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# TI Programmable 58/59

# Business Decisions

## Quick Reference Guide

## CONTENTS





## CALCULATING NOTES

### Low Battery Indication

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

### Algebraic Hierarchy

Operations and functions are performed automatically in following order.

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

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

### Flashing Display

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

## CONVERSIONS

### Angle Formats

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

### Polar to Rectangular

R [x:t] Θ [2nd] [P→R] → y; [x:t] → x

### Rectangular to Polar

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

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

### Angular Conversions

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



## STATISTICS

Initialize: [2nd] [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] [x̄] |
| then x-array | [x:t] |
| Standard Deviation | |
| (N − 1 Weighting) of y-array | [INV] [2nd] [s] |
| then x-array | [x:t] |
| (N Weighting) of y-array | [INV] [2nd] [σn] 11 [√x] |
| then x-array | [x:t] [√x] |
| Variance | |
| (N Weighting) of y-array | [2nd] [σn] 11 |
| then x-array | [x:t] |
| (N − 1 Weighting) of y-array | [2nd] [s] [x²] |
| then x-array | [x:t] [x²] |
| Y-Intercept | [2nd] [σn] 12 |
| Slope after y-intercept | [x:t] |
| Correlation Coefficient | [2nd] [σn] 13 |
| y' for new x | [2nd] [σn] 14 |
| x' for new y | [2nd] [σn] 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.

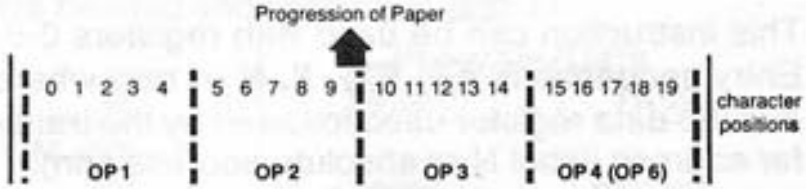
| Code nn | Function |
|---|---|
| 00* | Initialize print register. |
| 01* | Alphanumerics for far left quarter of print column. |
| 02* | Alphanumerics for inside left quarter of print column. |
| 03* | Alphanumerics for inside right quarter of print column. |
| 04* | Alphanumerics for far right quarter 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:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 0 | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 7 | 8 | 9 | A | B | C | D | E |
| 2 | - | F | G | H | I | J | K | L |
| 3 | M | N | O | P | Q | R | S | T |
| 4 | . | U | V | W | X | Y | Z | + |
| 5 | × | * | [ | ] | @ | ( | ) | , |
| 6 | ↑ | % | : | / | = | ' | × | $ |
| 7 | ≥ | ? | ÷ | ≤ | ≠ | ≈ | ≡ | Σ |

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

## PROGRAMMING NOTES

### Labels

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

### DSZ

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

### Flags

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



## MEMORY PARTITIONING

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

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

*Partition when calculator is turned on.

## PROGRAM KEY CODES

| Key Code | Key | Key Code | Key | Key Code | Key |
|---|---|---|---|---|---|
| 00 | 0 | 39 | cos | 72* | STO Ind |
| ↓ | ↓ | 40 | Ind | 73* | RCL Ind |
| 09 | 9 | 42 | STO | 74* | SUM Ind |
| 10 | E' | 43 | RCL | 75 | − |
| 11 | A | 44 | SUM | 76 | Lbl |
| 12 | B | 45 | y^x | 77 | x≠t |
| 13 | C | 47 | CMs | 78 | Σ+ |
| 14 | D | 48 | Exc | 79 | x̄ |
| 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 | x² | 66 | Pause | 96 | Write |
| 34 | √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.<br>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.<br>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.<br>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.

# BUSINESS DECISIONS MODULE CHECK

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| | **Library Module Check** | | | |
| A1 | Select Program | | [2nd] [Pgm] 01 | |
| A2 | Run Module Check | | [SBR] [2nd] [R/S] | 9.[1] |
| | **Initialize Linear Regression** | | | |
| B1 | Select Program | | [2nd] [Pgm] 01 | |
| B2 | Initialize Linear Regression | | [SBR] [CLR] | 0. |

**NOTES:** 1. The number 9. indicates the Business Decisions Library.

# LONG TERM FINANCING REQUIREMENTS



| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 02 | |
| 2 | Initialize | | [SBR] [CLR] | 0.00 |
| 3 | Enter earnings applied to funding needed for period 1 of summary. **If none, enter 0.**[1] | E | [2nd] [ E′ ] | E† |
| 4 | Enter the following in any order: | | | |
| | a. Expected revenue in sales | REV | [ A ] | REV† |
| | b. % Gross profit of sales | %GPS | [ B ] | %GPS† |
| | c. Capital assets needed per sales dollar | CAS | [ C ] | CAS† |
| | d. % Maximum debt allowed | %MD | [ D ] | %MD† |
| | e. Present total assets[2] | TA | [ E ] | TA† |
| | f. % Present debt level[2] | %PD | [2nd] [ A′ ] | %PD† |
| | g. % Dividend rate | %DR | [2nd] [ B′ ] | %DR† |
| | h. % Cost of capital for bonds | %CB | [2nd] [ C′ ] | %CB† |
| | i. % Cost of capital for stock | %CS | [2nd] [ D′ ] | %CS† |
| 5 | Perform financial summary[3] | | [2nd] [ E′ ] | period†• |
| | Gross Profit | | | P†• |
| | Dividends | | | D†• |
| | Retained Earnings | | | RE†• |
| | Capital Assets Needed | | | CAP†• |
| | Funding Needed | | | FN[5]†• |
| | Amount of Stock Sold | | | S†• |
| | Amount of Bonds Borrowed | | | B[6]†• |
| 6 | To continue the summary for subsequent periods, go to Step 4 and update inputs as necessary[4] | | | |

**NOTES:**

1. If entry is miskeyed, go to Step 2.
2. No further inputs required after initial data is entered.
3. Be sure Step 4 inputs are correct before performing Step 5. Correct mistakes by reentering data in Step 4.
4. If an input error is discovered after execution of Step 5, start over at Step 2.
5. A negative value for FN indicates the amount by which the Capital Needed was exceeded by the Present Assets and Retained Earnings applied from the previous period. This amount is added to the retained earnings for the next period.
6. A negative value for B indicates the amount by which the present debt level exceeds the maximum debt allowed. This excess debt amount is liquidated by proportionately increasing the sale of stock, thereby ensuring that the present debt level equals the maximum debt allowed.

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

• These values are displayed for approximately 4 seconds.

# DEBT FINANCING



| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 03 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Number of Periods | N | [ A ] | N |
| 4 | Enter Market Price of Bond (Net) | MP | [ B ] | MP |
| 5 | Enter Face Value of Bond | FACE | [ C ] | FACE |
| 6 | Enter Coupon Interest Rate per Period (decimal) | Coupon | [ D ] | Coupon (dec.) |
| 7 | Enter Corp. Tax Rate (decimal) | TAX | [ E ] | TAX (dec.) |
| 8 | Compute Payment Factor | | [2nd] [ E' ] | PMT factor |
| 9 | **Install Master Library Module** | | | |
| 10 | Select Program | | [2nd] [Pgm] 19 | |
| 11 | Initialize | | [2nd] [ E' ] | 0. |
| 12 | Select Ordinary Annuity/PV | | [2nd] [ C' ] | 0. |
| 13 | Enter N | N | [ A ] | N |
| 14 | Enter PMT Factor (Step 8) | PMT factor | [ C ] | PMT factor |
| 15 | Enter Market Price (Net) | MP | [ D ] | MP |
| 16 | Enter Face Value | FACE | [ E ] | FACE |
| 17 | Compute Cost of Capital | 0 | [ B ] | CB |

**NOTES:** 1. Depressing the TRACE key on the PC-100A following Step 2 will provide a printout.

# INVESTMENT EVALUATION



| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| | **Uneven Cash Flows** | | | |
| 1 | Select Program | | [2nd] [Pgm] 04 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Investment | INV | [ A ] | INV |
| 4 | Enter Cash Flows Using One or Both of the Following Methods: | | | |
| | I. Enter Cash Flow | | | |
| | • If Received | CF | [ B ] | CF |
| | • If Paid | CF | [+/−] [ B ] | −CF |
| | (Repeat as Needed) | | | |
| | II. a. Enter Expected Growth Rate of Cash Flows (decimal) | Growth | [2nd] [ C′ ] | Growth |
| | b. Enter 1st Cash Flow | CF | [ C ] | CF |
| | c. Enter Number of Cash Flows | N | [R/S] | $CF_N$ |
| | (Repeat as Needed) | | | |
| 5 | To Change or Correct a Cash Flow Entry: | | | |
| | a. Enter Cash Flow No. | CF# | [2nd] [ A′ ] | CF# |
| | b. Enter Cash Flow | | | |
| | • If Received | New CF | [2nd] [ B′ ] | New CF |
| | • If Paid | New CF | [+/−] [2nd] [ B′ ] | −New CF |
| 6 | Compute Internal Rate of Return | | [ D ] | i |
| 7 | Enter i As Decimal and Compute Present Value | i | [ E ] | PV |
| 8 | Enter i As Decimal and Compute Future Value | i | [2nd] [ E′ ] | FV |
| | **Stock Flotation** | | | |
| 1 | Select Program | | [2nd] [Pgm] 04 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Current Value of Stock | INC | [ A ] | INC |
| 4 | Enter Dividend Payments Using One or Both of the Following Methods: | | | |
| | I. Enter Dividend Payment (Repeat as Needed) | DIV | [ B ] | DIV |
| | II. a. Enter Expected Growth Rate of Dividends As Decimal | Growth | [2nd] [ C′ ] | Growth |
| | b. Enter 1st Dividend Payment | DIV | [ C ] | DIV |
| | c. Enter Number of Payments (Repeat as Needed) | N | [R/S] | $DIV_N$ |

| | | | | |
|---|---|---|---|---|
| 5 | To Change or Correct a Dividend Entry: | | | |
| | a. Enter Dividend No. | DIV # | [2nd] [ A′ ] | DIV # |
| | b. Enter Dividend Payment | New DIV | [2nd] [ B′ ] | New DIV |
| 6 | Enter Normal Growth Rate | Growth | [2nd] [ C′ ] | Growth |
| 7 | Enter Normal Dividend and Compute Rate of Return | $DIV_\infty$ | [2nd] [ D′ ] | i |

NOTES:
1. 16+N data registers are required by the program. N is the number of cash flows or dividend payments.

# PROJECT PLANNING & BUDGETING

**BD-05**

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 05 | |
| 2 | Initialize | | [SBR] [CLR] | 0.00 |
| 3 | Enter Maximum Number of Rows | Max No. | [2nd] [ B′ ] | Max No. |
| 4 | Reset Partitioning | $n^1$ | [2nd] [Op] 17 | Partitioning |
| | ENTER ELEMENTS 1–12 OF A ROW | | | |
| | **Method A** | | | |
| 5 | Enter Row Number | Row No. | [2nd] [ C′ ] | Row No. |
| 6 | Enter Element i (Repeat for i = 1–12) | $E_i$ | [ C ] | $E_i$ |
| | **Method B** | | | |
| 7 | Enter Row Number | Row No. | [2nd] [ C′ ] | Row No. |
| 8a | Enter Element 1 | $E_1$ | [ C ] | $E_1$ |
| 8b | Enter Growth Rate[2] (decimal) and Complete Entry of Columns 2–12 | Growth | [R/S] | Row No.[3] |

| | | | | |
|---|---|---|---|---|
| | ENTER ELEMENT 13 OF A ROW (Following 1–12 Entry) | | | |
| | **Method A** | | | |
| 9 | Enter Element 13 | $E_{13}$ | [ C ] | $E_{13}$ |
| | **Method B** | | | |
| 10a | Compute and Store Sum of Elements 1–12 in Column 13 | Row No. | [ E ] | $\Sigma R$ |
| 10b | Compute and Store Average of Elements 1–12 in Column 13 | | [R/S] | $\bar{x}R$ |
| | ENTER SINGLE ELEMENT | | | |
| 11a | Enter Row Number | Row No. | [2nd] [ C′ ] | Row No. |
| 11b | Enter Column Number | Col. No. | [R/S] | Col. No. |
| 12 | Enter Element[4] | E | [ C ] | E |
| | COLUMN TOTALS | | | |
| 13a | Compute and Store Sum of Column Elements 1 Through (R−1) in Row R (See Step 3) | Col. No. | [2nd] [ E′ ] | $\Sigma C$ |
| 13b | Compute and Store Average of Column Elements in Row R | | [R/S] | $\bar{x}C$ |

| | | | | |
|---|---|---|---|---|
| | ROW OPERATIONS[3] | | | |
| 14a | Enter Row A or<br>Enter Constant | $Row_A$<br>K | [ A ]<br>[2nd] [ A′ ] | $Row_A$<br>K |
| 14b | Enter Row B | $Row_B$ | [R/S] | $Row_B$ |
| 15 | Enter Resulting Row if Different From Row B[5] | $Row_C$ | [ B ] | $Row_C$ |
| 16 | Select Operation[6] | | | |
| | a. Add<br>b. Subtract<br>c. Multiply<br>d. Divide | | [SBR] [ + ]<br>[SBR] [ − ]<br>[SBR] [ × ]<br>[SBR] [ ÷ ] | $C_{13}$[7]<br>$C_{13}$[7]<br>$C_{13}$[7]<br>$C_{13}$[7] |
| | SHIFT OPERATIONS | | | |
| 17a | Enter Row to be Shifted | $Row_A$ | [ A ] | $Row_A$ |
| 17b | Enter Resulting Row[5] | $Row_B$ | [R/S] | $Row_B$ |
| 18a | Enter Number of Locations Row is to be Shifted and | | | |
| | Shift Left or<br>Shift Right | No. Loc.<br>No. Loc. | [ D ]<br>[2nd] [ D′ ] | 0.<br>0. |
| 18b | Enter New Data[8] (Repeat as Needed) | Data | [R/S] | Data |
| | RECALL A ROW | | | |
| 19a | Enter Row Number | Row No. | [ B ] | Row No. |
| 19b | Recall Row[3] | | [R/S] | $C_{13}$ |

**NOTES:**

1. Set partitioning by pressing n [2nd] [Op] 17 according to the following:

| No. of Rows | n |
|---|---|
| 3 | 5* |
| 4 | 6* |
| 5 | 8** |
| 6 | 9** |
| 7 | 10** |

*TI-58, within power-up partition for TI-59.
**TI-59 only.

2. Enter 0 for a constant value in each column.
3. Output format of the printer is

| No. | Row | No. | Row |
|---|---|---|---|
| $E_1$ | | $E_7$ | |
| $E_2$ | | $E_8$ | |
| $E_3$ | | $E_9$ | |
| $\sum_{i=1}^{3} E_i$ | $\Sigma$ | $\sum_{i=7}^{9} E_i$ | $\Sigma$ |
| $E_4$ | | $E_{10}$ | |
| $E_5$ | | $E_{11}$ | |
| $E_6$ | | $E_{12}$ | |
| $\sum_{i=4}^{6} E_i$ | $\Sigma$ | $\sum_{i=10}^{12} E_i$ | $\Sigma$ |

Observe that the data is organized by quarters for easy reference. Quarterly totals are also printed. If a printer is not available, the user should note that each of these values is displayed for approximately 2 seconds in the above order.

4. Note that at this point, Step 12 may be repeated to enter successive elements of a row. However, if too many entries are made the data will "spill over" into the next row.
5. The resulting row (row C) is where the new row is to be stored.
6. The sequence of operation is $R_A \square R_B = R_C$ or $K \square R_B = R_C$ (the $\square$ represents the selected operation). Note that if you want to subtract $R_B$ from K, you select [SBR] [ − ]; however, if you want to subtract K from $R_B$ you must enter −K and select [SBR] [ + ]. Similarly, to divide $R_B$ by K, enter 1/K and select [SBR] [ × ].
7. In most cases $C_{13}$ is simply the sum of elements 1−12. However, if the operation selected is $R_A \div R_B = R_C$, then $C_{13}$ becomes the 13th element of $R_A$ divided by the 13th element of $R_B$. If the operation is $K \div R_B = R_C$, $C_{13}$ becomes the harmonic mean of the first 12 elements of the row ($12K \div \Sigma R$).
8. If the row is shifted left, the data is stored in the next available location. If it is shifted right, new data is stored from the front. A flashing display indicates an attempt to store data when the row is filled.

# BREAKEVEN ANALYSIS

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 06 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Input In Any Order: | | | |
| | a. Variable Cost ($/unit) | VAR CST | [ A ] | VAR CST |
| | b. Cost Learning Rate (%)[1] | LEARN | [ B ] | 100 + LEARN |
| | c. Fixed Cost ($) | FIX CST | [ C ] | FIX CST |
| | d. Unit Price ($/unit) | U PRICE | [ D ] | U PRICE |
| | e. Price Erosion Rate (%)[1] | EROSION | [ E ] | 100 + EROSION |
| | f. Command as Follows: | COMMAND | [2nd] [ D′ ] | COMMAND |
| | 1–Find number of units to generate specified GPM. | | | |
| | 2–Find GPM from sale of specified number of units. | | | |
| | 3–Find total cost to produce specified number of units. | | | |
| | 4–Find total revenue from selling specified number of units. | | | |
| | 5–Find units for maximum GPM | | | |
| | g. Enter GPM% if Command is 1 Enter units if command is 2, 3, or 4. Not required if command is 5. | UNIT/GPM | [2nd] [ E′ ] | UNIT/GPM |
| 4 | Start Calculation | | [2nd] [ C′ ] | RESULT |

NOTES:

1. Constant percentage change in unit cost (price) for learning curve or erosion effect.
2. All dollar amounts are displayed to the nearest cent.
3. All unit outputs are displayed to the nearest unit.
4. All percentage outputs are displayed to the nearest hundredth of a percentage point.
5. Error indications (flashing display):
   a. No maximum GPM.
   b. GPM specified greater than maximum.
   c. GPM specified greater than or equal to 100%.
   d. Learning or Erosion Rate $\leq -50\%$.
6. Taxes are ignored in this program.

# FACILITY CAPACITY

**BD-07**

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 07 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Input In Any Order: | | | |
| | a. Arrivals per time period | $\lambda$[1,2] | [ A ] | $\lambda$ |
| | b. Service rate | $\mu$ | [ B ] | $\mu$ |
| | c. Number of servers, or | C[3] | [ C ] | C |
| | Number of phases | K[4] | [ C ] | K |
| | d. Cost per time period of customer waiting time | CW | [ D ] | CW |
| | e. Cost per time period of facility idle time | CI | [2nd] [ B′ ] | CI |
| | f. Option desired: | OPT | [2nd] [ A′ ] | OPT |
| | −1−Series case<br>0−Parallel case (expon)<br>1−Parallel case (const) | | | |
| 4 | Compute with Printer, or<br>Compute without Printer | | [ E ]<br>[2nd] [ E′ ] | See Library Manual p. 37 |

NOTES:
1. $\lambda < C\mu$ for parallel server case.
2. $\lambda < \mu$ for series server case.
3. $C > 0$
4. $K > 0$

# ECONOMIC REORDERING & PROD. RUNS

**BD-08**

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 08 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Repartition if Necessary[1] | No. Reg./10 | [2nd] [Op] 17 | |
| 4 | Enter Number of Price Breaks[2] | n | [ B ] | 0. |
| 5a | Enter Quantity at $i^{th}$ Price Break[3] | $Q_i$ | [ C ] | 0. |
| 5b | Enter Unit Price at $i^{th}$ Price Break | $CPU_i$ | [R/S] | 0. |
| 5c | Repeat 5a and 5b for n Pairs ($Q_i$, $CPU_i$) | | | |
| 6 | Enter Unit Holding Cost[4] | UHC | [ D ] | UHC |
| 7 | Enter Cost/Order Placed | CPO | [ E ] | CPO |
| 8 | Enter Demand Quantity/Year | DPY | [2nd] [ A′ ] | DPY |
| 9 | Enter Expected Demand During Lead Time | EDDLT | [2nd] [ B′ ] | EDDLT |
| 10 | Enter Std. Dev. of EDDLT | $\sigma$ | [2nd] [ C′ ] | $\sigma$ |
| 11 | Specify Type of Run[5] | CTL | [ A ] | 0. |
| 12 | Enter Data | See Note 5 | [R/S] | Data |
| 13 | Enter Prod. Quantity/Year[6] | P | [2nd] [ D′ ] | P |
| 14 | Enter Stockout Cost[7] | St | [STO] 17 | St |

| | | | | |
|---|---|---|---|---|
| 15 | Enter Probability of Stockout[7] | Pr | [STO] 15 | Pr |
| 16 | Start Computation | | [2nd] [ E′ ] | TAC[8] |
| | | | [R/S] | EOQ or EPQ |
| | | | [R/S] | R |
| | | | [R/S] | E(DDLT > R) |
| | | | [R/S] | Pr |
| | | | [R/S] | St |

NOTES:

1. Each price break requires two data registers beginning with $R_{29}$. The TI-59 will handle up to 15 price breaks with power-up partitioning (479.59). The TI-58 must be repartitioned as follows:

| No. of Price Breaks: | Press: |
|---|---|
| 1–5 | 4 [2nd] [Op] 17 |
| 6–10 | 5 [2nd] [Op] 17 |
| 11–15 | 6 [2nd] [Op] 17 |

2. n must be $\geq 1$ and must be immediately followed by $Q_1$ on input.
3. $Q_1$ must be 0.
4. UHC is a decimal fraction of CPU
5.

| CTL | Type of Run | Data Entered After CTL |
|---|---|---|
| 0 | Calc. TAC | Order or Production Qty. |
| 1 | Calc. EOQ w/known St | St |
| 2 | Calc. EOQ w/known Pr | Pr |
| −1 | Calc. EPQ w/known St | St |
| −2 | Calc. EPQ w/known Pr | Pr |

6. P is always required if CTL is −1 or −2. Required for CTL = 0 if TAC is to be calculated for a given production quantity.

NOTES:

7. Steps 14 and 15 are required only if CTL = 0. Pr or St must be 0, depending on whether TAC is to be calculated with a known cost of stockout or with a known probability of a stockout.
8. Output values are printed if the PC-100A is connected.

**Error Conditions**

1. $n \neq$ number of ($Q_i$, $CPU_i$) pairs
2. Illegal CTL digit
3. $Q_1 \neq 0$
4. For CTL = 0, both Pr and St = 0
5. Calculated Pr $\geq 1$
6. St = 0 for CTL = ±1
7. Pr outside the range 0 to 1 for CTL = ±2
8. DPY $\geq$ P for EPQ run
9. $n < 1$
10. CPU $\leq 0$

# REORDER TIMING

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 09 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Review Period (yrs) | T | [ D ] | T |
| 4 | Specify Type of Run (CTRL) | 0 or 1 | [ A ] | 0. |
| 5a | If CTRL = 0, enter prob. of backorder[1] | Pr | [R/S] | Pr |
| 5b | If CTRL = 1, enter cost of backorder | Cb | [R/S] | Cb |
| 6 | Enter Lead Time (yrs) | t | [ B ] | t |
| 7 | Enter Holding Cost | $C_h$ | [ C ] | $C_h$ |
| 8 | Enter Review Cost | $C_r$ | [R/S] | $C_r$ |
| 9 | Enter Cost to Place an Order | $C_p$ | [R/S] | $C_p$ |
| 10 | Enter Demand Per Year | D | [2nd] [ A′ ] | D |
| 11 | Enter Demand During Lead Time | $\mu$ | [2nd] [ B′ ] | $\mu$ |
| 12 | Enter Std. Dev. of Demand During Lead Time | $\sigma$ | [2nd] [ C′ ] | $\sigma$ |
| 13 | Enter Unit Price of Item | P | [2nd] [ D′ ] | P |
| 14a | Compute (without printer) | | [2nd] [ E′ ] | TC[2] |
| 14b | Compute (with printer) | | [ E ] | TC<br>R<br>T<br>Pr<br>Cb<br>Eb<br>SS<br>ERC<br>EPC<br>EHC<br>EBC |

NOTES:
1. $0 < Pr < 1$
2. Press [R/S] to obtain subsequent output values without printer.

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| | **INITIALIZE FUNCTION** | | | |
| 1 | Select Program | | [2nd] [Pgm] 10 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Level Constant | $\alpha_F$ | [ A ] | $\alpha_F$ |
| 4 | Enter Trend Constant[1] | $\alpha_T$ | [R/S] | $\alpha_T$ |
| 5 | Enter Seasonal Constant[1] | $\alpha_S$ | [R/S] | $\alpha_S$ |
| 6 | Enter number of time periods of historical data[6] | t | [ C ] | 0. |
| 7 | Enter Historical Data | $D_i$ | [R/S] | 0. |
| | Repeat until t values have been entered. | | | |
| 8 | Enter T = 0 if t + 1 periods of historical data required[2] | 0 | [2nd] [ C′ ] | 0. |
| 9 | Enter data for period (t + 1) | $D_{t+1}$ | [R/S] | $D_{t+1}$ |
| 10 | CTRL = −1 for Initialize | 1 | [+/−] [2nd] [ D′ ] | −1. |
| 11 | Compute[3,4] | | [ E ] | $T_t^*$<br>$F_t^*$<br>$S_i$; i = 1, M* |
| | **REVISE FUNCTION** | | | |
| 1 | Select Program | | [2nd] [Pgm] 10 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Level Constant[8] | $\alpha_F$ | [ A ] | $\alpha_F$ |
| 4 | Enter Trend Constant | $\alpha_T$ | [R/S] | $\alpha_T$ |
| 5 | Enter Seasonal Constant | $\alpha_S$ | [R/S] | $\alpha_S$ |
| 6 | Enter number of time periods of seasonal periodicity[5] | M | [ B ] | 0. |
| 7 | Enter seasonal coefficient[5] | $S_i$ | [R/S] | 0. |
| | Repeat Step 7 until M values have been entered | | | |
| 8 | Enter Level Coefficient | $F_t$ | [2nd] [ A′ ] | $F_t$ |
| 9 | Enter Trend Coefficient | $T_t$ | [R/S] | $T_t$ |
| 10 | Enter time period of new actual demand value | $\tau$ | [2nd] [ C′ ] | 0. |
| 11 | Enter new actual value | $D_\tau$ | [R/S] | $D_\tau$ |
| 12 | Set CTRL = 1 for Revise | 1 | [2nd] [ D′ ] | 1. |
| 13 | Compute[3,4] | | [ E ] | $F_\tau^*$<br>$T_\tau^*$<br>$S_\tau^*$ |

| | FORECAST FUNCTION | | | |
|---|---|---|---|---|
| | Steps 1 through 9 same as REVISE | | | |
| 10 | Enter time period of latest actual data | $\tau$ | [2nd] [ C′ ] | 0. |
| 11 | Enter number of time periods to be forecasted[7] | Limit | [ D ] | Limit |
| 12 | Set CTRL = 0 for Forecast | 0 | [2nd] [ D′ ] | 0. |
| 13 | Compute[3] | | [ E ] | $i^*$ $DF_{t,\,t+1}{}^*$ (i = 1, limit) |

**NOTES:**

1. If no trend and/or seasonal components in data, $\alpha_T$ and/or $\alpha_S = 0$.
2. t + 1 periods of historical data are required if data contains *both* trend and seasonal components.
3. Key [ E ] is used in conjunction with PC-100A. [2nd] [ E′ ] should be used in the absence of a PC-100A.
4. With the TI-59: $\alpha_F$, $\alpha_T$, $\alpha_S$, M, $S_i$ (i = 1, M), $F_t$, and $T_t$ may be stored on a magnetic card by pressing [2nd] [Fix] 9, 3 [2nd] [Write], insert card in slot.
5. M and $S_i$ required only if $\alpha_S \neq 0$.
6. t must equal M (seasonal periodicity) if $\alpha_S \neq 0$.
7. Limit must be $\geq 1$.
8. For the TI-59, Steps 3 through 9 may be replaced by: [2nd] [ B′], insert data card in slot.

* Printed on PC-100A.

# ASSEMBLY LINE BALANCING

| STEP | PROCEDURE | ENTER | PRESS | DISPLAY |
|---|---|---|---|---|
| 1 | Select Program | | [2nd] [Pgm] 11 | |
| 2 | Initialize | | [SBR] [CLR] | 0. |
| 3 | Enter Number of Tasks | No. Tasks | [ A ] | No. Tasks |
| 4 | Enter Task Time of Task i[1] (in XXX.X format) | Task Time | [ B ] | Task Time |
| 5 | Enter Task Number of Each Follower of Task i (Repeat as Needed) | Follower No. | [ C ] | Follower No. |
| 6 | Repeat Steps 4 and 5 for each Task | | | |
| 7 | After all Entries are made | | [ D ] | 0. |
| 8a | Enter Cycle Time (with printer) | Cycle Time[2] | [ E ] | See Note 3 |
| 8b | Enter Cycle Time (without printer) | Cycle Time[2] | [2nd] [ E' ] | See Note 4 |

NOTES:

1. The format of the task time is restricted to 4 digits, 3 to the left of the decimal and 1 to the right. Tasks must be entered in numerical sequence starting with Task No. 1.
2. The cycle time must be greater than or equal to the largest task time. If the cycle time is too small, the largest task time is flashed in the display.
3. The cycle time is printed upon entry. Then the number of each work station is printed followed by the numbers of the tasks assigned and the idle time at the station. When all tasks have been assigned, 0. is displayed following the last idle time.
4. Without the printer, [R/S] must be pressed between each output. Work station numbers are displayed as negative numbers. The numbers of the tasks assigned to the station are then displayed one at a time. Finally the idle time is flashed in the display. When all tasks have been assigned, 0. is displayed following the last idle time.