell width	Width†	[C]	Width
6	Repartition if needed	n	[2nd] [Op] 17	Steps, Regs
	Enter data using either I or II			
I	**KEYBOARD ENTRY**			
7	Enter data (repeat for each x_i)[2]	x_i†	[A]	i
	If Raw Data Base is filled:			
8a	Record raw data on magnetic card(s) if desired[3]			
8b	Reset Raw Data Pointer[4] and go to Step 7 to enter additional data			
9	Record intermediate data on magnetic card if desired[3]			
II	**MAGNETIC CARD ENTRY**[5]			
10	Read raw data card(s)	Card	[CLR]	0. Bank No.
11	Reset Raw Data Pointer[4]		[D]	31.
12	Compile Intermediate Data Base (raw data is printed)[6]		[2nd] [D']	Last i
13	For additional data card(s) – go to Step 10			
	To delete data[7]:			
14	Enter unwanted data	x_i	[2nd] [A']	x_i
15	Initialize Data Base[1]		[2nd] [E']	0.
16	Enter number of cells	Cells†	[B]	Cells
17	Enter lower limit	x_{min}†	[2nd] [B']	x_{min}
18	Enter cell width	Width†	[C]	Width
19	Repartition if needed	n	[2nd] [Op] 17	Steps, Regs
20	Recompile raw data currently stored in Raw Data Base (raw data is printed)[6]		[2nd] [D']	Last i
21	Reenter raw data that has been overwritten using either Steps 7-9 or 10-13			
22	Continue entering new data			

NOTES: See Data Entry Notes for 1-7.

8. The number of cells may not exceed 12.

† Printed when PC-100A is used.

* For TI-58, repartition by pressing 6 [2nd] [Op] 17.

MEANS AND MOMENTS

ST-08

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 03	No Change
2	Enter Univariate Data according to User Instructions found in Section III.			
3	Select Program		[2nd] [Pgm] 08	No Change
4	Calculate arithmetic mean		[A]	$\bar{x}$†
5	Calculate geometric mean[1]		[B]	g†
6	Calculate harmonic mean		[C]	h†
7a	Calculate second moment		[2nd] [A′]	m_2 †
7b	Calculate third moment		[R/S]	m_3 †
7c	Calculate fourth moment		[R/S]	m_4 †
8	Calculate Kurtosis[2]		[D]	Kurtosis†
9	Calculate Skewness[2]		[E]	Skewness†

NOTES:
1. The geometric mean is not valid for negative values of x.
2. Step 7 must be performed before calculating Kurtosis or Skewness.

† Printed when PC-100A is used.

HISTOGRAM CONSTRUCTION

ST-09

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 07	No Change
2	Enter Histogram Data according to User Instructions found in Section III.			
3	Select Program		[2nd] [Pgm] 09	No Change
4	Initialize		[2nd] [E′]	0.
5	Calculate sample mean		[A]	$\bar{x}$†
6	Calculate sample standard deviation[1]		[2nd] [A′]	s†
7a	Display count of current cell[2]		[B]	Count†
7b	Calculate upper limit of current cell[3]		[C]	x_{max}†
8	Display accumulation of cell counts		[RCL] 21	Σ Count

NOTES:
1. The n-1 method is used here. You may calculate s^2 using the n method by pressing [2nd] [Op] 11 [x ≷ t].
2. The cell number is incremented by 1 each time [B] is pressed. Divide the count by n to determine the frequency.
3. 7b must be performed immediately following 7a for the cell in question.

† Printed when PC-100A is used.

THEORETICAL HISTOGRAM

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 07	No Change
2	Enter Histogram data according to User Instructions found in Section III			
3	Calculate sample mean if desired[1,6]		[2nd] [$\bar{x}$] [x≷t]	$\bar{x}$
4	Calculate sample standard deviation if desired[1,6]		[INV] [2nd] [$\bar{x}$] [x≷t]	Ignore s
	For Continuous Distribution			
5	Enter continuous probability function into program memory (do not use [=], [CLR], or [RST])[2]	f(x)	[2nd] [CP] [LRN] [2nd] [Lbl] [2nd] [A'] [INV] [SBR] [LRN]	
6	Select Program		[2nd] [Pgm] 10	No Change
7	Initialize		[E]	0.
8	Calculate theoretically expected count of cell i[3] (repeat for each cell)		[A]	Count†
9	Calculate chi-square goodness of fit test[4]		[C]	$Q(\chi^2)$†
	For Discrete Distribution[5]			
10	Enter discrete probability function into program memory (do not use [=], [CLR, or [RST])[2]	f(k)	[2nd] [CP] [LRN] [2nd] [Lbl] [2nd] [A'] [INV] [SBR] [LRN]	
11	Select Program		[2nd] [Pgm] 10	No Change
12	Initialize		[2nd] [E']	0.
13	Calculate theoretically expected count of cell i[3] (repeat for each cell)		[2nd] [A']	Count†
14	Calculate chi-square goodness of fit test[4]		[C]	$Q(\chi^2)$†

NOTES:

1. Initialization of the Theoretical Histogram program destroys the data needed to compute $\bar{x}$ and s. Note that if you need to know the observed counts of the cells in your Histogram you may perform the Histogram Construction program at this time.
2. Initialization of the Histogram Data program provides 60 data registers. If you own a TI Programmable 58 you will have to repartition your calculator before entering your subroutine. Observe that the prewritten library routines calculating f(x) for the normal and binomial distributions may be called by your subroutine. However, due to conflicting register assignments, the chi-square and student's -t routines may not be used. Initialization may take as long as a minute depending on the length of your subroutine.
3. The cell number is incremented by 1 each time you press [A] or [2nd] [A']. Calculation of the expected count may take as long as a minute to complete. A count of zero causes a flashing display indicating invalid results. Press [RCL] 20 to display $\Sigma\chi^2$ for current cell.

UNIVARIATE DATA TRANSFORMS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	For Preprogrammed Transform			
1	Select Program*		[2nd] [Pgm] 11	No Change
2	Initialize[1]		[2nd] [E′]	1.
3	Repartition if desired	n	[2nd] [Op] 17	Steps. Regs
4	Choose Transform: Exponential, Logarithmic		[2nd] [A′] [2nd] [B′]	No Change No Change
5	Enter data (repeat for each x_i)[2]	x_i	[A]	i
	For User-Defined Transform			
6	Enter Transform into program memory (do not use [=], [CLR], or [RST])	f(x)	[2nd] [CP] [LRN] [2nd] [Lbl] [2nd] [A′] [INV] [SBR] [LRN]	
7	Select Program		[2nd] [Pgm] 11	No Change
8	Initialize[1]		[2nd] [E′]	1.
9	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
10	Select User-Defined Transform mode		[2nd] [C′]	No Change
11	Enter data (repeat for each x_i)[2]	x_i	[A]	i

NOTES:

1. Initialization uses routine [E] of the Univariate Data (Ungrouped) program.
2. Once the data is transformed, it is entered using routine [A] of the Univarite Data (Ungrouped) program. See the User Instructions of that program for data deletion procedures and limitations of the Raw Data Base. f(x) is printed when the PC-100A is used.
3. This program uses the same data registers as ST-03.

* For TI-58, repartition by pressing 6 [2nd] [Op] 17.

BIVARIATE DATA TRANSFORMS (DATA ENTRY)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	For Preprogrammed Transforms			
1	Select Program		[2nd] [Pgm] 12	No Change
2	Initialize[1]		[2nd] [E′]	0.
3	Repartition if desired	n	[2nd] [Op] 17	Steps. Regs
4	Choose Transform:			
	(x, ln y),		[2nd] [A′]	No Change
	(ln x, ln y),		[2nd] [B′]	No Change
	(ln x, y)		[2nd] [C′]	No Change
5a	Enter x_i[2]	x_i	[A]	i
5b	Enter y_i[2]	y_i	[B]	i
	(Repeat Step 5 for each data pair)			
	For User-Defined Transforms			
6	Enter Transforms into program memory (do not use [=], [CLR], or [RST])		[2nd] [CP] [LRN]	
			[2nd] [Lbl]	
			[2nd] [A′]	
		f(x)	[INV] [SBR]	
			[2nd] [Lbl]	
			[2nd] [B′]	
		g(y)	[INV] [SBR]	
			[LRN]	
7	Select Program		[2nd] [Pgm] 12	No Change
8	Initialize[1]		[2nd] [E′]	0.
9	Repartition if needed	n	[2nd] [Op] 17	Steps. Regs
10	Choose User-Defined Transform		[2nd] [D′]	No Change
11a	Enter x_i[2]	x_i	[A]	i
11b	Enter y_i[2]	y_i	[B]	i
	(Repeat Step 11 for each data pair)			

NOTES:

1. Initialization uses routine [2nd] [E′] of the Bivariate Data program.
2. Once the data is transformed, f(x) is entered using routine [A] of the Bivariate Data program and g(y) is entered using routine [B]. Data must be entered in pairs. See the Bivariate Data User Instructions for data deletion procedures and limitations of the Raw Data Base. f(x) and g(y) are printed when the PC-100A is used.
3. This program uses the same data registers as ST-04.

BIVARIATE DATA TRANSFORMS (MODEL FITTING)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	For Preprogrammed Curve			
1	Select Program		[2nd] [Pgm] 12	No Change
2	Initialize[1]		[2nd] [E′]	0.
3	Repartition if desired	n	[2nd] [Op] 17	Steps, Regs
4	Choose curve: Exponential, Power, Logarithmic		[2nd] [A′] [2nd] [B′] [2nd] [C′]	No Change No Change No Change
5a	Enter x_i[2]	x_i	[A]	i
5b	Enter y_i[2]	y_i	[B]	i
	(Repeat Step 5 for each data pair)			
6a	Calculate y-intercept and slope of line fitted to data points		[C]	b
6b	Display slope		[x≷t]	m
7	Calculate y' given x	x	[D]	y'
8	Calculate x' given y	y	[E]	x'
9	Calculate correlation coefficient		[2nd] [Op] 13	r
	For User-Defined Curve			
10	Enter transforms into program memory (do not use [=], [CLR], or [RST])		[2nd] [CP] [LRN] [2nd] [Lbl] [2nd] [A′] f(x) [INV] [SBR] [2nd] [Lbl] [2nd] [B′] g(y) [INV] [SBR] [LRN]	
11	Select Program		[2nd] [Pgm] 12	No Change
12	Initialize[1]		[2nd] [E′]	0.
13	Repartition if needed	n	[2nd] [Op] 17	Steps, Regs
14	Select User-Defined Curve Mode		[2nd] [D′]	No Change
15a	Enter x_i[2]		[A]	i
15b	Enter y_i[2]		[B]	i
	(Repeat Step 15 for each data pair)			
16a	Calculate slope and intercept of straight line fitted to transformed data		[C]	b
16b	Manually transform b to correct form			
16c	Display transformed m		[x≷t]	m
16d	Manually transform m to correct form			

17a	Calculate transformed y′ given transformed x^3	x	[RST] [2nd] [A′]	f(x)
17b	Manually transform g(y′) to y′		[2nd] [Op] 14	g(y′)
18a	Calculate transformed y′ given transformed y^3	y	[RST] [2nd] [B′]	g(y)
18b	Manually transform f(x′) to x′		[2nd] [Op] 15	f(x′)
19	Calculate correlation coefficient		[2nd] [Op] 13	r

NOTES:

1. Initialization uses routine [2nd] [E′] of the Bivariate Data program.
2. Once the data is transformed, f(x) is entered using routine [A] of the Bivariate Data program and g(y) is entered using routine [B]. Data must be entered in pairs. See the Bivariate Data program for data deletion procedures and limitation of the Raw Data Base. f(x) and g(y) are printed when the PC-100A is used.
3. [RST] returns control to program memory and allows you to use your transform routines directly.
4. See Table 3.1 for register contents.

t-STATISTIC EVALUATION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 04	No Change
2	Enter Bivariate Data according to User Instructions found in Section III.			
3	Select Program		[2nd] [Pgm] 13	No Change
	For Paired Observation			
4	Compute t-Statistic		[A]	t†
5	Display degrees of freedom		[B]	$_{\mu}$†
6	Display mean of difference between observations		[C]	$\bar{\Delta}$†
7	Display standard deviation of difference between observations		[D]	s_{Δ}†
	For Two Sample Test			
8	Enter hypothesized difference and compute t-Statistic	Δ	[2nd] [A′]	t†
9	Display degrees of freedom		[B]	$_{\mu}$†

NOTE: † Printed when PC-100A is used.

CONTINGENCY TABLE ANALYSIS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 14	No Change
2	Establish correct partitioning	6	[2nd] [Op] 17	Steps. 59
3	Enter number of rows[1]	R†	[D]	R
4	Enter number of columns[1]	C†	[E]	C
5	Initialize data entry routine[2]		[2nd] [E']	1.
6	Enter data by rows (i.e., $x_{11}, x_{12}, \ldots x_{1C}, x_{21}, \ldots x_{RC}$)[3]	x_{ij}†	[A]	Next j
7	Calculate χ^2-statistic[5]		[B]	χ^2
8	Calculate degrees of freedom if desired		[C]	ν
9	Calculate cumulative distribution function		[2nd] [B']	$P(\chi^2)$

NOTES:
1. R X C can be no greater than 25.
2. This program uses its own data entry routine.
3. Do not enter negative values. If an error is made, begin again.
4. Perform Steps 1-7 first.
5. Execution time increases with ν.

† Printed when PC-100A is used.

1-WAY ANALYSIS OF VARIANCE

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 06	No Change
2	Enter One-Way AOV data according to User Instructions found in Section III			
3	Select Program		[2nd] [Pgm] 15	No Change
4	Calculate F-statistic[1]		[A]	F†
5	Display degrees of freedom in numerator		[B]	ν_1†
6	Display degrees of freedom in denominator		[2nd] [B']	ν_2†
7	Display error sum of squares		[C]	ESS†
8	Display treatment sum of squares		[D]	TSS†
9	Display total sum of squares		[E]	SS†

NOTES:
1. Step 4 must be performed before Steps 5-9.

† Printed when PC-100A is used.

2-WAY ANALYSIS OF VARIANCE

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 06	No Change
2	Enter Two-Way AOV data according to User Instructions found in Section III[1]			
3	Select Program		[2nd] [Pgm] 16	No Change
4	Calculate total sum of squares		[A]	SS†
5	Calculate column sum of squares		[B]	CSS†
6	Calculate row sum of squares[2]		[2nd] [B']	RSS†
	For Column Effects			
7	Calculate F-Statistic		[C]	F_C†
8	Calculate degrees of freedom in numerator		[D]	ν_1†
9	Calculate degrees of freedom in denominator		[R/S]	ν_2†
	For Row Effects[3]			
10	Calculate F-Statistic		[2nd] [C']	F_R†
11	Calculate degrees of freedom in numerator		[D]	ν_1†
12	Calculate degrees of freedom in denominator		[R/S]	ν_2†

NOTES:
1. R + C cannot exceed 16.
2. Perform Step 5 before Step 6.
3. Perform Steps 7-9 first.

† Printed when PC-100A is used.

RANK SUM TESTS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 04	No Change
2	Enter Bivariate Data according to User Instructions found in Section III[1]			
3	Select Program		[2nd] [Pgm] 17	No Change
4	Rank data[2]		[A]	Ordered data is flashed in display and printed.
5	Calculate rank sum of x[3,5]		[B]	T_x †
6	Calculate Mann-Whitney for x		[C]	w_x †
7	Calculate normal deviate for x		[D]	z_x †
8	Calculate rank sum of y[4]		[2nd] [B′]	T_y †
9	Calculate Mann-Whitney for y		[C]	w_y †
10	Calculate normal deviate for y		[D]	z_y †
11	Display rank mean		[E]	$\overline{w}$ †
12	Display rank variance		[2nd] [E′]	s_w^2 †

NOTES:

1. Enter all the x values first, then enter the y values. This invalidates data deletion procedures.
2. Perform this step before 5 or 8.
3. Perform this step before 6 and 7.
4. Perform this step before 9 and 10.
5. Execution time increases with the number of data points.

† Printed when PC-100A is used.

MULTIPLE LINEAR REGRESSION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 05	No Change
2	Enter Trivariate Data according to User Instructions found in Section III			
3	Select Program		[2nd] [Pgm] 18	No Change
4a	Calculate coefficients and display a_0		[A]	a_0 †
4b	Display a_1		[B]	a_1 †
4c	Display a_2		[C]	a_2 †
5	Calculate coefficient of determination		[D]	R^2 †
6	Calculate z' for a given x and y	x† y†	[2nd] [A′] [2nd] [B′]	x z'†

NOTE: † Printed when PC-100A is used.

NORMAL DISTRIBUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 19	No Change
2	Calculate standard normal density of z	z	[A]	$\phi(z)$
3	Calculate $Pr(Z \leq z)$	z	[B]	P(z)
4	Calculate $Pr(Z > z)$	z	[C]	Q(z)
5	Calculate $Pr(Z \leq \|z\|)$	z	[D]	A(z)

BINOMIAL DISTRIBUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 20	No Change
2	Enter number of trials	n	[A]	n
3	Enter probability of success on each trial	p	[B]	p
4	Calculate mean		[2nd] [A′]	μ
5	Calculate standard deviation		[2nd] [B′]	σ
6	Calculate probability of k successes	k	[C]	f(k)
7	Calculate probability of k or fewer successes	k	[D]	P(k)
8	Calculate probability of more than k successes	k	[E]	Q(k)

NOTES:

1. Steps 4-8 may be performed at any time and in any order following Steps 1-3.
2. If an output flashes in the display the calculator probably overflowed in calculation. Disregard results. (This only occurs for large n and small k.)

CHI-SQUARE DISTRIBUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 21	No Change
2	Enter degrees of freedom[1]	ν	[A]	$\Gamma(\nu/2)$
3	Enter χ^2 Statistic and calculate density function[2]	χ^2	[B]	$f(\chi^2)$
4	Enter χ^2 Statistic and calculate cumulative distribution function[2]	χ^2	[C]	$P(\chi^2)$

NOTES:

1. Execution time increases with ν.
2. Perform Step 2 first.

STUDENT'S-t DISTRIBUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 21	No Change
2	Enter degrees of freedom[1]	ν	[A]	$\Gamma(\nu/2)$
3	Enter t-Statistic and calculate density function[2]	t	[D]	f(t)
4	Enter t-Statistic and calculate cumulative distribution function[1, 2]	t	[E]	P(t)

NOTES:
1. Execution time increases with ν.
2. Perform Step 2 first.
3. Program operation leaves the calculator in radian mode.

F DISTRIBUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select Program		[2nd] [Pgm] 22	No Change
2	Enter degrees of freedom in numerator	ν_1	[A]	ν_1
3	Enter degrees of freedom in denominator	ν_2	[B]	ν_2
4	Calculate $Pr(F > F)$[1]	x	[C]	Q(F)

NOTE:
1. Execution time increases as ν_1 and ν_2 increase and F decreases.

DATA ENTRY NOTES

The following notes apply to all *Data Entry* programs.

1. Initialization affects only the intermediate data base and the raw data pointer. The raw data base is not disturbed. However, you may want to clear these registers using the [CMs] key *before initialization* (check partitioning). Initialization also provides 60 data registers as described earlier.

2. The calculator ignores data entered after the raw data base is filled. This condition is indicated by a flashing display. You may determine how many pieces of data you can store in the raw data base using the following table. This table gives the upper limit of complete sets of data that may be stored for the indicated partitioning.

Table 3.2.

	Partitioning (n)						
Upper Limit of Data	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Univariate Data (Ungrouped), Analysis of Variance Data, and Histogram Data	x_9	x_{19}	x_{29}	x_{39}	x_{49}	x_{59}	x_{69}
Univariate Data (Grouped)	x_4 f_4	x_9 f_9	x_{14} f_{14}	x_{19} f_{19}	x_{24} f_{24}	x_{29} f_{29}	x_{34} f_{34}
Bivariate Data	x_4 y_4	x_9 y_9	x_{14} y_{14}	x_{19} y_{19}	x_{24} y_{24}	x_{29} y_{29}	x_{34} y_{34}
Trivariate Date	x_2 y_2 z_2	x_5 y_5 z_5	x_9 y_9 z_9	x_{12} y_{12} z_{12}	x_{15} y_{15} z_{15}	x_{19} y_{19} z_{19}	x_{22} y_{22} z_{22}

3. Follow these steps to record the data base on magnetic cards.

    1. Place the bank number of the registers you wish to record in the display.
    2. Press [2nd] [Write].
    3. Insert magnetic card in card slot.

    The bank number of the intermediate data base ($R_{00} - R_{29}$) is 4. The bank numbers of the raw data base are given below.

Registers	Bank Number
$R_{30} - R_{59}$	3
$R_{60} - R_{89}$	2
$R_{90} - R_{99}$	1

    Note that bank 1 includes program memory.

4. Resetting the raw data pointer to the beginning of the raw data base allows you to continue entering new raw data after filling the raw data base by writing over previously entered data. Although the intermediate data base is not affected, overwritten raw data is lost unless first stored on a magnetic card. Note that you may obtain a hardcopy printer listing of the data registers by entering the number of the first register you want listed and pressing [INV] [2nd] [List]. Then press [R/S] when you want to stop.

5. If you have already compiled your intermediate data base and recorded it on a magnetic card, simply read that card and go on to the data evaluation programs. You don't even have to call the Data Entry program to do this.

6. The length of execution time increases with the number of data points when the intermediate data base is compiled directly from the raw data base.

7. Data must be deleted in the same form it is entered in (e.g., pairs, triplets, etc.). Data that has been overwritten may not be deleted. If the calculator cannot find the data you have asked it to delete, nines are flashed in the display. This process may take several seconds to complete.