TI Programmable 58/59

Master Library

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		$\times \frac{\pi}{180}$	$\div 0.9$
Radians	$\times \frac{180}{\pi}$		$\times \frac{200}{\pi}$
Grads	$\times 0.9$	$\times \frac{\pi}{200}$	

STATISTICS

Initialize: [2nd] [Pgm] 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] [$\bar{x}$]
then x-array	[x⇄t]
Standard Deviation	
(N − 1 Weighting) of y-array	[INV] [2nd] [$\bar{x}$]
then x-array	[x⇄t]
(N Weighting) of y-array	[INV] [2nd] [Op] 11 [$\sqrt{x}$]
then x-array	[x⇄t] [$\sqrt{x}$]
Variance	
(N Weighting) of y-array	[2nd] [Op] 11
then x-array	[x⇄t]
(N − 1 Weighting) of y-array	[2nd] [$\bar{x}$] [x^2]
then x-array	[x⇄t] [x^2]
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

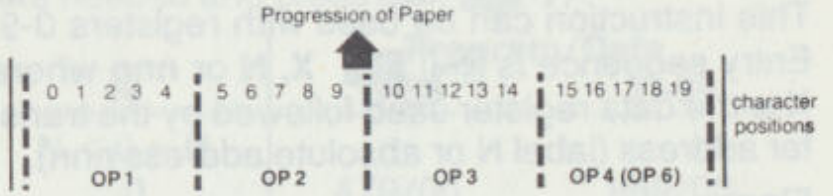
Each special control operation is called by pressing [2nd] [Op] **nn** where **nn** is the 2-digit code assigned to each operation (short form addressing can be used here). These operations use up to 4 pending operations and 1 subroutine level.

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.

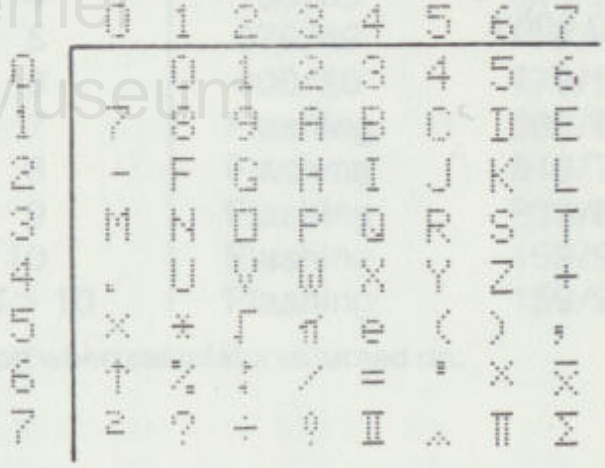
*Designed specifically for use with optional PC-100A Print Cradle

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:



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	Σ+
14	D	48	Exc	79	$\bar{x}$
15	E	49	Prd	80	Grad
16	A'	50	|x|	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	D.MS
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	CP	63*	Exc Ind	93	•
30	tan	64*	Prd Ind	94	+/−
32	x:t	65	×	95	=
33	x^2	66	Pause	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.

MASTER LIBRARY DIAGNOSTIC

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	Diagnostic/Module Check			
A1	Select Program		2nd Pgm 01	
A2	Run Diagnostic		SBR =	1.[1]
	or			
A3	Library Module Check		SBR 2nd R/S	1.[2]
	Initialize Linear Regression			
B1	Select Program		2nd Pgm 01	
B2	Initialize Linear Regression		SBR CLR	0.
	Print Routine			
C1	Select Program		2nd Pgm 01	
C2	Set calculator to print input and output for user-defined keys of program numbered mm[3]. Now the User Instructions for that program can be followed except that the program need not be called.	mm	STO 00	mm

NOTES:

1. This output is obtained if the calculator is operating properly.
2. The number 1 indicates the Master Library.
3. The Master Library programs are numbered 1 through 25. Program number 0 is the calculator's program memory.

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Prgm 02	
2	Enter order of matrix	n	A	n*
3	Enter elements of matrix A by columns starting with column 1. (To correct an entry in column j, simply enter j and press B. Then reenter the entire column using the R/S key)	1	B	1.
		a_{11}	R/S	a_{11}*
		a_{21}	R/S	a_{21}*
		⋮	⋮	⋮
		a_{n1}	R/S	a_{n1}*
		a_{12}	R/S	a_{12}*
		a_{22}	R/S	a_{22}*
		⋮	⋮	⋮
		a_{nn}	R/S	a_{nn}*
4	Calculate determinant		C	|A|*
	If |A| ≠ 0: Solve Ax = b (Perform Steps 1-4 first)			
5	Enter elements of column vector b starting with b_1. (To correct an entry error for b_i, simply enter i and press D. Then reenter b_i using the R/S key.)	1	D	1.
		b_1	R/S	b_1*
		⋮	⋮	⋮
		b_n	R/S	b_n*
6	Calculate x		CLR E	1.
7	Display the elements of x, starting with x_1	1	2nd A'	1.
			R/S	x_1*
			⋮	⋮
			R/S	x_n*
8	To display x_i only	i	2nd A'	i
	To solve the system for a new vector b', repeat Steps 5-8 only.		R/S	x_i*
	If |A| ≠ 0: Find A^{-1} (Perform Steps 1-4 first)			
9	Calculate A^{-1}		CLR 2nd B'	1.
10	Display the elements of A^{-1} by columns starting with column 1: (To display the elements of A^{-1} starting with column j, enter j before pressing 2nd C'). Due to pivoting, A^{-1} may be stored with its columns permuted even though it is displayed in the correct order. Therefore, A^{-1} must be reentered for use in subsequent calculations. Note: A is lost once A^{-1} is calculated.	1	2nd C'	1.
			R/S	a_{11}^{-1}*
			R/S	a_{21}^{-1}*
			⋮	⋮
			R/S	a_{n1}^{-1}*
			R/S	a_{12}^{-1}*
			⋮	⋮
			R/S	a_{nn}^{-1}*
11	To compute |A| and A^{-1} simultaneously, perform Steps 1-3, then perform this step and continue with Step 10 to display A^{-1} if |A| ≠ 0.		2nd E'	|A|*

*These values are automatically printed when the PC-100A Print Cradle is connected.

NOTES:

1. Because of round-off error, this program may not give exact answers for |A|. For example, $\begin{vmatrix} 3 & -2 \\ -9 & 6 \end{vmatrix}$ is evaluated as -9×10^{-12} instead of zero.
2. The inverse of a 3 × 3 matrix is found in approximately 1 minute while a 9 × 9 requires about 12 minutes for computation.
3. This program includes its own print commands and therefore should not be used with the print routine of program ML-01.

MATRIX ADDITION AND MULTIPLICATION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 03	
2a	Enter number of rows in A	m	A	m*
2b	Enter number of columns in A (Steps 2a and 2b must be performed in sequence)	n	A	n*
3	Enter the elements of matrix A starting with column 1. (To correct an entry error in column j, simply enter j and press B. Then reenter the entire column using the R/S key)	1 a_{11} a_{21} ⋮ a_{m1} a_{12} a_{22} ⋮ a_{mn}	B R/S R/S ⋮ R/S R/S R/S ⋮ R/S	1. a_{11}* a_{21}* ⋮ a_{m1}* a_{12}* a_{22}* ⋮ a_{mn}*
	For Matrix Addition:			
4	First Then enter the elements of matrix B using the R/S key as in Step 3. (To correct an entry error in column j, simply enter j and press C. Then reenter the entire column using the R/S key.	1	C	1.
5a	Enter λ_1	λ_1	D	λ_1*
5b	Enter λ_2 (Steps 5a and 5b must be performed in sequence. These steps are required even if $\lambda_1 = 1$ and/or $\lambda_2 = 1$)	λ_2	D	λ_2*
6	Calculate $C = \lambda_1 A + \lambda_2 B$		CLR E	1.
7	Display the elements of C starting with column 1: To display the elements of C starting with column j, enter j before pressing 2nd A'. (To use C as the new A, repeat Steps 4-7. For a new case go to Step 2.	1	2nd A' R/S R/S ⋮ R/S R/S R/S ⋮ R/S	1. c_{11}* c_{21}* ⋮ c_{m1}* c_{12}* c_{22}* ⋮ c_{mn}*
	For Matrix Multiplication (Perform Steps 1-3 first)			
8	Enter the elements of column j of matrix B starting with b_{1j}. (To correct an entry error for b_{ij}, enter i, press 2nd B' and reenter b_{ij} using the R/S key.)	1 b_{1j} ⋮ b_{nj}	2nd B' R/S ⋮ R/S	1. b_{1j}* ⋮ b_{nj}*
9	Calculate column j of matrix C		2nd C'	1.
10	Display the elements of column j of matrix C, starting with c_{1j}	1	2nd D' R/S ⋮ R/S	1. c_{1j}* ⋮ c_{mj}*
11	To display c_{ij} only	i	2nd D' R/S	i c_{ij}*
12	To compute AB = C, repeat Steps 8-10 for j = 1 to j = p			

NOTE: 1. This program includes its own print commands and should not be used with program ML-01.

*These values are printed automatically if the PC-100A is connected.

COMPLEX ARITHMETIC

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 04	
2a	Enter real part of X	a	A	a
2b	Enter imaginary part of X (2a and 2b must be performed in sequence)	b	A	b
3a	Enter real part of Y	c	2nd A'	c
3b	Enter imaginary part of Y (3a and 3b must be performed in sequence)	d	2nd A'	d
	Perform either Step 4, 5, 6, 7, 8, 9, or 10.			
4	Calculate X + Y		B x:t	real part imaginary part
5	Calculate X − Y		2nd B' x:t	real part imaginary part
6	Calculate X x Y		C x:t	real part imaginary part
7	Calculate X ÷ Y		2nd C' x:t	real part imaginary part
8	Calculate Y^X		D x:t	real part imaginary part
9	Calculate $\log_Y X$		2nd D' x:t	real part imaginary part
10	Calculate $\sqrt[X]{Y}$		E x:t	real part imaginary part
	After a calculation, the result becomes the new X.			
11	To swap X and Y		2nd E'	0.

COMPLEX FUNCTIONS

ML-05

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 05	
2a	Enter real part of X	a	A	a
2b	Enter imaginary part of X (2a and 2b must be performed in sequence)	b	A	b
3	Calculate polar form of X, if desired		B x⇄t	r θ
	Perform either Step 4, 5, 6, 7, or 8			
4	Calculate X^2		C x⇄t	real part imaginary part
5	Calculate $\sqrt{X}$		D x⇄t	real part imaginary part
6	Calculate 1/X		E x⇄t	real part imaginary part
7	Calculate ln X		2nd A x⇄t	real part imaginary part
8	Calculate e^X		2nd B x⇄t	real part imaginary part
	After a calculation, the result becomes the new X.			

COMPLEX TRIG FUNCTIONS

ML-06

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 06	
2a	Enter real part of X	a	A	a
2b	Enter imaginary part of X (2a and 2b must be performed in sequence)	b	A	b
	Perform either Step 3, 4, 5, 6, 7, or 8			
3	Calculate sin X		B x⇄t	real part imaginary part
4	Calculate cos X		C x⇄t	real part imaginary part
5	Calculate tan X		D x⇄t	real part imaginary part

6	Calculate $\sin^{-1}$ X		2nd B′ x⇄t	real part imaginary part
6a	If imaginary part (b) of input X is negative		+/− STO 02	imaginary part (with sign changed)
7	Calculate $\cos^{-1}$ X		2nd C′	real part
7a	If imaginary part (b) of input X is negative		+/− STO 01	real part (with sign changed)
7b			x⇄t	imaginary part
8	Calculate $\tan^{-1}$ X		2nd D′ x⇄t	real part imaginary part

NOTES:
1. After a calculation, the result becomes the new X.
2. X is expressed in radians. Program leaves calculator in radian mode.

POLYNOMIAL EVALUATION

ML-07

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 07	
2	Enter n[1]	n	A	n*
3	Enter all coefficients[2] starting with a_0 (To correct a_i, enter i, press B and reenter a_i with the R/S key.)	0 a_0 a_1 ⋮ a_n	B R/S R/S ⋮ R/S	0. a_0* a_1* ⋮ a_n*
4	Enter x and compute P(x)	x	C	P(x)*
5	For a new value of x repeat Step 4			

NOTES:
1. Number of data registers available ≥ n + 6.
2. Even if a coefficient is zero, it must be entered.
3. This program contains print commands and should not be used with program ML-01.

*These values are printed automatically if the calculator is connected to the PC-100A Print Cradle.

ZEROS OF FUNCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Initialize		RST	0.
2	Select learn mode		LRN	000 00
3	Use A′ as label		2nd Lbl 2nd A′	001 00 002 00
4	Enter f(x) as a series of keystrokes. Do not use = or CLR. Do not use registers 0-8.			
5	End f(x) with INV SBR		INV SBR	xxx 00
6	Leave learn mode		LRN	0.
7	Select program		2nd Pgm 08	
8	Enter lower limit	a	A	a
9	Enter upper limit	b	B	b
10	Enter sampling increment[1]	Δx	C	Δx
11	Enter maximum error[2]	ϵ	D	ϵ
12	Calculate roots. Repeat this step until flashing 9's display is obtained which indicates all roots in [a,b) have been found.		E	root
13	To use a different interval, Δx, or ϵ, repeat Steps 8-12.			

NOTES:

1. If Δx is not entered, b − a is assumed.
2. If ϵ is not entered, .01 is assumed.
3. Evaluate expressions using parentheses only.
4. [a,b) is a notation which means that a is included in the interval but b is not.
5. Program may run for several minutes, depending on input data.

SIMPSON'S APPROXIMATION (CONTINUOUS) ML-09

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Initialize		RST	0.
2	Select learn mode		LRN	000 00
3	Use A′ as label		2nd Lbl 2nd A′	001 00 002 00
4	Enter f(x) as a series of keystrokes. Do not use = or CLR. Do not use registers 0-5.			
5	End f(x) with INV SBR		INV SBR	xxx 00
6	Leave learn mode		LRN	0.
7	Select program		2nd Pgm 09	
8	Enter lower limit	x_0	A	x_0
9	Enter upper limit	x_n	B	x_n
10	Enter n(n = 2, 4, 6, · · ·, display flashes if not legal entry)	n	C	h
11	Compute integral		D	I
12	For a new interval or a new n, repeat Steps 7-11.			

NOTE: 1. Evaluate expressions using parentheses only.
2. Running time is dependent on input data.

SIMPSON'S APPROXIMATION (DISCRETE) ML-10

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 10	
2	Enter n(n = 2, 4, 6, ···, display flashes if not a legal entry). See note 2.	n	A	n*
3	Enter h	h	B	h*
4	Enter function values starting with f_0	0 f_0 f_1 ⋮ f_n	C R/S R/S ⋮ R/S	0. f_0* f_1* ⋮ f_n*
5	Calculate integral		D	I*

NOTES: 1. This program contains print commands, and should not be used with program ML-01.
2. n + 7 ⩽ No. of data registers.

*These values are printed automatically if the calculator is connected to the PC-100A Print Cradle.

TRIANGLE SOLUTION (1)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 11	
2	Initialize		2nd E'	0.
3	Select degree, grad, or radian mode			
	Knowing SSS			
4	Enter a	a	A	a
5	Enter b	b	B	b
6	Enter c	c	C	c
7	Calculate ∠A		2nd A'	∠A'
8	Calculate ∠B		2nd B'	∠B'
9	Calculate ∠C		2nd C'	∠C'
	Knowing SSA			
10	Enter a	a	A	a
11	Enter b	b	B	b
12	Enter ∠A	∠A	C	∠A
13	Calculate c		D	c'
14	Calculate ∠B		2nd B'	∠B'
15	Calculate ∠C		2nd C'	∠C'
	Knowing SAS			
16	Enter a	a	A	a
17	Enter b	b	B	b
18	Enter ∠C	∠C	C	∠C
19	Calculate c		E	c'
20	Calculate ∠B		2nd B'	∠B'
21	Calculate ∠A		2nd C'	∠A'

NOTES:
1. Input data must be reentered following each set of calculations.
2. A flashing display indicates there is no triangle satisfying the input data.
3. All inputs should be entered in the sequence shown, all outputs should be calculated in the order shown. Do not omit any steps except output steps which follow the last part in question.

TRIANGLE SOLUTION (2)

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 12	
2	Select degree, grad, or radian mode			
	Knowing ASA			
3	Enter a	a	A	a
4	Enter ∠B	∠B	B	∠B
5	Enter ∠C	∠C	C	∠C
6	Calculate ∠A		2nd A'	∠A
7	Calculate b		D	b
8	Calculate c		E	c
	Knowing SAA			
9	Enter a	a	A	a
10	Enter ∠A	∠A	B	∠A
11	Enter ∠C	∠C	C	∠C
12	Calculate ∠B		2nd B'	∠B
13	Calculate b		D	b
14	Calculate c		E	c
15	**Calculate Area** Calculate area of triangle. Sides b, c, a must have been previously computed and consequently reside in R_{01}, R_{02}, and R_{07}, respectively. If not, they can be manually placed there.		2nd C'	Area

NOTES:

1. Input data must be reentered after each set of calculations.
2. For a triangle solution in program ML-11, the area may be calculated by pressing 2nd Pgm 12, RCL 06, STO 07, 2nd C' without reentering the data.
3. All inputs should be entered in the sequence shown, all outputs should be calculated in the order shown. Do not omit any steps except those which follow the last part in question.

CURVE SOLUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 13	
2	Enter one pair from the following			
	a. Enter θ	θ	A	θ
	a. Enter r	r	B	r
	or			
	b. Enter θ	θ	A	θ
	b. Enter s	s	C	s
	or			
	c. Enter θ	θ	A	θ
	c. Enter c	c	D	c
	or			
	d. Enter r	r	B	r
	d. Enter s	s	C	s
	or			
	e. Enter r	r	B	r
	e. Enter c	c	D	c
3	See Note 1			
4	Calculate θ		2nd A'	θ'
5	Calculate r		2nd B'	r'
6	Calculate s		2nd C'	s'
7	Calculate c		2nd D'	c'
8	Calculate A		E	A'
9	Calculate a		2nd E'	a'

NOTES:
1. All steps 4 through 9 must be performed in sequence. Values entered in Step 2 may be omitted.
2. θ is expressed in radians. Program leaves calculator in radian mode.

NORMAL DISTRIBUTION

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 14	
2	Enter data and calculate Z(x)	x^1	A	Z(x)
3	Calculate Q(x)		B	Q(x)

NOTES:

1. $|x| \leq 15.11$, display will flash for x outside this range.
2. Z(x) must be calculated before Q(x).
3. $Z(-x) = Z(x)$ and $Q(-x) = 1 - Q(x)$.
4. $P(x) = 1 - Q(x)$.

RANDOM NUMBER GENERATOR

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 15	
2	Initialize		2nd C'	0.
3	Enter random number seed ($0 \leqslant$ seed $\leqslant 199017$)	seed	E	seed
	For Uniform Distribution			
4	Enter lower limit	A	A	A
5	Enter upper limit	B	B	B
6	Generate random number (Repeat as needed)		C	Random No.
	For Normal Distribution			
7	Enter desired mean	$\bar{x}$	A	Desired $\bar{x}$
8	Enter desired standard deviation	σ	B	Desired σ
9	Generate random number (Repeat as needed)		2nd C'	Random No.
	For Either Distribution			
10	Compute actual mean of generated numbers		2nd $\bar{x}$	Actual $\bar{x}$
11	Compute actual standard deviation of generated numbers		INV 2nd $\bar{x}$	Actual σ
12	Display number of generated numbers		RCL 03	N
	For Range of (0,1)			
13	Generate random number (Repeat as needed)		SBR 2nd D.MS	Random No.

NOTE: 1. Five significant digits of the originally generated number are retained for further calculations. Therefore, no more than the first five significant digits of the generated numbers may be considered to be random.

COMBINATIONS, PERMUTATIONS, FACTORIALS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 16	
2a	Enter n	n	A	Integer |n|
2b	Enter r ($0 \leq r \leq n$) (2a must precede 2b)	r	B	Integer |r|
	Factorial			
3	Calculate factorial of n ($0 \leq n \leq 69$)		C	n!
	Permutations			
4	Calculate number of possible permutations		D	$P(^{n}_{r})$
	Combinations			
5	Calculate number of possible combinations		E	$C(^{n}_{r})$

NOTES:

1. For $r > n$ the display flashes 9.9999999 99.
2. The display flashes 9.9999999 99 for overflow in the calculation.
3. For negative entries of either n or r, the absolute values are used and the display flashes the result.
4. For non-integer values of either n or r, only the integer values are used and the display flashes the results.
5. Step 2 must be repeated for each calculation.
6. Running time is dependent upon input data.

MOVING AVERAGES

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 17	
2	Initialize		2nd E'	0.
3	Enter number of values to be averaged	n[1]	A	n
4	Enter value to be averaged	m	B	average[2]
	Repeat for each value.			

NOTES:

1. Error conditions:
   For $n \leq 0$ or n non-integer, the display will flash 9.9999999 99.
2. An average will be taken for all values entered below the nth value. Once the nth value is entered, the concept of moving averages begins.
3. The number of data registers available must be greater than or equal to n + 5.

COMPOUND INTEREST

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
	U.S. Method			
1	Select program		2nd Pgm 18	
2	Initialize		2nd E'	0.00
3	Enter three of the following four variables in any order:			
	Number of periods	N	A	N
	Interest-rate (percent per period)	%I	B	%I
	Present value	PV	C	PV
	Future value	FV	D	FV
4	Calculate the remaining variable			
	Number of periods	0	A	N
	Interest rate (percent per period)	0	B	%I
	Present value	0	C	PV
	Future value	0	D	FV
	Annuity Formulas			
	(See Note 1 below and Notes on Annuity Formulas)			
5	Solve for $S_{\overline{n}|i}$		2nd A'	$S_{\overline{n}|i}$
6	Solve for $(1 + i)\, S_{\overline{n}|i}$		2nd B'	$(1+i)\, S_{\overline{n}|i}$
7	Solve for $a_{\overline{n}|i}$		2nd C'	$a_{\overline{n}|i}$
8	Solve for $(1 + i)\, a_{\overline{n}|i}$		2nd D'	$(1+i)\, a_{\overline{n}|i}$

NOTE: 1. *Steps 5-8 assume the following:*
N is stored in R_{01}
$I \div 100$ is stored in R_{08}
$(I \div 100) + 1$ is stored in R_{09}

ANNUITIES

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 19	
2	Initialize		2nd E'	0.
3	Select type of routine:			
	Sinking Fund		2nd A'	0.
	Annuity Due/FV		2nd B'	0.
	Ordinary Annuity/PV		2nd C'	0.
	Annuity Due/PV		2nd D'	0.
4	Enter the known variables in any order			
	Number of Periods	N	A	N
	Interest Rate (percent per period)	%I	B	%I
	Payment per Period	PMT	C	PMT
	PV or FV	PV or FV	D	PV or FV
	Balloon Payment[1]	BAL	E	BAL
5	Solve for the unknown variable			
	Number of Periods	0	A	N
	Interest Rate (percent per period)	0	B	%I
	Payment per Period	0	C	PMT
	PV or FV	0	D	PV or FV
	Balloon Payment	0	E	BAL
6	To solve another problem of the same type, go to Step 4 (See Note 2). For a problem of a different type, go to Step 2.			

NOTES:
1. If balloon payment does not apply, **DO NOT** enter zero. Merely skip the step.
2. If balloon payment was non-zero in the previous problem and is zero in the new problem, go to Step 2.

DAY OF THE WEEK, DAYS BETWEEN DATES

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 20	
	Days Between Dates			
2	Enter first date	MMDD.YYYY	A	0.
3	Enter second date	MMDD.YYYY	B	0.
4	Calculate number of days between given dates		C	No. of days
	Day of the Week			
5	Enter date and calculate day of week *0 – Sat 4 – Wed 1 – Sun 5 – Thurs 2 – Mon 6 – Fri 3 – Tues	MMDD.YYYY	D	Day of week*

NOTES:

1. Date must be entered in the order: month day year
2. Error conditions
   a. negative inputs
   b. DD > 31
   c. MM > 12
   d. YYYY < 1582

HI-LO GAME

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 21	
	You Guess			
2	Key in a number (0 to 1)*	Number	A	0.
3	Generate secret number		B	0.
4	Enter your guess (1 to 1023) Clue: −1. if guess was low 1. if guess was high flashing 0. if your guess was correct	Guess	C	Clue
5	Repeat Step 4 as required			
6	Display score		D	Score
7	For a new number, go to Step 3			
	Calculator Guesses			
8	Select a number (1 to 1023)			
9	Display calculator's first guess		2nd A'	Calc. guess
10	If calculator's guess is: Low High Correct		 2nd B' 2nd C' 2nd D'	 Calc. guess Calc. guess Calc. guess
11	Repeat Step 10 as required			
12	For a new game, go to Step 8			

*Each number you select will produce a different game.

CHECKING/SAVINGS ACCOUNT MANAGEMENT ML-22

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 22	
2	Load data registers from card[1] or Enter checking balance Enter savings balance	 C. Bal S. Bal	 2nd A' E 2nd B' E	 C. Bal. S. Bal.
3	Select checking mode		2nd A'	
4	Enter deposit amount	Dep. amt.	B	New Bal.
5	Enter check amount	Chk. amt.	C	New Bal.
6	Repeat 4 and 5 as necessary			
7	Select savings mode		2nd B'	
8	To add interest: Enter annual interest rate (%) Enter compounding periods per year Enter number of periods	 %I/yr P N	 2nd C' 2nd D' D	 %I/yr %I/per. New Bal.
9	To add savings deposit	Dep. amt.	B	New Bal.
10	To subtract savings withdrawal	Withdr. amt.	C	New Bal.
11	To display checking balance		2nd A' A	Chk. Bal.
12	To display savings balance		2nd B' A	Sav. Bal.
13	Optional: Record data registers on card[1]			

NOTE: 1. For TI Programmable 59 only.

DMS OPERATIONS ML-23

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 23	
2	Enter number n (dd.mmss)	n	A	n(dec. deg.)
	For Addition or Subtraction			
3	For addition, enter number p(dd.mmss)	p	B	(n + p)
4	For subtraction, enter number p(dd.mmss)	p	+/- B	(n − p)
	For Multiplication or Division			
5	For multiplication, enter scalar a	a	C	(n × a)
6	For division, enter scalar a	a	D	(n ÷ a)

NOTES: 1. Display is in Fix 4 format after any of the four operations is performed.

2. For chained operations, the result of an operation should be used directly as the entered number in Step 2. This will minimize rounding errors.

UNIT CONVERSIONS (1)

ML-24

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 24	
2	To convert:			
	inches to centimeters	inches	A	cm
	centimeters to inches	cm	2nd A'	inches
	feet to meters	feet	B	meters
	meters to feet	meters	2nd B'	feet
	yards to meters	yards	C	meters
	meters to yards	meters	2nd C'	yards
	miles to kilometers	miles	D	km
	kilometers to miles	km	2nd D'	miles
	miles to nautical miles	miles	E	nau. miles
	nautical miles to miles	nau. miles	2nd E'	miles

UNIT CONVERSIONS (2)

ML-25

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Select program		2nd Pgm 25	
2	To convert:			
	°F to °C	°F	A	°C
	°C to °F	°C	2nd A'	°F
	fluid ounces to liters	fl. oz.	B	liters
	liters to fluid ounces	liters	2nd B'	fl. oz.
	U.S. gallons to liters	gallons	C	liters
	liters to U.S. gallons	liters	2nd C'	gallons
	ounces to grams	ounces	D	grams
	grams to ounces	grams	2nd D'	ounces
	pounds to kilograms	pounds	E	kg
	kilograms to pounds	kg	2nd E'	pounds

NOTES

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