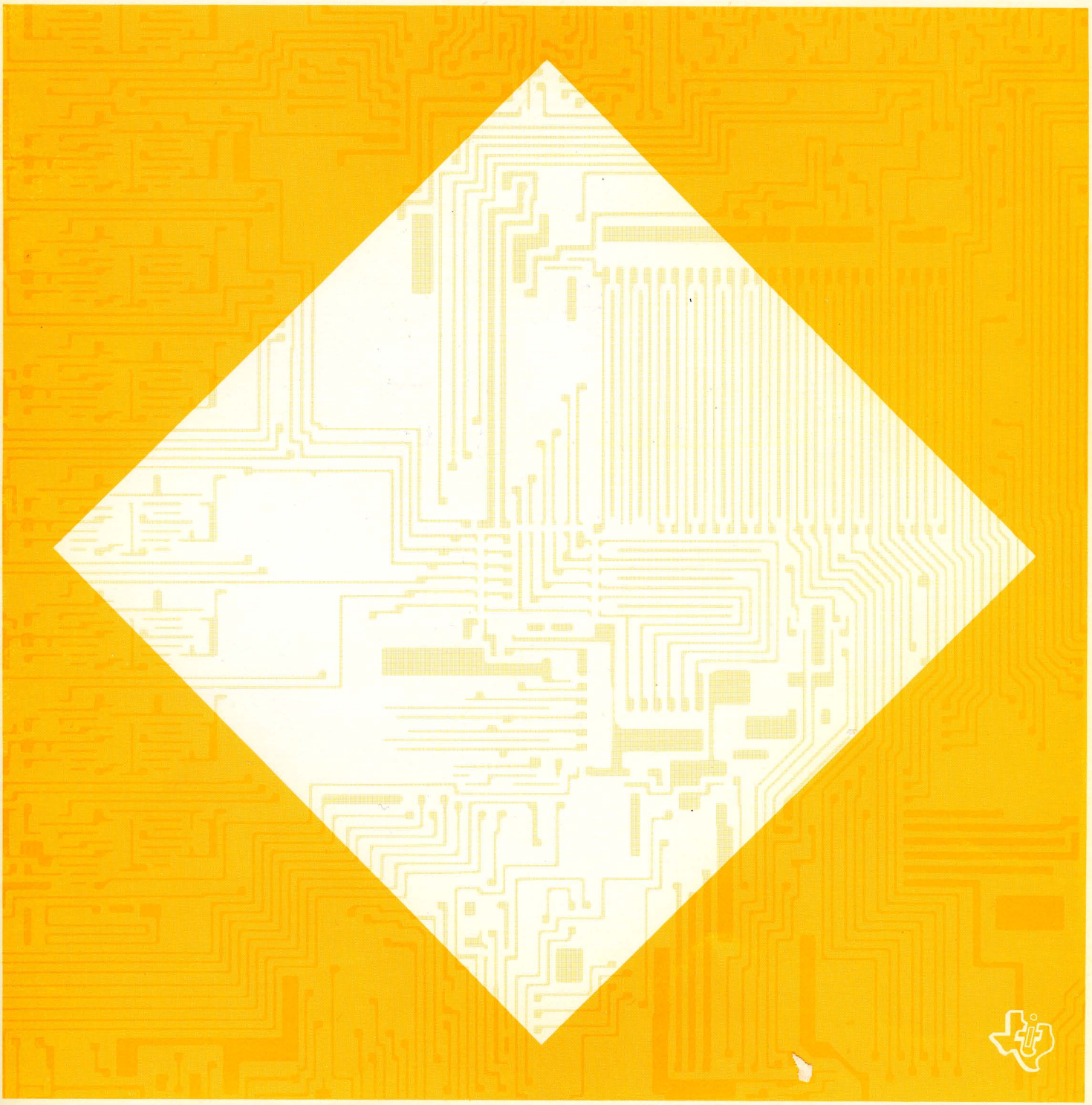
TI Programmable 58/59

Leisure Library

Using the power of your *Solid State Software*™ module



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Introduction

The Leisure Library Module places at your fingertips a library of programs designed primarily for your enjoyment. Within seconds you can install this *Solid State Software** module which tailors your calculator to leisure time activities. The library includes simple recreational diversions, challenging games of skill, and programs which perform tedious calculations that are a part of several popular games.

USING THIS MANUAL

Following this brief introduction, you will find the description, concise instructions, and examples for each of the 21 programs in the Leisure Library. Each program is easily identified by the "LE" number in the upper corner of the page. This number corrsponds with the call number you use to tell the calculator which program in the *Solid State Software* module you wish to use.

The primary reference point in this manual for each program is the Instructions. These instructions are also available for you in the handy pocket guide furnished with the library. The program description and examples should be used when you first run a program, to help you understand its full capabilities and limitations. Nonmagnetic label cards to identify the user-defined keys are also included in the library. Carefully remove the cards from the sheet and insert them in the card carrying case for convenient storage. Note that a special holder has been built into the case for storage of the library module.

USING THE OPTIONAL PRINTER

If you have the optional PC-100A printer†, a printed record of entries and results is automatic. The Instructions and examples show exactly which values are printed in addition to being displayed. Note that some values are printed and do not remain in the display. Also note that the printer is required for all alpha messages.

Use the Calculator Mounting procedure in the PC-100A Owner's Manual to mount your calculator on the PC-100A. The switch called out in Step 2 should be set to "OTHER" for your calculator. Always turn the calculator and printer off before mounting or unmounting the calculator.

*Trademark of Texas Instruments

Note: The TI Programmable 58 and TI Programmable 59 will not operate on the PC-100 print cradle.

TIPS FOR RUNNING PROGRAMS

Before you begin using the *Solid State Software* programs on your own, here are a few things to keep clearly in mind until you become familiar with your calculator.

1. Press [CLR] before running a program if you are not sure of the status of the calculator. (To be completely sure of calculator status, turn it off and on again — but remember that this will clear the program memory.)

2. Some programs will leave the calculator in fix-decimal format. In this event, you should press [INV] [2nd] [fix] before running another program if this format is not desired.

3. There is no visual indication of which *Solid State Software* program has been called. If you have any doubts, the safest method is to call the desired program with [2nd] [Pgm] mm, where mm is the two-digit program number. The calculator will remain at this program number until another program is called, [RST] is pressed or the calculator is turned off.

4. A flashing display normally indicates an improper key sequence or that a numerical limit has been exceeded. When this occurs, always repeat the program sequence and check that each step is performed as directed by the Instructions. Any unusual *limits of a program are given in the Instructions or related notes.* The In Case of Difficulty portion of Appendix A in the Owner's Manual may be helpful in isolating a problem.

5. Some steps of the *Solid State Software* programs may run for up to 30 seconds depending on input data. If you desire to halt a running program, press the [RST] key. This is considered as an emergency halt operation which returns control to the main memory. A program must be recalled to be run again.

DOWNLOADING *SOLID STATE SOFTWARE* PROGRAMS

If you need to examine a *Solid State Software* program, it can be downloaded into the main program memory.* This will allow you to single step through a program in or out of the learn mode. It also allows using the program list or trace features of the optional printer. The only requirement for downloading a *Solid State Software* program is that the memory partition be set so there is sufficient space in the main program memory to receive the downloaded program. The key sequence to download a program is [2nd] [CP] [2nd] [Pgm] mm [2nd] [Op] 09, where mm is the program number to be downloaded. This procedure places the requested program into program memory beginning at program location 000. The downloaded program writes over any instructions previously stored in that part of program memory. Remember to press [RST] before running or tracing the downloaded program.

Please note that the partition must be reset from the power-up condition in the TI Programmable 58 for programs LE-05, 06, 07, 08, 10, 11, 16, 17, 20, and 21. The key sequence to repartition the main memory for LE-06 and 21 is 0 [2nd] [Op] 17. The sequence for LE-16 is 1 [2nd] [Op] 17. The sequence for LE-05, 07, 08, 10, 17, and 20 is 2 [2nd] [Op] 17. Repartitioning must be performed before the downloading sequence. Some of these downloaded programs may not run properly due to insufficient data registers.

*Unless the library is a protected special-purpose library.

REMOVING AND INSTALLING MODULES

The Leisure Library Module can easily be installed in the calculator 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.

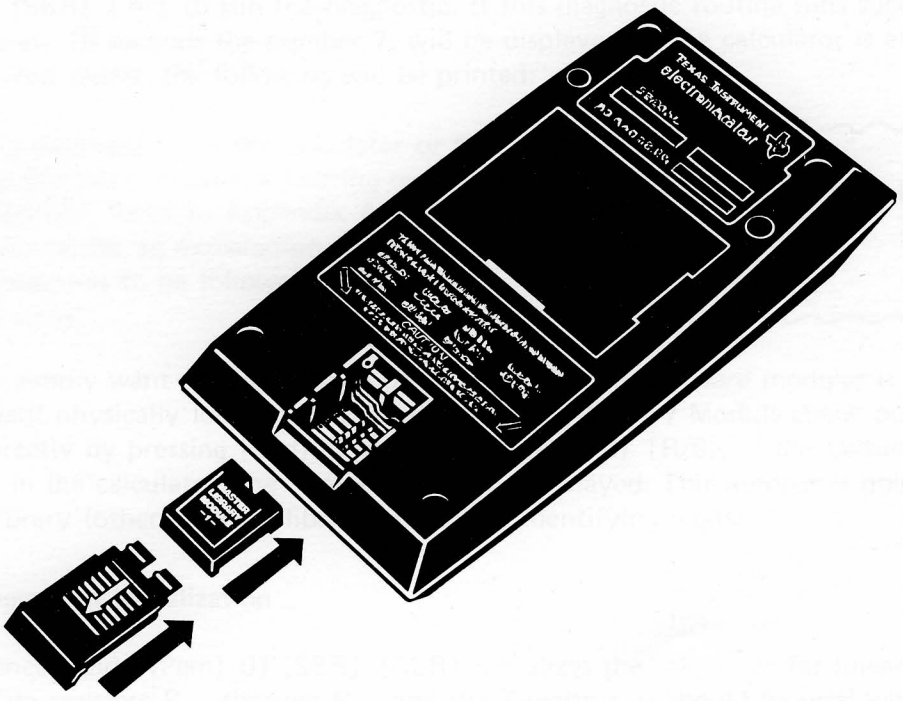
1. **Turn the calculator OFF.** Loading or unloading the module with the calculator ON may cause the keyboard or display to lock out. Also, shorting the contacts can damage the module or calculator.

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.



Don't touch the contacts inside the module compartment as damage can result.

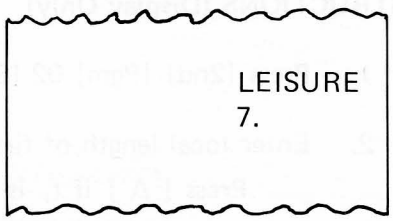
Leisure Library Diagnostic

This program performs the following functions separately.

1. Diagnostic/Library Module Check
2. Linear Regression Initialization

Diagnostic/Library Module Check

This routine checks the operation of your calculator and most of its functions, including conversion and statistics functions that are preprogrammed in the calculator, trigonometric functions, data register operations, program transfers, and comparisons. It also uses other Leisure Library programs to verify that the module is connected and operating correctly. Press [2nd] [Pgm] 01 [SBR] [=] to run the diagnostic. If this diagnostic routine runs successfully, in approximately 15 seconds the number 7. will be displayed. If the calculator is attached to a PC-100A print cradle, the following will be printed:



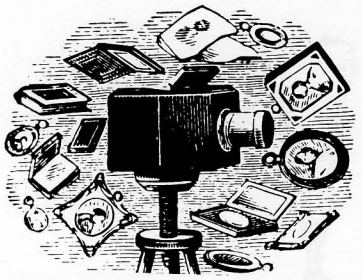
If there is a malfunction in the calculator or the *Solid State Software* module, a flashing number will be displayed. Refer to Appendix A of the Owner's Manual for an explanation of the various procedures to be followed when you have difficulties.

When you simply want to know which of your *Solid State Software* modules is in the calculator without physically looking at it, you can call the Library Module check portion of the routine directly by pressing [2nd] [Pgm] 01 [SBR] [2nd] [R/S]. If the Leisure Library Module is in the calculator, the number 7. will be displayed. This number is unique to the Leisure Library (other optional libraries use other identifying digits).

Linear Regression Initialization

The sequence [2nd] [Pgm] 01 [SBR] [CLR] initializes the calculator for linear regression by clearing data registers R_{01} through R_{06} and the T-register. It should be used whenever linear regression or other built-in statistics functions are to be started. You can also use the routine at any time to clear these registers selectively without disturbing any other registers.

Photo I: Exposure Compensation



This program calculates the adjusted exposure time required to compensate for the change in magnification when making enlargements of different sizes. After one perfect print has been produced from a negative at any magnification, the proper exposure can subsequently be calculated for a print at any other magnification. Because magnification itself is not readily measurable, the distance from the negative to its projected image, D, is used as the input parameter. Given the focal length of the lens used for the first print, f_1, the negative-to-image distance, D_1, and the exposure time, t_1, the focal length of the lens used for the second print, f_2, ($f_2 = f_1$ if the same lens is used) and the second negative-to-image distance, D_2, the following formulas are used to find the second exposure time, t_2, and the new magnification, M:

$$D_2 = 2f_2 + f_2 M + f_2 / M$$

$$t_2 = t_1 \left[\frac{(D_2 - 2f_2 + \sqrt{D_2^{\,2} - 4f_2 D_2})\, f_1}{(D_1 - 2f_1 + \sqrt{D_1^{\,2} - 4f_1 D_1})\, f_2} \right]^2$$

Solid State Software TI ©1977				
PHOTO I — EXPOSURE COMPENSATION				LE-02
f(in)	D(in)			
f(mm)	D(mm)	t	m	

INSTRUCTIONS (Display Only)

1. Press [2nd] [Pgm] 02 [SBR] [CLR] to initialize program; 0. will be displayed.

2. Enter focal length of first lens, f_1.
   Press [A] if f_1 is in millimeters.
   Press [2nd] [A′] if f_1 is in inches.
   Focal length in millimeters is displayed.

3. Enter first negative-to-image distance, D_1.
   Press [B] if D_1 is in millimeters.
   Press [2nd] [B′] if D_1 is in inches.
   $-D_1$ in millimeters is displayed.

4. Enter first exposure time, t_1, and press [C].

5. Enter focal length of second lens, f_2. Follow procedure of Step 2. This step may be omitted if $f_2 = f_1$.

6. Enter second negative-to-image distance, D_2. Follow procedure of Step 3.

7. Press [C] to find second exposure time.

8. Press [D] to find magnification

NOTES:

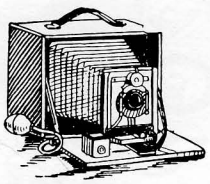
1. This program works only for magnifications greater than 1:1. Therefore, the negative-to-image distance entered in Step 3(6) must be at least 4 times the focal length entered in Step 2(5).

2. For proper determination of t_2 at Step 7, a negative number must be in the display. This occurs automatically provided Step 7 follows Step 6 directly.

EXAMPLE: Starting from perfect exposure with a 50mm lens at D_1 = 22 inches and t_1 = 18 seconds, find the exposure time for the same lens when D_2 = 26.5 inches.

Enter	Press	Display	Comments
	[2nd] [Pgm] 02 [SBR] [CLR]	0.	Initialize
50	[A]	50.	f_1 (mm)
22	[2nd] [B′]	−558.8	$-D_1$ (mm)
18	[C]	18.	t_1
26.5	[2nd] [B′]	−673.1	$-D_2$ (mm)
	[C]	28.33368147	t_2
	[D]	11.37408081	M

Photo II: Fill-In Flash



This program computes the correct f-stop when flash is used in the presence of strong ambient light, such as when flash is used outdoors to fill in shadows. It may be used with automatic or nonautomatic flash units. For nonautomatic flash, the required working distance, given the desired f-stop, is also computed.

Assume a light meter reading of a subject reveals that if the background is properly exposed, the subject will be underexposed by N_1 f-stops. If it is desired to underexpose the subject by N_2 f-stops, the quantity $(2^{-N_2} - 2^{-N_1})$ represents the fraction of a normal flash exposure required in addition to the ambient light to achieve the desired result.

For a nonautomatic flash, this exposure is given by the formula:

$$\text{f-stop} = \text{guide number/distance (ft)}$$

Correcting for ambient light yields:

$$\text{f-stop} = [\text{guide no./distance}] \div \sqrt{2^{-N_2} - 2^{-N_1}}$$

For an automatic flash, the f-stop normally used for automatic operation replaces the expression in brackets.

NOTE: This program does not apply to flash units whose guide numbers vary significantly with shutter speeds.

Solid State Software TI ©1977				
PHOTO II — FILL-IN FLASH				LE-03
f stops	Light ratio	Guide #	f ↔ dist.	

INSTRUCTIONS (Display Only)

1. Press [2nd] [Pgm] 03 [SBR] [CLR] to initialize the program; 0. will be displayed.

2. Enter the number of f-stops, N_1, subject is underexposed without fill in and press [A]. Lighting ratio, 2^{N_1}, is displayed. N_1 must be greater than N_2.

3. Enter desired lighting ratio, 2^{N_2}, and press [B]. Desired lighting ratio is displayed.

4. a. For automatic flash, enter the auto f-setting and press [C]. The required f-number is displayed.
   b. For nonautomatic flash, enter the guide number and press [C]. Then go to Step 5.

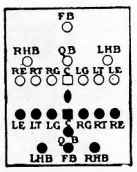
5. a. To solve for working distance, enter the desired f-number and press [D].
   b. To solve for f-number, enter the desired working distance and press [D].
   c. Repeat Step 5a or 5b as desired.

EXAMPLE: A photographer would like to use one of the following combinations to properly expose a sunlit background: f/16 @ 30th, f/11 @ 60th, f/8 @ 125th, f/5.6 @ 250th. His backlighted subject would be underexposed at 2.5 stops without fill-in flash. He desires a lighting ratio of 2:1. What should his working distance be if he uses f/11 @ 60th and his flash guide number is 65? If he wishes to work at 14 feet, what f setting should be used?

If he uses an automatic flash with a nominal automatic setting of 8, what should his actual f setting be?

Enter	Press	Display	Comments
	[2nd] [Pgm] 03 [SBR] [CLR]	0.	Initialize
2.5	[A]	5.656854249	No-flash lighting ratio
2	[B]	2.	Desired lighting ratio
65	[C]	114.3304791	Enter guide number
11	[D]	10.39367992	Working distance
14	[D]	8.166462795	f-number
8	[C]	14.07144359	f-number

Football Predictor



This program predicts the score of a football game based on four factors:

1. Average of points scored by the home team's offense, H_O
2. Average of points scored against the home team's defense, H_D
3. Average of points scored by the opposing team's offense, O_O
4. Average of points scored against the opposing team's defense, O_D

The predicted score is determined in the following manner:

$$\text{Home Team's Score} = \frac{H_O + O_D}{2} \qquad \text{Opposing Team's Score} = \frac{H_D + O_O}{2}$$

Because the predictions are based on averages, the scores predicted tend to fall within a limited range and extreme scores never appear.

Solid State Software TI ©1977				
FOOTBALL PREDICTOR				LE-04
			Opponent	
	Home			Prediction

INSTRUCTIONS (Display Only)

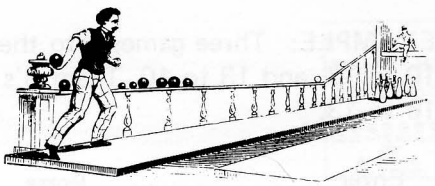
1. Press [2nd] [Pgm] 04 [SBR] [CLR] to initialize; 0. is displayed.
2. For each game the home team has played:
   a. Enter points scored by the home team and press [B].
   b. Enter points scored against the home team and press [R/S].
3. For each game the opposing team has played:
   a. Enter points scored by the opposing team and press [2nd] [D'].
   b. Enter points scored against the opposing team and press [R/S].
4. Make prediction by pressing [E]. Predicted score is displayed in the following format:

Home Team Score . Opposing Team Score

EXAMPLE: Three games into the season, team A's record is 2 and 1 with scores of 21 to 20, 10 to 17, and 13 to 10. Team B's record is also 2 and 1 with scores of 7 to 6, 17 to 9, and 16 to 13.

Enter	Press	Display	Comments
	[2nd] [Pgm] 04 [SBR] [CLR]	0.	Initialize
21	[B]	0.	A offense (1)
20	[R/S]	0.	A defense (1)
10	[B]	0.	A offense (2)
17	[R/S]	0.	A defense (2)
13	[B]	0.	A offense (3)
10	[R/S]	0.	A defense (3)
7	[2nd] [D′]	0.	B offense (1)
6	[R/S]	0.	B defense (1)
17	[2nd] [D′]	0.	B offense (2)
9	[R/S]	0.	B defense (2)
16	[2nd] [D′]	0.	B offense (3)
13	[R/S]	0.	B defense (3)
	[E]	12.14	Prediction (A.B)

Bowling Scorekeeper



This program can be used to keep score for up to 90 bowlers (50 bowlers for the TI Programmable 58) bowling simultaneously. Individual counters for each bowler allow scoring to be done at any time.

Solid State Software TI ©1977				
BOWLING SCOREKEEPER				LE-05
#Bowlers				
Bowler#	Pins(1)	Pins(2)	+Pins(10)	Score

INSTRUCTIONS (Display and Printer)

1. Press [2nd] [Pgm] 05 [SBR] [CLR] to initialize program. Displayed value is not affected.

2. Enter number of bowlers and press [2nd] [A′].

   Note: If the number of bowlers is greater than 50 (20 for the TI-58), the partitioning of your calculator will have to be changed. The number of data registers required is the number of bowlers plus 10. See your Owner's Manual for instructions on partitioning your calculator's memory.

3. Enter number of bowler and press [A]. Each [A] increments frame number for that bowler.

   A flashing 10. indicates that the bowler is entering the tenth frame — press [CE] and continue.

4. Enter number of pins knocked down by first ball in a frame and press [B].

5. Enter number of pins knocked down by second ball in a frame and press [C]. (Do not enter 0 if first ball was a strike.)

6. If a third ball is bowled in the tenth frame, enter the number of pins knocked down and press [D].

7. Repeat Steps 3 through 6 until scoring is complete.

8. You may recall a bowler's score by entering his number and pressing [E]. The score is displayed in the form:

   Score . BF

where

F is the number of the last frame completed by the bowler.

B is the number of balls pending in that frame.

This information will be printed if the PC-100A is being used.

9. With the PC-100A printer, you can obtain a complete listing of the current scores of all bowlers by pressing [SBR] [2nd] [Prt].

10. For a new game, press [SBR] [CLR] and go to Step 2.

EXAMPLE: Use this program to verify the following score:

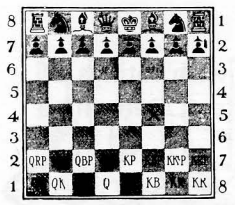
9	6	2	8	9	–	9		7	2	8	1	7	9	8
16	24		43	52		72	91	100		109		128	146	

Enter	Press	Display	Comments
	[2nd] [Pgm] 05 [SBR] [CLR]		Initialize
1	**[2nd]** [A′]	1.	No. of Players
1	[A]	1.	Player Number
9	[B]	9.	First Ball
1	[C]	1.	Second Ball
1	[A]	1.	Player Number
6	[B]	6.	First Ball
2	[C]	2.	Second Ball
1	[A]	1.	Player Number
8	[B]	8.	First Ball
2	[C]	2.	Second Ball
1†	[E]	34.13†	Third frame score (1 ball pending)
1	[A]	1.	Player Number
9	[B]	9.	First Ball
0	[C]	0.	Second Ball
1	[A]	1.	Player Number
9	[B]	9.	First Ball
1	[C]	1.	Second Ball
1	[A]	1.	Player Number
10	[B]	10.	First Ball (Strike)
1†	[E]	82.26†	Sixth frame score (2 balls pending)

(continued on next page)

Enter	Press	Display	Comments
1	[A]	1.	Player Number
7	[B]	7.	First Ball
2	[C]	2.	Second Ball
1	[A]	1.	Player Number
8	[B]	8.	First Ball
1	[C]	1.	Second Ball
1	[A]	1.	Player Number
7	[B]	7.	First Ball
3	[C]	3.	Second Ball
1†	[E]	119.19†	Ninth frame score (1 ball pending)
1	[A]	"10."*	Player is starting tenth frame
9	[B]	9.	First Ball
1	[C]	1.	Second Ball
8	[D]	8.	Third Ball
1†	[E]	146.1†	Final Score

†These values are printed if the PC-100A is connected.
*Press [CE] to stop flashing and continue.



Chess Rater

The United States Chess Federation has established guidelines for the rating of groups of players as a result of tournament play. This program implements these guidelines. The player categories involved are:

1. Established chess players
2. Provisional chess players
3. Unrated chess players

In determining his new rating, the program takes into account the player's category, the number of games played, opponent's rating per game, number of wins recorded and bonus in effect.

Solid State Software TI ©1977				
CHESS RATER				LE-06
Prov Games	Edit Opp.			
Old Rating	Opp. Rating	Bonus	Wins	New Rating

INSTRUCTIONS (Display Only)

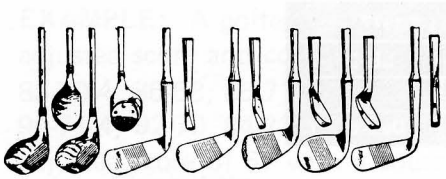
1. Press [2nd] [Pgm] 06 [SBR] [CLR] to initialize program; 0. is displayed.
2. Enter player's old rating (if none, enter 0) and press [A].
3. For provisional players, enter number of provisional games on which rating is based (if unrated, enter 0) and press [2nd] [A′]. Omit this step if player is established.
4. Enter opponent's rating and press [B]. To edit an opponent's rating, press [2nd] [B′]., reenter the correct rating and press [B].
5. Repeat Step 4 for all games.
6. If bonus in effect, press [C], and 99. will be displayed.
7. Enter number of wins and press [D].
8. Press [E] to find new rating.

EXAMPLE: An established player with an old rating of 1905 plays opponents with ratings of 1750, 1630, 2150, 2240, 1500, 1700. He scores 2½ wins with the bonus in effect. Determine his new rating.

Enter	Press	Display	Comments
	[2nd] [Pgm] 06 [SBR] [CLR]	0.	Initialize
1905	[A]	1905.	Old Rating
1750	[B]	1750.	Opponent
1630	[B]	1630.	Opponent
2150	[B]	2150.	Opponent
2240	[B]	2240.	Opponent
1500	[B]	1500.	Opponent
1700	[B]	1700.	Opponent
	[C]	99.	Bonus
2.5	[D]	2.5	Wins
	[E]	1873.	New Rating

An unrated player plays opponents rated 1270, 1310, 1640, and 1120, winning 2 games. Determine his rating.

Enter	Press	Display	Comments
	[2nd] [Pgm] 06 [SBR] [CLR]	0.	Initialize
0	[A]	0.	Old Rating
0	[2nd] [A′]	0.	No. of Provisional Games
1270	[B]	1270.	Opponent
1310	[B]	1310.	Opponent
1640	[B]	1640.	Opponent
1120	[B]	1120.	Opponent
2	[D]	2.0	Wins
	[E]	1335.	New Rating



Golf Handicapper

This program, which is usable with or without the print cradle, allows a golfer to calculate his handicap according to the handicap system of the USGA. Some regional district members of the USGA use a slightly different handicapping formula, but the same principles are followed.

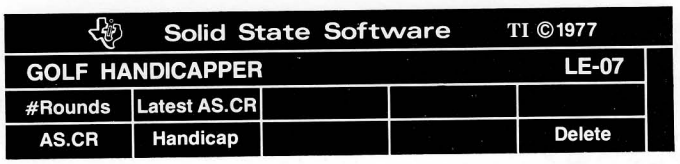
A current handicap is computed by taking 96 percent of the average of a golfer's 10 lowest differentials from his most recent 20 rounds. A round's differential is the adjusted score (result of an equitable stroke control procedure for handicap purposes) less the course rating (a difficulty rating assigned by representatives of the authoritative golf organization in the area of the course). A course rating is not necessarily an integer; 70.2 could be a course rating.

Handicaps are calculated to the nearest integer stroke. They are normally positive.

Negative results from the handicap calculation can be interpreted as a scratch golfer's obligation to his playing partner. (A handicap of –4 means the scratch golfer should allocate a stroke to his partner on each of the four hardest handicap holes on the particular course they are playing.)

When at least 5 but fewer than 20 differentials are available, the handicap is calculated using the following table:

Differentials Available	Differentials Used in Handicap
5	Lowest 1
6	Lowest 2
7	Lowest 3
8 or 9	Lowest 4
10 or 11	Lowest 5
12 or 13	Lowest 6
14 or 15	Lowest 7
16 or 17	Lowest 8
18 or 19	Lowest 9



INSTRUCTIONS (Display and Printer)

1. Press [2nd] [Pgm] 07 [SBR] [CLR] to initialize program; 0. will be displayed. Press 4 [2nd] [Op] 17 to reset partition for TI-58.

2. Enter number of rounds for handicap calculation, press [2nd] [A′]. The number of rounds and differentials used in handicap will be printed, the number of differentials will be displayed.

3. Enter the adjusted score and course rating for each round using the following format: AS.CR, press [A]. The adjusted score, course rating and differential will be printed. The differential will be displayed (example, AS = 82, CR = 71.2, enter 82.712, press [A], 87.712, 10.8 will be printed, 10.8 will be displayed). Repeat Step 3 until all rounds are entered. To edit a previous entry at any time before Step 4, enter number of round miskeyed, press [E]. Number of round will be displayed. Enter correct data and press [A]. Continue entering additional data.

4. Calculate handicap by pressing [B]. The lowest differential used in handicap will be printed and displayed approximately every 7 seconds. The sum, average, and 96 percent of the average for the differentials will be printed and displayed along with the rounded handicap.

NOTES

The TI-59 allows golfers to enter the data in Step 2 by using mag cards. The following procedure can be used with the TI-59 to update a golfer's handicap based on his most recent 20 rounds.

1. After Step 3, enter 4, press [2nd] [Write], insert card (printed side up) into the lower slot in the right side of the calculator. 4 will be displayed after the 20 current differentials are recorded. Perform Step 4.

2. If the data is recorded on a magnetic card, handicap calculations may be performed by pressing [2nd] [Pgm] 07 [SBR] [CLR] and completing the following:

   a. Read card containing previous 20 differentials by loading card into the lower slot in the right hand side of the calculator. 4 will be displayed.

   b. Enter latest adjusted score and course rating, press [2nd] [B′]. Adjusted score, course rating and differential are printed. The differential is displayed.

   c. Enter 4, press [2nd] [Write] and record current 20 differentials on mag card.

   d. Enter number of rounds for handicap calculation and press [2nd] [A′] as in Step 2.

   e. Press [B] to calculate handicap as in Step 4.

EXAMPLE: A golfer wants to calculate his handicap using his most recent 20 rounds. His adjusted score and course rating for these rounds are as follows: 91-68, 83-69.2, 82-70, 95-68, 88-70.4, 86-68, 86-71, 87-69.6, 84-69.6, 80-68, 82-70, 94-69, 90-71.2, 80-72, 84-70, 86-68, 90-71.4, 92-70, 84-72, 70-71 (Ans. 11). He now wishes to update his handicap with his latest adjusted score of 67 with a course rating of 72.2 (Ans. 9).

Enter	Press	Display	Comment
	[2nd] [Pgm] 07 [SBR] [CLR]	0.	Initialize
20†	[2nd] [A′]	10.†	# of diff. in hand.
91.68†	[A]	23.†	d_1
83.692†	[A]	13.8†	d_2
182.70†	[A]	112.†	d_3
3	[E]	3.	Edit game #3
82.70†	[A]	12.†	Corrected d_3
95.68†	[A]	27.†	d_4
88.704†	[A]	17.6†	d_5
86.68†	[A]	18.†	d_6
86.71†	[A]	15.†	d_7
87.696†	[A]	17.4†	d_8
84.696†	[A]	14.4†	d_9
80.68†	[A]	12.†	d_{10}
82.70†	[A]	12.†	d_{11}
94.69†	[A]	25.†	d_{12}
90.712†	[A]	18.8†	d_{13}
80.72†	[A]	8.†	d_{14}
84.70†	[A]	14.†	d_{15}
86.68†	[A]	18.†	d_{16}
90.714†	[A]	18.6†	d_{17}
92.70†	[A]	22.†	d_{18}
84.72†	[A]	12.†	d_{19}
70.71†	[A]	−1.†	d_{20}
4	[2nd] [Write] * [B]	4.	Record data for the 20 rounds
		−1.†	Lowest 10 differentials used to calculate handicap. (Each value displayed about ½ second.)
		8.†	
		12.†	
		12.†	
		12.†	
		12.†	
		13.8†	
		14.†	
		14.4†	
		15.†	
		112.2†	Σ diff.
		11.22†	Avg. of diff.
		10.7712†	96% avg.
		11.†	Handicap

(continued on next page)

*For TI-59 only.

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

LE-07

Enter	Press	Display	Comments
	[2nd] [Pgm] 07 [SBR] [CLR]	0.	Initialize
Load Card (or reenter data)		4.	Read 20 prev. diff. into data memory.
67.722†	[2nd] [B′]	−5.2†	Diff. of latest round.
4	[2nd] [Write] *	4.	Record current 20 diff's for future handicap calculations.
20†	[2nd] [A′] [B]	10.†	# of diff. in hand.
		−5.2†	Lowest 10 differentials used to calculate handicap. (Each value displayed about ½ second.)
		−1.†	
		8.†	
		12.†	
		12.†	
		12.†	
		12.†	
		13.8†	
		14.†	
		14.4†	
		92.†	Σ diff.
		9.2†	Avg. diff.
		8.832†	96% avg.
		9.†	Handicap

†These values are printed if the PC-100A is connected.
*For TI-59 only.

Bridge Scorer

This program is designed to aid duplicate bridge (tournament bridge) players in calculation of the traveling score by giving the results of each deal. Seven user-defined keys enable the duplicate bridge scorer to calculate the value of the contract if made and the total points (net plus) or penalty (net minus) resulting when an overtrick or trick down condition occurs.

Solid State Software TI ©1977				
BRIDGE SCORER				LE-08
			Over	Down
Trick	Bid	Vulnerable	Doubled	Contract

INSTRUCTIONS (Display Only)

1. Press [2nd] [Pgm] 08 [SBR] [CLR] for initialization; 0. will be displayed.
2. Enter value of first trick (enter 20 if diamonds or clubs, 30 if spades or hearts, 40 if no trump). Press [A]. Value of first trick will be displayed.
3. Enter number of tricks bid. Press [B]. Number of tricks bid is displayed.
4. If vulnerable press [C], number of tricks bid is displayed. (If not vulnerable, omit this step.)
5. If doubled, press [D], 2 is displayed. (If not doubled, omit this step.)
6. If redoubled, press [D], 4 is displayed. (If not redoubled, omit this step.)
7. Find value of contract if made. Press [E]. Value, if made, is displayed.
8. Enter number of overtricks, press [2nd] [D'], total points with overtricks is displayed. (If no overtricks, omit this step.)
9. Enter number of tricks down. Press [2nd] [E']. Penalty (net minus) resulting is displayed. (If no tricks down, omit this step.)

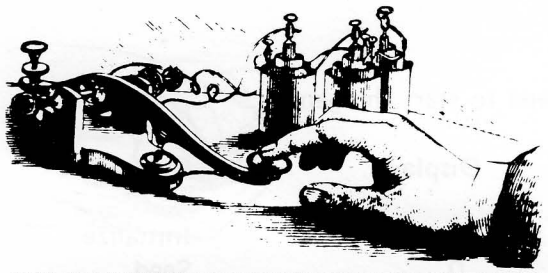
Repeat Steps 2 through 9 for subsequent deals.

EXAMPLE: Determine the score where the bid is 4 spades, not vulnerable, making 1 overtrick.

Enter	Press	Display	Comments
	[2nd] [Pgm] 08 [SBR] [CLR]	0.	Initialize
30	[A]	30.	Value of First Trick
4	[B]	4.	Bid
	[E]	420.	Value of contract if made
1	[2nd] [D′]	450.	Total points with overtrick

EXAMPLE: Determine the score where the bid is 3 diamonds, vulnerable, doubled and redoubled, and down 2 tricks.

Enter	Press	Display	Comments
	[2nd] [Pgm] 08 [SBR] [CLR]	0.	Initialize
20	[A]	20.	Value of First Trick
3	[B]	3.	Bid
	[C]	3.	Vulnerable
	[D]	2.	Doubled
	[D]	4.	Redoubled
	[E]	790.	Value of contract if made
2	[2nd] [E′]	−1000.	Penalty points



Codebreaker

How many trials does it take you to break a four-digit code? There are no zeros in the code and no digit is repeated. Even with these restrictions there are 3024 possible codes making slim your chances of simply guessing the number. Therefore, you must carefully analyze the information supplied by the calculator following each trial. This information is in the form N.R where N is the number of digits in your trial number which are in the code number and in correct position and R is the number of digits in your trial which are in the code number but not correctly placed in your number. You have broken the code when 4.0 is displayed.

The optional printer provides an immediate record of each trial and its result to assist you in determining your next number. If a printer is not available, keeping these records with pencil and paper will help you formulate a logical sequence of trials.

Solid State Software TI ©1977				
CODEBREAKER				LE-09
Guess				Seed

INSTRUCTIONS (Display) (Printer prints displayed results except Step 2)

1. Press [2nd] [Pgm] 09 [SBR] [CLR] to initialize program. Displayed number will not change.

2. Key in a number (0 to 199017) and press [E]. In about 15 seconds 0. will be displayed.

3. Key in a 4-digit trial number and press [A]. "N.R" will be displayed where N is the number of correct digits correctly placed and R is the number of correct digits that are in the wrong locations.*

4. Repeat Step 3 until 4.0 is displayed. Remember to carefully evaluate the results of each trial, and to combine the results of successive trials as you select the next trial number. Your proficiency as a codebreaker is measured by the number of trials required to reach 4.0.

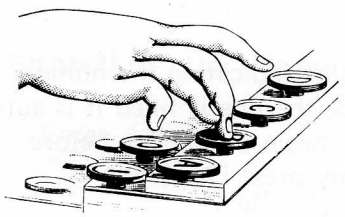
5. For a new code, press [RCL] 09 [E] and start with Step 3.

*If a digit is entered more than once in a single trial, an incorrect score may result. For example, if the code is 1234 and 1111 is guessed, 1.3 will be displayed.

EXAMPLE: Play Codebreaker using 82 as your seed to start the game.

Enter	Press	Display	Comments
	[2nd] [Pgm] 09 [SBR] [CLR]		Initialize
82	[E]	0.	Seed
1234†	[A]	1.1†	1 correct, 1 wrong loc.
5678†	[A]	1.0†	1 correct
1239†	[A]	1.2†	1 correct, 2 wrong loc.
9238†	[A]	1.2†	1 correct, 2 wrong loc.
2935†	[A]	0.4†	0 correct, 4 wrong loc.
5293†	[A]	4.0†	All correct

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



Memo Pad

With this program you can use your calculator and PC-100A to write messages as on a typewriter. If you own a TI Programmable 59 you may even record your messages (up to 24 lines) on magnetic cards and reprint them at a later time.

Solid State Software TI ©1977				
MEMO PAD				LE-10
New Line	Print All	Edit	Line Print	
Left	Center	Right	Number	Space

INSTRUCTIONS (Printer Only)

1. Press [2nd] [Pgm] 10 [SBR] [CLR] to initialize program; 20. is displayed. Press [2nd] [Fix] 9 to remove a fixed-decimal format.

2. A telephone-pad entry is used to enter all characters one at a time.

STU 7	VWX 8	YZ– 9
JKL 4	MNO 5	PQR 6
ABC 1	DEF 2	GHI 3
,.? 0		

For characters other than numbers, find the character on the above chart and enter the number beneath it into the display. Then press an appropriate user-defined key as explained below.

- Press [A] if the character is to the left of the number
- Press [B] if the character is centered above the number.
- Press [C] if the character is to the right of the number.

For numbers, enter single-digit integers into the display and press [D].

To skip a space or leave a blank, simply press [E].

3. After a character is entered a number appears in the display indicating the number of entries that may still be made before filling the line. Once the line is filled it is automatically printed and a new line is begun. If you wish to begin a new line before filling the old one, or if your message is completed, simply press [2nd] [A′].

4. Once your message is entered you may record it on magnetic cards following the instructions found in your Owner's Manual if you own a TI Programmable 59. (See Notes to determine which registers to record on magnetic cards.)

5. To print a message after it has been entered into the calculator manually or from magnetic card, press [2nd] [Pgm] 10 [2nd] [B′].

NOTES

1. Four data registers are used to store each line of your message beginning with R_4. If your message is k lines long, registers 0 through 4k + 3 must be left available for program use. Check the partitioning of your calculator to ensure that the needed registers are available. Repartitioning is necessary if you plan to enter more than 14 lines (6 for the TI-58). (See your Owner's Manual.)

2. If you want the calculator to begin storing your message in a higher register you may enter a line number, k, and press [2nd] [C′]. This causes the calculator to leave lines 1 through k-1 blank and begin storing the message in register 4k. R_0 through R_3, as well as the T-Register, must be left available for program use.

3. Pressing [2nd] [B′] prints the entire message stored in the calculator. However, if you wish to print a selected line, enter the line number and press [2nd] [D′].

4. If you make an error while entering a line, simply enter the number of the line in which the error was made and press [2nd] [C′]. Then reenter the entire line.

5. If you discover an error after the line is entered, press [2nd] [C′] and reenter the entire line **including blanks at the end of the line.** Then enter k + 1, where k is the number of the last completed line, and press [2nd] [C′] again before continuing.

6. Under normal circumstances your message is printed as you fill up each line. However, if you don't want your message printed as you enter it, simply press [2nd] [St flg] 1 after initialization.

EXAMPLE: Use this program to write "HAPPY PROGRAMMING".

Enter	Press	Display	Comments
	[2nd] [Pgm] 10 [SBR] [CLR]	20.	Initialize
	[E]	19.	Space
3	[B]	18.	H
1	[A]	17.	A
6	[A]	16.	P
6	[A]	15.	P
9	[A]	14.	Y
	[E]	13.	Space
6	[A]	12.	P
6	[C]	11.	R
5	[C]	10.	O
3	[A]	9.	G
6	[C]	8.	R
1	[A]	7.	A
5	[A]	6.	M
5	[A]	5.	M
3	[C]	4.	I
5	[B]	3.	N
3	[A]	2.	G
	[2nd] [A']	20.	HAPPY PROGRAMMING is printed

3. Player Hits (Optional)

   a. If you wish to be dealt additional cards, press [A] for each new card. The card is briefly displayed and printed, followed by your new total.

   b. Each Ace dealt to you is automatically counted as 1 point. If you wish an Ace to be scored as 11 points, press [2nd] [A'] after you have taken all the cards you desire.

4. After taking all the cards you desire, press [B]. The dealer then reveals his hole card and takes other cards as needed. The cards are displayed and printed along with the dealer's total, in the same way as for the player.

5. Press [D] and go to Step 3 for a new hand. Cards are printed and displayed as described in Step 2.

EXAMPLE: Play Blackjack against the calculator using 831 as a seed to start the game. Note that display values shown with quote marks are displayed for only about ½ second.

Enter	Press	Display	Print		Comments
	[2nd] [Pgm] 11 [SBR] [CLR]	0.			Initialize
831	[E]	"13."	KING	S(D)	Dealer's show card
		"7."	7.	H	Your hole card
		"9."	9.	S	Your show card
		16.	16.	HIT?	Your total
	[A]	"8."	8.	S	Your show card
		24.	24.		Your total
			YOU BUSTED TRY AGAIN		You lose
	[D]	"6."	6.	S(D)	Dealer's show card
		"13."	KING	H	Your hole card
		"1."	ACE	S	Your show card
		11.	11.	HIT?	Your total
	[2nd] [A']	21.	21.	HIT?	+10 for Ace
	[B]	"5."	5.	H(D)	Dealer's hole card
		"11."	JACK	S(D)	Dealer's show card
		21.	21.		Dealer's total
			TRY AGAIN		You lose

(continued on next page)

LE-11

Enter	Press	Display	Print		Comments
	[D]	"7."	7.	S(D)	Dealer's show card
		"4."	4.	H	Your hole card
		"9."	9.	S	Your show card
		13.	13.	HIT?	Your total
	[A]	"6."	6.	S	Your show card
		19.	19.	HIT?	Your total
	[B]	"12."	QUEEN	H(D)	Dealer's hole card
		17.	17.		Dealer's total
			LUCKY		You win

Acey-Deucy

This program allows you to play the game of Acey-Deucy against the calculator. The way the game is played is that the calculator first generates two random numbers and shows them to you. Then after you are given the odds, you enter your bet and a third random number is generated. If it is between the first two you win the bet. Your initial bankroll of $100 is updated after each hand.

Solid State Software TI ©1977				
ACEY-DEUCY				LE-12
Bet	Number	Bankroll		
Seed	Number 1	Number 2		Odds

INSTRUCTION (Display Only)

1. Press [2nd] [Pgm] 12 [SBR] [CLR] to initialize. A fix-2 display is selected.
2. Enter a seed number between 0 and 199017 and press [A]. Your initial bankroll of $100 appears in the display.
3. Press [B] to generate the first random number.
4. Press [C] to generate the second random number.
5. Press [E] to calculate odds.
6. Enter your bet and press [2nd] [A']. If you win, the amount of your winnings appears in the display. If you lose, the negative amount of your bet appears in the display.
7. To see the number generated in Step 6, press [2nd] [B'].
8. To display the value of your bankroll, press [2nd] [C'].
9. To continue playing, return to Step 3 or 6.

NOTE: Results may sometimes appear to be inaccurate due to rounding of the display. For example, if .214 is the lower of the two numbers and .213 is the third number, you lose even though both numbers are displayed as .21.

EXAMPLE: Play Acey-Deucy using 775 as your seed to start the game.

Enter	Press	Display	Comments
	[2nd] [Pgm] 12 [SBR] [CLR]		Initialize in fix 2
775	[A]	100.00	Enter seed, display bank
	[B]	0.12	1st number
	[C]	0.47	2nd number
	[E]	1.91	Odds
25	[2nd] [A′]	−25.00	Bet (lost)
	[2nd] [B′]	0.02	Display number
	[2nd] [C′]	75.00	Bank
	[B]	0.85	1st number
	[C]	0.17	2nd number
	[E]	0.47	Odds
25	[2nd] [A′]	11.74	Bet (won)
	[2nd] [B′]	0.59	Display number
	[2nd] [C′]	86.74	Bank
25	[2nd] [A′]	11.74	Bet (won)
	[2nd] [B′]	0.22	Display number
	[2nd] [C′]	98.47	Bank
	[B]	0.32	1st number
	[C]	0.21	2nd number
	[E]	8.20	Odds
5	[2nd] [A′]	−5.00	Bet (lost)
	[2nd] [B′]	0.42	Display number
	[2nd] [C′]	93.47	Bank

Craps

This game follows the rules of the familiar dice game:

a. First roll of 7 or 11 wins

b. First roll of 2, 3, or 12 loses

c. Any other first roll is your point and you win if it is rolled again before 7 is rolled (making your point). If 7 is rolled before your point, you lose.

The dice are represented on the display and printer as M.N where M and N are the numbers on the dice. All bets are even odds (1 to 1) and are made by entering the amount and pressing [C] before each roll. If a bet is not entered, the calculator assumes the amount of the previous bet (0 for the first roll). Your initial bankroll is $100, and is updated after each round. You may continue playing until your bankroll is depleted ($0.00).

Solid State Software TI ©1977				
CRAPS				LE-13
Roll		Bet	Last Roll	Seed

INSTRUCTIONS (Display and Printer)

1. Press [2nd] [Pgm] 13 [SBR] [CLR] to initialize program. Displayed number will not change.

2. Press [·], then key in any number and press [E]. "100.00" will be displayed and printed.

3. Key in your bet and press [C]. This number will be displayed and printed. If you enter a bet larger than your bankroll, the display will flash 9's. You may press [CE] and enter a correct amount to continue. Entering a negative bet will cause the same effect.

4. Press [A] for your first roll which will be displayed unless you roll 2, 3, 12, 7, or 11 causing only your updated bankroll to be displayed. You may see what the roll was by pressing [D]. Both the roll and updated bankroll are printed after pressing [A]. If you won or lost on the first roll, start again with Step 3. Otherwise, continue with Step 5 and try to make your point.

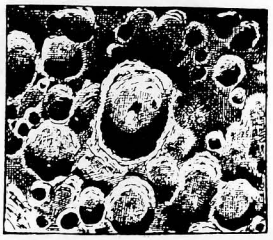
5. Press [A] for your next roll, which will be displayed unless it is 7 or your point. In either of these cases, your updated bankroll will be displayed. You may see the winning or losing roll by pressing [D]. With the printer, both the roll and the revised bankroll are printed. If you win or lose, start again with Step 3.

6. Repeat Step 5 until you win or lose.

7. Continue until your $100 is depleted. To start over, go to Step 2.

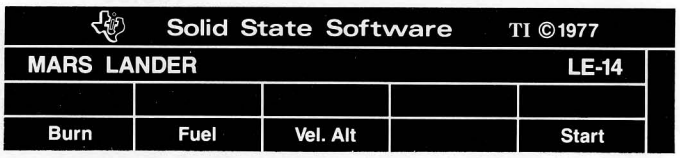
EXAMPLE: Play Craps using .57 as the seed.

Enter	Press	Display	Print	Comments
	[2nd] [Pgm] 13 [SBR] [CLR]	(No change)		Initialize
.57	[E]	100.00	100.00	Enter seed display bank
25	[C]	25.00	25.00	Bet
	[A]	4.4	4.4	8 is your point
	[A]	5.6	5.6	
	[A]	6.6	6.6	
	[A]	2.4	2.4	
	[A]	1.3	1.3	
	[A]		2.6	Winning roll
		125.00	125.00	New bank
	[D]	2.6		Winning roll
25	[C]	25.00	25.00	Bet
	[A]	3.3	3.3	
	[A]		6.1	Losing roll
		100.00	100.00	New bank
	[D]	6.1		Losing roll
25	[C]	25.00	25.00	Bet
	[A]		6.5	Winning roll
		125.00	125.00	New bank
	[D]	6.5		Winning roll



Mars Lander

This program simulates landing a spacecraft on the Martian soil. When you take control, the spacecraft is at an altitude of 2603 feet with a downward velocity of 487 ft/sec. These conditions are displayed as –487.2603. The object is to make a perfect landing; that is, land with a final velocity of zero at altitude zero. To accomplish this task, you have 630 units of fuel to burn in one-second bursts. Each burn must be 0 to 75 units. Initially each unit of fuel provides an acceleration of 1 ft/sec^2 away from the surface. For realism, the effect of the burn changes as the fuel is consumed and the mass of the spacecraft changes. Gravitation of Mars is assumed to be 13 ft/sec^2.



INSTRUCTIONS (Display and Printer)

1. Press [2nd] [Pgm] 14 [SBR] [CLR] to initialize program. Display value will not change.

2. Press [E], –487.2603 will be displayed and printed as the initial status of velocity and altitude (Vel.Alt).

3. Key in amount of burn (0 to 75), press [A], the revised status will be displayed and printed. With the printout, the amount of fuel burned precedes the status. If you enter a burn of more than 75 units, only 75 units will be burned.

4. Repeat Step 3 until you land (or crash). A perfect landing will be displayed and printed as 0. A number flashing in the display or printed with a question mark is the velocity at which you crashed.

5. Start a new landing by pressing [E].

NOTES

1. You may check your fuel supply by pressing [B].

2. Press [C] to display your current status (Vel.Alt).

LE-14

EXAMPLE: Try to make a safe landing on Mars.

Enter	Press	Display	Comments
	[2nd] [Pgm] 14 [SBR] [CLR]	(No change)	Initialize
	[E]	−487.2603†	Initial status, Vel.Alt
75†	[A]	−422.2149†	Vel.Alt
50†	[A]	−381.1747†	Vel.Alt
50†	[A]	−339.1387†	Vel.Alt
50†	[A]	−295.1070†	Vel.Alt
	[B]	405.00	Fuel
	[C]	−295.1070†	Vel.Alt
25†	[A]	−279.0783†	Vel.Alt
25†	[A]	−263.0512†	Vel.Alt
75†	[A]	−184.0289†	Vel.Alt
75†	[A]	−100.0147†	Vel.Alt
50†	[A]	−46.0074†	Vel.Alt
	[B]	155.00	Fuel
	[C]	−46.0074†	Vel.Alt
25†	[A]	−25.0038†	Vel.Alt
20†	[A]	−10.0020†	Vel.Alt
10†	[A]	−9.0010†	Vel.Alt
12†	[A]	−5.0003†	Vel.Alt
15†	[A]	3.0002†	Vel.Alt (moving up)
	[B]	73.00	Fuel
	[C]	3.0002†	Vel.Alt
5†	[A]	−3.0002†	Vel.Alt
11†	[A]	0.†	Safe landing

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

Jive Turkey

This game resembles the classic game of Hi-Lo; but only up to a point. This program sometimes "jives" you.

To play the game, you try to guess a number that the program has generated. It then tells you whether your guess is high, low, or correct. However, at the beginning of the game you have to enter a "probability of truth", a number between 0 to 100. This entry determines how often the program "jives" you. For example, if you enter 75, the program gives you correct answers 75% of the time and incorrect answers 25% of the time.

Solid State Software TI ©1977				
JIVE TURKEY				LE-15
% Truth	Seed		Score	Guess

INSTRUCTIONS (Display and Printer)

1. Press [2nd] [Pgm] 15 [SBR] [CLR] to initialize program; 0. is displayed.

2. Enter the "probability of truth" as a number between 0 and 100 and press [A].

3. Enter a seed number, 0 to 199017, and press [B]. The program then generates an integer between 0 and 100.

4. Enter your guess (0 to 100) and press [E]. If your guess is too high, 1 is displayed; too low, −1 is displayed. If your guess is correct, the correct number is flashed in the display. (Your guess and the program's answer are printed.)

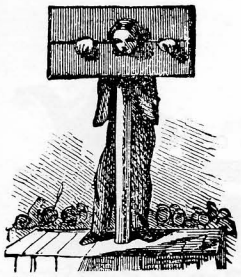
5. Press [D] to determine how many guesses you have taken. (First press [CE] if display is flashing.)

6. To play another game, press [SBR] [CLR] and go to Step 2.

EXAMPLE: Play Jive Turkey using 956 as the seed number and the probability of truth equal to 80.

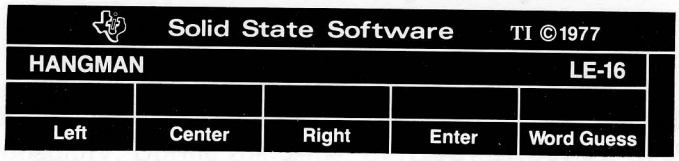
Enter	Press	Display	Comments
	[2nd] [Pgm] 15 [SBR] [CLR]	0.	Initialize
80†	[A]	80.	Probability of truth
956†	[B]	0.	Seed
50†	[E]	1.†	High
25†	[E]	1.†	High
15†	[E]	−1.†	Low
20†	[E]	1.†	High
17†	[E]	−1.†	Low
18†	[E]	−1.†	Low
19†	[E]	1.†	High ?
19†	[E]	−1.†	Low
19†	[E]	−1.†	Low
22†	[E]	"22."†	Correct (flashing display)
	[CE] [D]	10.†	Guesses

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



Hangman

This calculator version of Hangman may be played by 2 or more players. One player thinks of a word or words of up to 20 characters and spaces and enters it into the calculator. The other players then try to guess the word(s) before they are "hung". The program requires the use of a PC-100A.



INSTRUCTIONS (Printer Only)

1. Press [2nd] [Pgm] 16 [SBR] [CLR] to initialize; 0. is displayed. If the calculator has fixed-decimal display format, press [2nd] [Fix] 9 and continue.

2. A telephone pad entry is used to enter all characters one at a time.

STU 7	VWX 8	YZ (Space) 9
JKL 4	MNO 5	PQR 6
ABC 1	DEF 2	GHI 3

   To enter a character (or space), find the character on the above chart and enter the number beneath it into the display. Then press an appropriate user-defined key as explained below:

   - Press [A] if the character is to the left of the number.
   - Press [B] if the character is centered above the number.
   - Press [C] if the character is to the right of the number.

3. After a character is entered a number appears in the display indicating the number of entries that may still be made before filling the line. Once you have finished entering your word(s), press [D]. ([D] need not be pressed if 20 characters are entered as this sequence is automatically called.) The PC-100A then prints dashes indicating the positions of the entered characters. Note: 10 to 20 seconds are required for computation in this step and in Step 4.

4. To guess a letter simply enter the letter as in Step 2. If the letter is correct it is placed in the correct position(s) and printed along with the previously guessed letters and remaining blanks. If it is wrong the number of wrong guesses is printed along with the incorrect letter. Note that entering a correct letter more than once may cause erroneous symbols to be printed.

5. To guess the complete word press [E] and enter the word as in Steps 2 and 3. If the word is correct it is printed; if not, the number of wrong guesses is printed.

6. After 7 wrong guesses, you are officially "hung". However, you may continue playing if you wish.

EXAMPLE: With the calculator connected to the PC-100A printer, play the Hangman game with "TRIAL RUN" as the message to be guessed.

Enter	Press	Display	Print		Comments
	[2nd] [Pgm] 16 [SBR] [CLR]	0.			Initialize
7	[B]	19.			
6	[C]	18.			
3	[C]	17.			Input
1	[A]	16.			Message
4	[C]	15.			"TRIAL
9	[C]	14.			RUN"
6	[C]	13.			
7	[C]	12.			
5	[B]	11.			
	[D]	0.	_____	___	Enter line
1	[A]	0.	___A_	___	Guess A
2	[B]	0.		1. E	Guess E
3	[C]	0.	__IA_	___	Guess I
5	[C]	0.		2. O	Guess O
7	[C]	0.	__IA_	_U_	Guess U
2	[A]	0.		3. D	Guess D
7	[A]	0.		4. S	Guess S
7	[B]	0.	T_IA_	_U_	Guess T
5	[A]	0.		5. M	Guess M
6	[C]	0.	TRIA_	RU_	Guess R
4	[C]	0.	TRIAL	RU_	Guess L
5	[B]	0.	TRIAL	RUN	Guess N

LE-17

Learning Nim

Nim is a game where two players take turns removing chips from a common pile. The object of the game is to force the other player to take the last chip.

In this version of Nim you may play with up to 94 chips (54 for the TI Programmable 58). The calculator acts in the capacity of one of the players and you are the other. Each player must remove either 1, 2, or 3 chips per turn.

A special feature of this program indicated by the title is that it has the ability to "learn". Starting with no data on which to base choices, the machine randomly chooses its moves — all being of equal probability. During the game, the calculator keeps track of all its moves; and with each successive game it updates its memory based on the results. So watch out! The next time around the calculator will play a better game.

Solid State Software TI ©1977				
LEARNING NIM				LE-17
You 1st	Calc 1st			New Game

INSTRUCTIONS (Display Only)

1. Press [2nd] [Pgm] 17 [SBR] [CLR] to initialize program; 0. is displayed.

2. Enter the number of chips you wish to use and press [R/S]. If you use more than 54 chips (24 for the TI-58), the calculator must be repartitioned. The number of chips plus 6 equals the number of registers needed for program use. See your Owner's Manual for instructions on partitioning your calculator's memory.

3. If you wish to make the first move, press [A] and go to Step 5. The number of chips in the pile is displayed.

4. If you want the calculator to make the first move, press [B]. The calculator then makes its move and displays the number of chips remaining in the pile.

5. Enter the number of chips you wish to take and press [R/S] . The calculator then makes its move and returns the number of chips remaining after its move. Repeat this step until the display flashes. If 0 is flashed, you win. If π (3.141592654) is flashed, the calculator wins.

6. For a new game, press [CE] [E] and return to Step 2. (The number of chips used in the last game is displayed.)

EXAMPLE: Play the Learning Nim game using 15 chips. Note that some entries may require several seconds for processing.

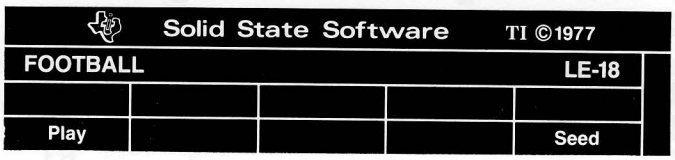
Enter	Press	Display	Comments
	[2nd] [Pgm] 17 [SBR] [CLR]	0.	Initialize
15	[R/S]	15.	Number of chips
	[A]	15.	You go first
3	[R/S]	10.	
3	[R/S]	6.	
1	[R/S]	2.	
1	[R/S]	"0."	You win (flashing display)
	[CE] [E]	15.	New game
	[R/S] *	15.	Number of chips
	[B]	12.	Calculator first
3	[R/S]	7.	
2	[R/S]	3.	
2	[R/S]	"0."	You win (flashing display)

* [R/S] must be pressed to establish the number of chips.

Football

Football, a game for two players, must be played with the PC-100A printer. Each player is quarterback for his team and has the option of a run, short pass, or long pass on each play. Movement of the ball is recorded by printout of the yards to go for a touchdown. The ball must be advanced ten yards or more in four plays or less, or possession of the ball changes.

Scoring is either by touchdowns, which may count six or seven points as determined by the calculator, or by safeties, which count two points.



INSTRUCTIONS (Printer Only)

1. Press [2nd] [Pgm] 18 [SBR] [CLR] to initialize; 0. will be displayed.
2. Decide which player will be on offense first (coin toss).
3. To start a game, press [·], then key in any number and press [E]. The number of yards to go for a touchdown will be printed.
4. The quarterback selects one of the following:

   Press [1] [A] for a run play, or

   Press [2] [A] for a short pass, or

   Press [3] [A] for a long pass.

5. Yards to go for a touchdown is printed after each play:

   a. The number is printed twice if a first down has been made.

   b. If the number is printed once, the display will indicate the yards to go for a first down.

   c. Change of possession is indicated by a paper advance followed by printing of the yards to go for the new offensive team.

d. Scoring is indicated by a yards-to-go figure, either less than zero (a touchdown) or greater than 100 (a safety). Touchdowns count as 6 or 7 points and safeties count as 2 points. After a score is printed, a new yards-to-go number is printed, and play transfers to the other team.

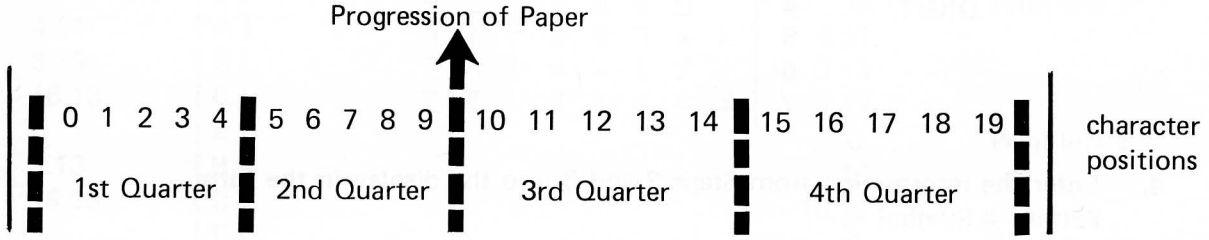
6. Play continues until the calculator signals the end of a game with a paper advance and the scores for teams 1 and 2, respectively. A game consists of 60 to 70 plays. The exact number is set by the calculator depending upon the number entered in Step 3.

EXAMPLE: Play Football using .2156 as a seed to start the game. The following example shows the progress of the game up to the first change of possession.

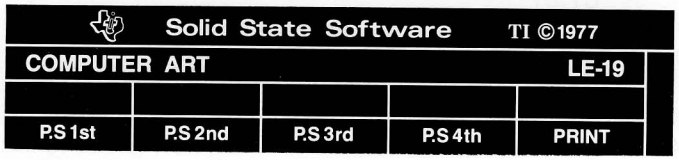
Enter	Press	Display	Print	Comments
	[2nd] [Pgm] 18 [SBR] [CLR]	0.		Initialize
.2156	[E]	87.	87.	Yds for TD
1	[A]	5.	82.	Run
2	[A]		70.	Short pass
		70.	70.	First down
1	[A]	9.	69.	Run
3	[A]	15.	75.	Long Pass
2	[A]	3.	63.	Short pass
1	[A]		63.	Run
				Change of possession
		37.	37.	Yds for TD

Computer Art

Have you ever thought of becoming an artist? If you have, your TI Programmable calculator, along with a PC-100A, makes drawing fun. The PC-100A tape may be divided into four quarters of five characters each as shown below.



Now, using this program, you may print any of the following patterns in any quarter of the tape. These patterns are illustrated using an asterisk, however, you may choose any character, number, or symbol that the PC-100A is capable of printing.



INSTRUCTIONS (Printer Only)

1. Press [2nd] [Pgm] 19 [SBR] [CLR] to initialize; 0. is displayed. If the calculator has fixed-decimal display format, press [2nd] [Fix] 9 and continue.

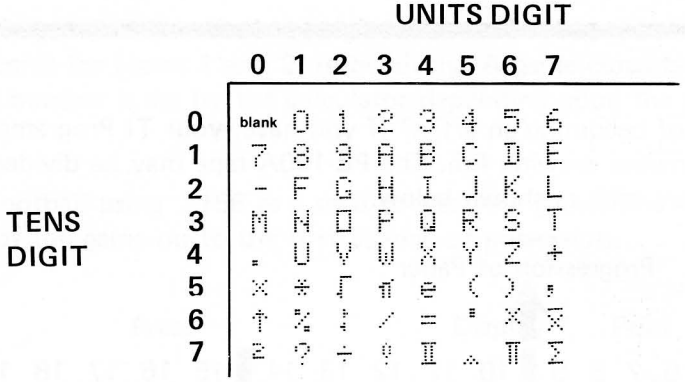
2. Select the pattern you desire and note its number.

Pattern	No.	Pattern	No.	Pattern	No.	Pattern	No.
`    *`	1	`*   *`	9	`*    *`	17	`* *   *`	25
`  *  `	2	`*  *  `	10	`*   *  `	18	`* *  * `	26
`  * *`	3	`*  * *`	11	`*   * *`	19	`* *  * *`	27
`*    `	4	`* *   `	12	`*  *   `	20	`* * *  `	28
`*   *`	5	`* *   *`	13	`*  *   *`	21	`* * *   *`	29
`* *  `	6	`* * *  `	14	`*  * *  `	22	`* * * *  `	30
`* * *`	7	`* * * *`	15	`*  * * *`	23	`* * * * *`	31
`*    `	8	`*      `	16	`* *    `	24		

Note: Vertical dashed line indicates right-hand edge of column.

3. Choose a character from the following chart and determine its code number:

   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.



4. Enter the information from Steps 2 and 3 into the display in the form **Pattern #.Symbol #.**

5. Select the quarter of the tape you wish to use by pressing the appropriate user-defined key.

   [A] – First Quarter
   [B] – Second Quarter
   [C] – Third Quarter
   [D] – Fourth Quarter

6. Repeat Steps 1-5 for each quarter as desired, then press [E] to print the entire line.

7. Repeat Steps 1-6 for each line.

Note: If you need more than one type of character in a specific quarter of the tape, you can fill the print buffer directly by using the special operation codes described in your Owner's Manual. Pressing [E] will print the contents of the print buffer.

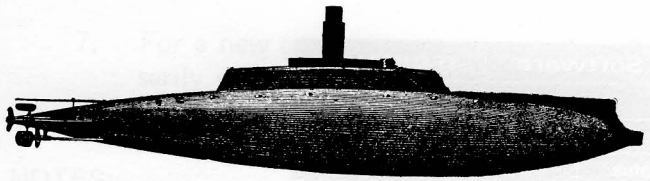
EXAMPLE: Draw a Christmas tree using the Computer Art program.

Enter	Press	Display	Comments
	[2nd] [Pgm] 19 [SBR] [CLR]	0.	Initialize
8.51	[C]	8.51	
	[E]	0.	Print line 1
1.51	[A]	1.51	
4.51	[D]	4.51	
	[E]	0.	Print line 2
1.13	[B]	1.13	
	[E]	0.	Print line 3
4.51	[A]	4.51	
3.13	[B]	3.13	
16.13	[C]	16.13	
	[E]	0.	Print line 4
3.13	[B]	3.13	
16.13	[C]	16.13	
	[E]	0.	Print line 5
2.51	[A]	2.51	
7.13	[B]	7.13	
24.13	[C]	24.13	
8.51	[D]	8.51	
	[E]	0.	Print line 6
15.13	[B]	15.13	
28.13	[C]	28.13	
	[E]	0.	Print line 7
15.13	[B]	15.13	
28.13	[C]	28.13	
2.51	[D]	2.51	
	[E]	0.	Print line 8
8.51	[A]	8.51	
31.13	[B]	31.13	
30.13	[C]	30.13	
	[E]	0.	Print line 9
31.13	[B]	31.13	
30.13	[C]	30.13	
	[E]	0.	Print line 10
1.13	[A]	1.13	
31.13	[B]	31.13	
31.13	[C]	31.13	
4.51	[D]	4.51	
	[E]	0.	Print line 11
4.51	[A]	4.51	
31.13	[B]	31.13	
30.13	[C]	30.13	

(continued on next page)

LE-19

Enter	Press	Display	Comments
	[E]	0.	Print line 12
1.74	[B]	1.74	
	[E]	0.	Print line 13
31.20	[A]	31.2	
2020202074	[2nd] [Op] 02	2020202074.	Enter different symbols in same quarter
31.20	[C]	31.2	
31.20	[D]	31.2	
	[E]	0.	Print line 14

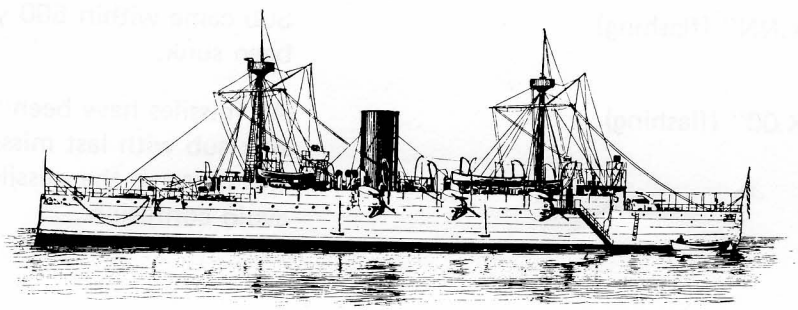


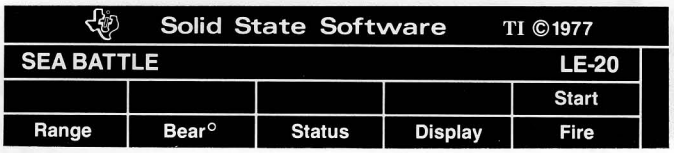
Sea Battle

Because of battle damage, your missile frigate has no radar and no engine. A nuclear submarine whose last reported position was about 15,000 yards at an unknown bearing was coming toward you at 30 knots. You are armed with 15 small missiles which require 1 minute to manually insert the estimated range in yards and bearing in degrees. Previous intelligence reports show the following expectations versus missile-miss distance with this class of sub.

Miss Distance (yds)	Intelligence Report
Over 500	No damage to sub. Sub comes straight at you after a miss of this distance.
500 and under	1. Sub suffers damage which decreases speed 6 knots per close hit until speed has decreased to 6 knots. No further decrease. 2. Sub takes evasive action making 45° turn away from missile impact area. 3. Repeated close hits cause the sub to continue on this 45° line if the miss is in the same direction or to veer 90° if the next miss is on the opposite side of the sub. 4. A miss distance greater than 500 yards after a near miss causes the sub to come straight at you again.
50 and under	Sinks sub.

Your frigate will be sunk if you have fired all missiles without sinking the sub or if the sub comes within 500 yards of your frigate.





INSTRUCTIONS (Display Only)

1. Press [2nd] [Pgm] 20 [SBR] [CLR] to initialize program. Displayed value will not change.

2. To start the game press [2nd] [E′]. The display will show 15000.15 which indicates a range of 15000 yards and 15 missiles remaining.

3. Key in estimated range in yards and press [A]. Remember the 1 minute interval between the range report and the missile firing. The sub will move during this time.

4. Key in estimated bearing in degrees (0 to 360°, positive or negative) and press [B]. Remember to account for movement of the sub since the last report.

5. Range and bearing can be entered in either order. Changes can be made after entry if made before firing. You may elect not to fire a missile by keying in 0, pressing [A] and then [E]. This preserves your missile supply but brings the sub closer.

6. Press [E] to fire a missile at range and bearing selected. Display depends on miss distance. Sub takes action as noted in the Intelligence Report. Display will be of following types:

Display	Miss Distance	Remarks
0.NN	Over 5000	No range information, only number of missiles left.
XXXX.NN	5000 and under	Missile transmits miss distance, sub comes straight at you.
XXX.NN	500 and under	See Intelligence Report for sub's action.
"XX.NN" (flashing)	50 and under	Sub has been sunk. Last missile number is preserved.
"XXX.NN" (flashing)		Sub came within 500 yards. You have been sunk.
"XXX.00" (flashing)		All missiles have been fired. In case you sink sub with last missile, the calculator will preserve the missile number to avoid confusion.

7. For a new game, start over with Step 2. Each game after the first does not necessarily start with 15,000 yards (but it will be within 500 yards of this) and will appear from a new bearing angle.

NOTES:

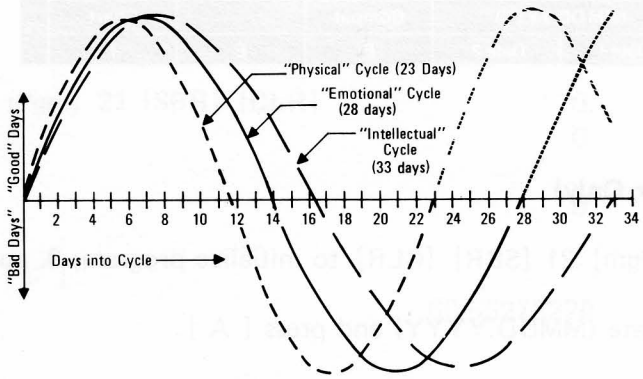
1. Previous range and bearing values can be recalled to help you determine new values.
   a. Pressing 1 [C] recalls your previous range setting.
   b. Pressing 2 [C] recalls your previous bearing angle.
2. Pressing [D] recalls display at the end of last shot.
3. Playing hints:
   a. Use 2000 yards = 1 nautical mile.
   b. Each turn takes 1 minute.
   c. Top speed of 30 knots = 1000 yards per minute.
   d. Minimum speed of 6 knots = 200 yards per minute.
   e. Graph paper and drafting instruments for plotting may be useful.
4. Game difficulty has been selected for experienced players. To increase number of missiles (20 is suggested for novices), use the following at Step 2. After [2nd] [E'], press 20 [STO] 00 [D] and 15000.20 will be displayed.
5. This program leaves the calculator in fix-2 display format. Press [2nd] [Fix] 9 for standard display.

EXAMPLE: Play the Seabattle game.*

Enter	Press	Display	Comments
	[2nd] [Pgm] 20 [SBR] [CLR]	(No change)	Initialize
	[2nd] [E′]	15000.15	Start game
14000	[A]	14000.00	Range
90	[B]	90.00	Bearing
	[E]	0.14	Miss over 5000 yds
13000	[A]	13000.00	Range
180	[B]	180.00	Bearing
	[E]	0.13	Miss over 5000 yds
12000	[A]	12000.00	Range
270	[B]	270.00	Bearing
	[E]	478.12	Under 500 yds, see Intel. Rpt.
11600	[A]	11600.00	Range
272	[B]	272.00	Bearing
	[E]	1266.11	Under 5000 yds, see Intel. Rpt.
10800	[A]	10800.00	Range
268	[B]	268.00	Bearing
	[E]	425.10	Under 500 yds, see Intel. Rpt.
10500	[A]	10500.00	Range
265	[B]	265.00	Bearing
	[E]	164.09	Under 500 yds, see Intel Rpt.
10300	[A]	10300.00	Range
264	[B]	264.00	Bearing
	[E]	181.08	Under 500 yds, see Intel Rpt.
10200	[A]	10200.00	Range
261	[B]	261.00	Bearing
	[E]	255.07	Under 500 yds, see Intel. Rpt.
10100	[A]	10100.00	Range
262	[B]	262.00	Bearing
	[E]	176.06	Under 500 yds, see Intel. Rpt.
10000	[A]	10000.00	Range
263	[B]	263.00	Bearing
	[E]	100.05	Under 500 yds, see Intel Rpt.
9900	[A]	9900.00	Range
264	[B]	264.00	Bearing
	[E]	"26.05"	Under 50 yds, sub sunk

*The example shown assumes an OFF/ON start.

Biorhythms



BIORHYTHM "CYCLES"

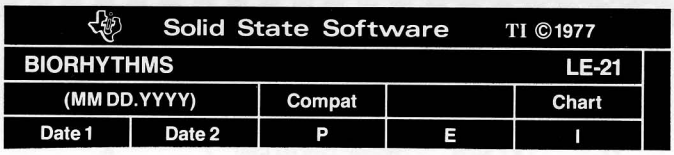
Each person's "good" and "bad" days are said to be patterned in part by physical, emotional, and intellectual biorhythm cycles which start at birth and continue throughout his life. As shown in the diagram, "good" days are when the curve is above the horizontal line; days below the line are "bad" days. Crossover days are "critical" days. Because these curves are continuous, any given day will fall somewhere within one of the repeating cycles. For example, day 33 in the diagram is 33 (or 0) days into the 33-day intellectual cycle, 5 days into the 28-day emotional cycle, and 10 days into the 23-day physical cycle. The amplitude of each cycle may be expressed as a value between −1 and 1 where −1 is the low point, 0 the critical point, and 1 the high point of the curve. Using this program, you can determine your position in the biorhythm cycles on any given day simply by entering your birthdate and the date in question. With the PC-100A you can also "chart" your biorhythm cycles.

From the brief description, it is easy to see that the biorhythm cycles of two people are apt to match exactly only if they are born on the same day. The relative match of one person's "ups and downs" to another's is called biorhythm compatibility. The composite match of the three cycles is computed by the program. This compatibility rating (a percentage value) is normally evaluated in the following general categories:

	50% is average
below	35% indicates potential for strong variances
above	65% indicates potential for blissful relations

Now use the program to see if the way your day has gone matches your biorthythm indicators. Or check your biorhythm compatibility with a friend or relative, or someone you particularly like or dislike. The results may prove interesting, or at least fun.

Dates are entered in the form MMDD.YYYY, where MM is the month number, DD is the day and YYYY is the year. For example, December 7, 1941 is entered as 1207.1941.



INSTRUCTIONS

Biorhythm Chart (Printer Only)

1. Press [2nd] [Pgm] 21 [SBR] [CLR] to initialize program; 0. appears in display.
2. Key in birth date (MMDD.YYYY) and press [A].
3. Key in test date (MMDD.YYYY) and press [B]. The number in the display indicates the day of the week of the test date where 0 = Saturday, 1 = Sunday, 2 = Monday . . ., 6 = Friday.
4. Press [2nd] [E'] to chart your biorhythm cycles. The numbers down the center of the tape locate the critical points and correspond to the days of the week as described in Step 3. "P" is plotted for the physical cycle, "E" for emotional and "I" for intellectual. An "X" is printed where two cycles share the same point. Press [RST] to stop the program. Start with Step 1 for a new chart.

Biorhythm Cycles (Display Only)

1. Press [2nd] [Pgm] 21 [SBR] [CLR] to initialize program; 0. appears in display.
2. Key in birth date (MMDD.YYYY) and press [A].
3. Key in test date and press [B]. (Day of the week is displayed as in Step 3.)
4. a. Press [C] to determine amplitude of physical cycle.
   b. Press [D] to determine amplitude of emotional cycle.
   c. Press [E] to determine amplitude of intellectual cycle.

Biorhythm Compatibility (Display Only)

1. Press [2nd] [Pgm] 21 [SBR] [CLR] to initialize program; 0. appears in display.
2. Key in earlier birth date (MMDD.YYYY) and press [A].

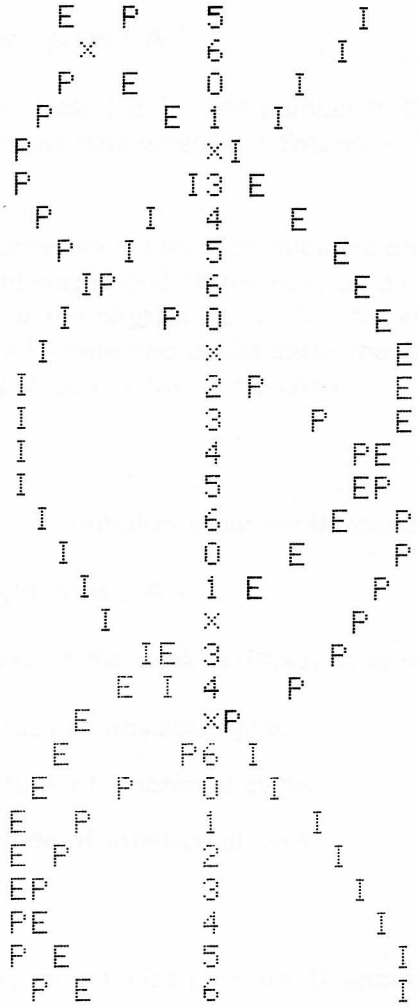
3. Key in later birth date (MMDD.YYYY) and press [B]. Day of the week of later birth date is displayed as in Step 3.

4. Press [2nd] [C′] to determine biorhythm compatibility.

EXAMPLE: Determine the biorhythm compatibility of a person born on September 13, 1946 and a person born on April 23, 1949.

Enter	Press	Display	Comments
	[2nd] [Pgm] 21 [SBR] [CLR]	0.	Initialize
913.1946	[A]	0.	Enter Sept. 13, 1946
423.1949	[B]	0.	Enter Apr. 23, 1949
	[2nd] [C′]		(0 = Sat.)
		60.55273229	Compatibility rating (%)

EXAMPLE: Determine a person's position on the biorhythm cycles for September 1, 1977 if that person was born on February 22, 1954. Then plot that person's biorhythm chart for the month of September, 1977.

Enter	Press	Display	Print	Comments
	[2nd] [Pgm] 21 [SBR] [CLR]	0.		Initialize
222.1954	[A]	0.		Enter Feb. 22, 1954
901.1977	[B]	5.		Enter Sept. 1, 1977 (5 = Thur.)
	[C]	−.3984010881		Physical position
	[D]	−.7818314834		Emotional position
	[E]	.7557495749		Intellectual position
	[2nd] [E′]			Plot begins at Sept. 1 Right side of tape is positive, left side is negative.
	[RST]			Stop program

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