THE HP-19B POCKET BOOK

I%: 16.0  NPV: -3,355.61

1,275 1,275

2,135 2,135 2,135

125

-7,000

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Introduction

The HP-19B Pocket Book uses a standard convention for describing keystroke procedures. There are three classes of keystrokes:

[EXIT] Primary keys are in a box
[MAIN] Shifted keys begin with
[FIN] Menu keys have a shaded box

The display is represented as follows:

```
31.95
1,294.50
0.00

FIN | BUS | SUM | TIME | SOLVE | TEXT
```

The top line is called line 1, the next line down as line 2, and the third line is line 3, or the calculator line, where calculations may be performed.

Lines 1 and 2 often show the results of previous calculations, and thus are called the history stack.

The bottom line contains menu key definitions: each box defines the action of the key just below it. A menu key can be either a menu selection or a menu variable.

Press [CLEAR] to clear the calculator line. Press [CLEAR DATA] to clear the history stack and menu variables.
The Calculator Line

The calculator line is used for arithmetic:

**Keys:**

<table>
<thead>
<tr>
<th>Keys</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEAR DATA</td>
<td>0.00</td>
</tr>
<tr>
<td>247 × 3</td>
<td>741.00</td>
</tr>
<tr>
<td>55 ÷ 6</td>
<td>9.17</td>
</tr>
</tbody>
</table>

A *chain calculation* uses the previous result:

**Keys:**

<table>
<thead>
<tr>
<th>Keys</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 4</td>
<td>9.17+4</td>
</tr>
<tr>
<td>=</td>
<td>13.17</td>
</tr>
</tbody>
</table>

The previous answer (in line 2) may be used in a chain calculation by pressing **LAST**:

**Keys:**

<table>
<thead>
<tr>
<th>Keys</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ LAST</td>
<td>13.17+741.00</td>
</tr>
<tr>
<td>=</td>
<td>754.17</td>
</tr>
</tbody>
</table>

To begin a chain calculation with a number on the history stack, press ↓ or ↑ until the number you want is on line 3.

**Keys:**

<table>
<thead>
<tr>
<th>Keys</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ + 83</td>
<td>741.00+83</td>
</tr>
<tr>
<td>=</td>
<td>824.00</td>
</tr>
</tbody>
</table>
Calculating With Menus

All menu functions behave on the same principle – enter what you know, then ask for what you don’t know. For a simple example, suppose you want to know the percentage difference between 36 and 45. Press [MAIN] BUS %CHG to start the %CHG menu.

When you’re starting a new problem, you may wish to clear the history stack and the menu variables by pressing [CLEAR DATA]. Now you’re ready to enter the numbers you know.

Enter the known numbers by typing the number and pressing the appropriate menu key. In this example, you know the OLD and NEW values, 36 and 45, so key in 36 OLD, then 45 NEW.

To solve for the number you don’t know, just press its menu key. To calculate the percent change, press %CH.

The history stack (but not the calculator line) is cleared when you change menus.
Storage Registers

Storage registers 0 through 9 may be used to store and recall numbers. To store the rightmost number on the calculator line, press [STO] followed by any number from 0 through 9. To recall the number, press [RCL], then the register number.

Numbers can be stored or recalled during a chain calculation. Pressing 8 [+] 1 [STO] 2 [=] stores 1 in register 2 and displays the answer 9.00 in the calculator line. Pressing 5 [+] [RCL] 2 [=] adds 5 plus the contents of register 2 and displays the answer 6.00 in the calculator line.

You can do arithmetic on numbers in registers by pressing [STO] followed by a math operator:

<table>
<thead>
<tr>
<th>Keys</th>
<th>New Contents of Register n:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[STO] + n</td>
<td>Old number + displayed number</td>
</tr>
<tr>
<td>[STO] − n</td>
<td>Old number − displayed number</td>
</tr>
<tr>
<td>[STO] × n</td>
<td>Old number x displayed number</td>
</tr>
<tr>
<td>[STO] ÷ n</td>
<td>Old number ÷ displayed number</td>
</tr>
<tr>
<td>[STO] ^ n</td>
<td>Old number ^ displayed number</td>
</tr>
</tbody>
</table>

The [STO] and [RCL] functions also work with menu variables. [RCL] [NEW] recalls the contents of the variable NEW, and [STO] + [OLD] adds the displayed number to the variable OLD.
Modes

The Modes Menu

The MODES menu (\[M O D E S\]) controls most calculator modes and contains the language menu:

- **SELECT MODE**
- **BEEPER:** ON
- **PRINTER:** NO AC ADAPTER
- **D/R** BEEP PRNTR INTL

- **D/R** Switches between Degrees and Radians modes (Radians modes shows \(2\pi\) in the display)
- **BEEP** Switches between three choices: ON, APPTS ONLY, and OFF
- **PRNTR** Switches print speeds (faster when printer is connected to AC adapter)
- **INTL** Selects the language menu

Pressing **EXIT** returns you to the previous menu.

Finance and Date Modes

The Begin and End modes are selected in the **MAIN** \[F I N\] \[T V M\] \[O T H E R\] menu by pressing either **BEG** or **END**.

The date and clock modes are selected in the **MAIN** **TIME** **SET** menu. Press **M/D** to switch between MM.DDYYYY and DD.MMYYYY modes. Press **12/24** to switch between 12- and 24-hour clock modes.
Printing

The HP-19B can produce printed output on an HP 82240 printer. Depending on the calculator state, pressing \[\text{PRNT}\] prints the following:

- The rightmost number in line 3
- All of line 3 when entering a message
- The current equation in the SOLVE menu
- A graphics display

The \[\text{PRINTER}\] menu ( [\text{PRINTER}] ) contains these entries:

- DISPL: Prints the first three display lines
- LIST: Prints the current menu variables
- REGS: Prints registers 0 through 9
- TIME: Prints the current date and time
- TRACE: Toggles the Trace mode

To print the entire display, hold down \[\text{ON}\], press \[\text{PRNT}\], and release them together. To print an amortization schedule, see \textit{Amortization}. To print a histogram (or plot), press \[\text{PRNT}\] while the graph is displayed.

If the printer is connected to an AC adapter, the \[\text{PRNTR}\] key in the MODES menu may be used to speed up printing.
Percentage Calculations

Use % to add or subtract percentages:

Keys: 
35 \(+\) 8 % 
= 
\(-\) 20 % 
= 

Display: 
35.00+2.80 
37.80 
37.80-7.56 
30.24 

To calculate 65% of 124, use \(|\times|\):

Keys: 
124 \(|\times|\) 65 % 
= 

Display: 
124.00\times0.65 
80.60 

The BUS menu contains percentage menus:

<table>
<thead>
<tr>
<th>SELECT A MENU</th>
</tr>
</thead>
<tbody>
<tr>
<td>80.60</td>
</tr>
<tr>
<td>%CHG</td>
</tr>
</tbody>
</table>

%CHG  Percent change using old and new values
%TOTL  Percent of total using total and part values
MU%C  Markup as a percentage of cost using cost and price values
MU%P  Markup as a percentage of price using cost and price values (sometimes referred to as margin on sales)
Suppose you want to know the markup as a percentage of price for a product with a cost of $21.65 and a selling price of $44.95. Press [MAIN] [BUS] [MU%P] to start the MU%P menu, and [CLEAR DATA] to clear the menu variables:

### Keys:  
- 21.65 [COST]  
- 44.95 [PRICE]  
- [MU%P]

### Display:  
- COST=21.65  
- PRICE=44.95  
- MARKUP%P=51.84  

To find the minimum price be to achieve a markup of 60%, press 60 [MU%P] [PRICE]:

- COST=21.65  
- MARKUP%P=60.00  
- PRICE=54.13

The variables COST and PRICE are shared between percentage menus. Continuing from the previous example, find the markup as a percent of cost by pressing [EXIT] [MU%C] [M%C]:

- MARKUP%C=150.00
Time-Value-of-Money (TVM) calculations use a sign convention: money received is shown with a positive number, money paid out is shown with a negative number. In cash flow diagrams, money received shows an arrow pointing up, while money paid out shows an arrow pointing down.

The following diagrams illustrate several common cash flow problems:

48-Month Automobile Loan

Loan With Balloon Payment
Loan From Lender’s Point of View

Lease Payments at Beginning of Each Period

Deposits Into Account at End of Each Period Including an Initial Deposit
The Time-Value-of-Money (TVM) menu is used for compound interest calculations where identical payments occur over regular periods which coincide with the compounding periods. In TVM calculations, money received is displayed as a positive number; money paid out is displayed as a negative number (see also Cash Flow Diagrams).

The TVM menu entries store or calculate the following:

- **N**: Number of periods \( N \)
- **I\%YR**: Annual interest \( I\%YR \) as a percentage
- **PV**: Present value
- **PMT**: Payment amount
- **FV**: Future value
- **P/YR**: Stores the number of payments per year
- **BEG**: Sets Begin mode: payments at the start of each period
- **END**: Sets End mode: payments at the end of each period
- **AMRT**: Displays the amortization menu
To begin a new TVM problem, press \[ \text{CLEAR DATA} \]. Set the number of payments per year and Begin or End mode as needed. To change the number of payments per year, key in the new value and press \( P/Y \). Select the payment mode by pressing \( BEG \) or \( END \).

To solve TVM problems, enter the values you know and solve for the unknown by pressing the appropriate key.

**Auto Loan Example**
The new 1989 Grande Chrome Deluxe sells for $26,780. The buyer has $8500 down. Calculate the payments on a 13% annual interest, four-year loan, starting in the TVM menu:

<table>
<thead>
<tr>
<th>Keys:</th>
<th>Display:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \text{CLEAR DATA} ] [ \text{EXIT} ] ( 4 \times 12 ) ( 13 % YR ) ( 26780 ) ( 8500 ) ( PV ) ( PMT )</td>
<td>( 12 \text{ PMTS/YR: END MODE} ) ( N=48.00 ) ( I% YR=13.00 ) ( 26,780.00-8,500 ) ( PV=18,280.00 ) ( PMT=-490.41 )</td>
</tr>
</tbody>
</table>

**Loan Amount From Payment**
The monthly payment in the previous example is $490.41. Suppose the purchaser wants a $475 payment. To calculate the new loan amount, enter
the desired payment (remember the sign convention) into \[ P_{MT} \], and press \[ P_{V} \]:

**Keys:**

475 +/-  
\[ P_{MT} \]  
\[ P_{V} \]  

**Display:**

\[ -475.88 \]  
\[ P_{MT}=-475.00 \]  
\[ P_{V}=17,705.72 \]

The amount that can be borrowed is $17,705.72, so adding back the down payment ($8,500) shows that the seller would have to reduce the price to $26,205.72.

### Auto Lease Example

Calculate the minimum payment on a four-year lease for a car valued at $21,650, using 13% annual interest and a residual value expected to be $12,250. To solve the problem, set Begin mode, enter the purchase option in FV, and solve for the payment:

**Keys:**

[CLEAR DATA]  
OTHER BEG  
EXIT  
48 \[ N \]  
21650 \[ PV \]  
13 \[ I_{%YR} \]  
12250 +/-  
\[ F_{V} \]  
\[ P_{MT} \]  

**Display:**

12 PMTS/yr: BEGIN MODE  
\[ N=48.00 \]  
\[ P_{V}=21,650.00 \]  
\[ I_{%YR}=13.00 \]  
\[ -12,250.00 \]  
\[ F_{V}=-12,250.00 \]  
\[ P_{MT}=-380.76 \]
Savings Example
Open an account that pays 7.5% annual interest compounded monthly with an initial investment of $3500. Calculate the future value of the account five years from now if no other deposits are made, or if monthly deposits of $25 are made:

Keys:

Display:

Balloon Payments
Calculate the monthly payment on a 20-year loan of $136,000 at 11.25%, then the balance due after 10 years, using the TVM menu:

Keys:

Display:
Fund With Regular Withdrawals

To finance a college education, you project withdrawals at the start of each quarter of $1,950 for four years. If the fund earns 8% compounded monthly and will be entirely depleted at the end of the four years, what should the initial balance be?

First convert the interest rate:

Keys:       Display:
BMMAN       P=12.00
FIN ICONV
PER 12 P
8 NOM%  NOM%=8.00
EFF%     EFF%=8.30
4 P       P=4.00
NOM%      NOM%=8.05

Now use the adjusted rate to compute the initial balance (PV) of the fund:

Keys:       Display:
EXIT EXIT
TVM       12 PMTS/yr: END MODE
STO I%YR
I%YR=8.05
OTHER
4 P/yr
BEG EXIT
4 PMTS/yr: BEGIN MODE
N=16.00
1950 +/- PMT
PMT=-1,950.00
0 FY
FV=0.00
PV=26,981.03
Amortization

An amortization schedule may be calculated after a loan is specified in the TVM menu by pressing \text{OTHER}, then \text{AMRT}.

\begin{center}
\begin{tabular}{|c|c|c|c|c|}
\hline
\text{KEY IN \#PAYMENTS TO AMORTIZE; PRESS (#P)} \\
\hline
0.00 \\
\hline
\#P & INT & PRIN & BAL & NEXT \text{ TABLE} \\
\hline
\end{tabular}
\end{center}

The AMRT menu keys offer the following options:

- \text{\#P} \quad \text{Stores the number of periods to amortize and calculates the amortization schedule}
- \text{INT} \quad \text{Displays the amount of the payments applied toward interest}
- \text{PRIN} \quad \text{Displays the amount of the payments applied toward principal}
- \text{BAL} \quad \text{Displays the loan balance}
- \text{NEXT} \quad \text{Amortizes the next set of \#P payments}
- \text{TABLE} \quad \text{Prints an amortization table}

\textbf{Amortization Example}

A four-year home equity loan of $15,000 at 11\% annual interest has a monthly payment of $387.68. Starting in the TVM menu, calculate the interest and principal payment contributions for the first two years:
Printing An Amortization Table

To print an amortization table on an HP 82240 printer, prepare the loan values in the TVM menu, press OTHER AMRT. Enter the number of periods per table entry into #P, and press TABLE. Finally, key in the number of the last payment to print and press START.

For example, print an amortization table for the first two years of the previous example:
Keys:

- [MAIN]
- FIN  TVM
- CLEAR DATA
- OTHER
- CLEAR DATA
- EXIT

Display:

N=48.00
I%YR=11.00
PV=15,000.00
PMT=-387.68

12 PMTS/yr: END MODE

PAYMENTS: 1-12
BALANCE=11,841.76
INTEREST=-1,493.92

KEY IN LAST PMT TO PRINT; PRESS (START)

P/YR=
12.00

8,318.05
Interest Rate Conversions

The ICONV menu ( MAIN FIN ICONV ) converts between nominal and effective interest rates. Press PER to select periodic compounding, or CONT for continuous compounding. These are the menu selections:

- NOM% Stores or calculates the nominal rate
- EFF% Stores or calculates the effective rate
- F Stores the no. of compounding periods

The variables NOM% and EFF% are shared between the two conversion menus. To convert between nominal and effective interest rates, store the number of compounding periods in F (periodic only), key in the interest rate you know, and solve for the other. For example:

Convert 7.25% annual interest, compounded continuously to the equivalent rate compounded quarterly, starting from the ICONV menu:

**Keys:**
- CONT 7.25 NOM%
- EFF%
- EXIT
- PER 4 F
- NOM%

**Display:**
- NOM%=7.25
- EFF%=7.52
- P=4.00
- NOM%=7.32

To use this calculated interest rate in TVM, press EXIT EXIT TVM STO I%YR.
Uneven Cash Flows

The CFLO menu (MAIN FIN CFLO) operates on a cash flow list, which consists of an initial cash flow followed by a series of grouped cash flows. Cash flows obey the TVM sign convention: positive numbers show money received, negative numbers show money paid out.

The CFLO menu contains these entries:

- **CALC**: Menu for TOTAL, IRR%, NPV, NUS, NFV
- **INSRT**: Inserts a cash flow group into the list
- **DELET**: Deletes a cash flow group from the list
- **NAME**: Names the current list
- **GET**: Changes to a new or existing list
- **PLOT**: Plots graph of NPV vs. I%

To begin a new list, press **GET** *NEW*. (You may need to clear or name the current list; press **CLEAR DATA**, or press **NAME**, type a name, and press **INPUT**.)

```
INITIAL FLOW
>INIT=0.00
CALC INSRT DELET NAME GET PLOT
```

Enter the initial cash flow by keying in the value (use +/- if needed) and pressing **INPUT**.
Each cash flow group consists of the value and number of consecutive occurrences:

```plaintext
FLOW(1) =
#TIMES =
0.00
```

Enter or change the value pointed to by ▶ by keying in the new value and pressing [INPUT]. Press ↑ or ↓ to move between cash flows, and ▶↑ or ▶↓ to move to the top or bottom of the list.

Insert a new cash flow group by pressing INSRT when positioned at the group below the desired new flow. Delete a group by pressing DELET. Press RCL INPUT to recall a flow to the calculator line.

Uneven Cash Flow Example

In this example the initial flow of $7,000 is paid out, followed by three groups of cash flow receipts: 2 at $1,275, 3 at $2,135, and 1 at $125:

```
1,275 1,275
2,135 2,135 2,135
125
```

Starting at the CFLO menu, enter this series of cash flows as follows:
Keys:

Display:

GET *NEW  
7000 +/-  
INPUT  
1275 INPUT  
2 INPUT  
2135 INPUT  
3 INPUT  
125 INPUT  

Calculate the sum of the series, the IRR%, then NPV, NUS, and NFV at 7%:

Keys:  

Display:

CALC TOTAL  
IRR%  
7 I%  
NPV  
NUS  
NFV  

TOTAL=2,080.00  
IRR%=8.34  
I%=7.00  
NPV=282.32  
NUS=59.23  
NFV=423.68  

To plot NPV versus I%, press PLOT from the CFLO menu (press EXIT PLOT after the previous example):

Press the arrow keys to move the cursor, PRNT to print the graph, and EXIT to return to the CFLO menu. The horizontal axis is always I% = -18% to 50%. The vertical axis is scaled automatically.
The BOND menu (MAIN FIN BOND) performs the following bond calculations:

- The price of a bond
- The yield to maturity of a bond
- The yield to call on a coupon date
- Accrued interest

Values are expressed per $100 face value or as a percentage.

Upon entering the menu, the display shows the current bond type:

```
30/360 SEMIANNUAL
0.00
```

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SETT</th>
<th>MAT</th>
<th>CPN%</th>
<th>CALL</th>
<th>YLD%</th>
<th>PRICE</th>
<th>ACCRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displays the bond type menu</td>
<td>Stores the settlement date</td>
<td>Stores the maturity date</td>
<td>Stores the annual coupon rate</td>
<td>Stores the call price per $100 face value</td>
<td>Stores or calculates the yield to maturity</td>
<td>Stores or calculates the price (per $100)</td>
<td>Calculates accrued interest (per $100)</td>
</tr>
</tbody>
</table>
Press [CLEAR DATA] to clear the bond variables and set CALL=100. (Bonds held to maturity must have a call value of 100.)

Press TYPE to specify the bond type: 30/360 or actual/actual calendar, semi- or annual payments:

- 360  Sets the calendar to a 360 day year
- A/A  Sets the calendar to the actual basis
- SEMI Sets semi-annual coupon payments
- ANN  Sets annual coupon payments
- EXIT Returns to the BOND menu

Key in the purchase date in the current format (MM/DD/YYYY or DD/MM/YYYY - see Modes) and press SETT. Key in the maturity (or call) date and press MAT.

Key in the coupon rate as a percentage and press CPN%.

Press MORE to perform price/yield and accrued interest calculations.

To calculate price, key in the yield and press YLD%, then press PRICE. To calculate yield, key in the price and press PRICE, then press YLD%.

Calculate accrued interest by pressing ACCRU. Add price and accrued interest to calculate the total amount owed the seller.
Bond Yield Example

Calculate the yield of a 73/4% bond purchased 8/10/1987 maturing on 5/1/2002 if the quote is 881/4. Assume semi-annual payments and a 30/360 calendar.

Keys: 

Display:

Now add accrued interest to the price:

Keys: 

Display:
The following is a partial list of bonds that can be solved with the BOND menu:

**30/360 Bonds, Semi-Annual Coupon Payments**
- State/Municipal/Local Government
  - Zero-coupon bonds
  - Tax supported bonds
  - Revenue, assessment, or special supported bonds
- Corporate bonds
- Certificates of deposit with periodic interest
- Inter-American Development Bank bonds
- World Bank Bonds
- Federal agency instruments
  - Commodity Credit Corporation (CCC) bonds
  - Export-Import Bank (Ex-Im) participation certificates
  - Federal Home Loan Bank (FHLB) bonds and notes
  - FICB debentures if coupon interest is paid periodically
  - Federal Land Bank (FLB) bonds
  - FNMA debentures
  - GNMA bonds and participation certificates
  - New Communities Act debentures
  - U.S. Postal Service bonds
  - Tennessee Valley Authority (TVA) bonds
  - Merchant Marine bonds

**Actual/Actual, Semi-Annual Coupon Payments**
- U.S. Treasury Bonds and Notes
- Federal agency instruments
  - Farmers Home Administration (FHDA) insured notes
  - Federal Housing Administration (FHA) debentures

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Depreciation

The DEPRC menu (MAIN FIN DEPRC) calculates depreciation and remaining depreciable value (RDV) using cost, salvage, and life values. The following methods are available:

- Declining balance (DB)
- Sum-of-the-years’-digits (SOYD)
- Straight line (SL)
- Accelerated Cost Recovery System (ACRS)

<table>
<thead>
<tr>
<th>BASIS</th>
<th>SALV</th>
<th>LIFE</th>
<th>ACRS%</th>
<th>ACRS</th>
<th>MORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stores the depreciable-cost basis</td>
<td>Stores the salvage value</td>
<td>Stores the useful life of the asset</td>
<td>Stores the ACRS percentage</td>
<td>Calculates ACRS based on BASIS and ACRS%</td>
<td></td>
</tr>
</tbody>
</table>

For DB: stores the DB factor as % of SL

Calculates DB and RDV

Calculates SOYD and RDV

Calculates SL and RDV
Asset Description
The asset description is stored in the menu variables BASIS, SALV, and LIFE. For example, enter a $8500 machine to be depreciated over 5 years with a salvage value of $350:

Keys: Display:

1 [MAIN] 0.00
FIN DEPRC
CLEAR DATA BASIS=8,500.00
8500 BASIS SALV=350.00
350 SALV LIFE=5.00
5 LIFE

DB, SOYD, and SL Depreciation
Enter the BASIS, LIFE, and SALV values as shown above, then press MORE to show the depreciation methods. Calculate the depreciation and RDV using the double-declining balance method (DB with FACT% = 200) for two years:

Keys: Display:

1 YR# 1.00
200 FACT% FACT%=200.00
DB RDV=4,750.00
DB=3,400.00
2 YR# 2.00
DB RDV=2,710.00
DB=2,040.00
Now calculate the depreciation for the 2nd year using SOYD:

Keys: Display:
SOYD

RDY=3,260.00
DB=2,173.33

ACRS Deductions
ACRS deductions are based on BASIS and ACRS%. Enter the cost basis, then the ACRS percentage from IRS tables (use 15% and 20% in this example) and calculate the deduction as follows:

Keys: Display:
8500 BASIS BASISR=8,500.00
15 ACRS% ACRS=1,275.00
20 ACRS% ACRS=1,700.00

BASISR=8,500.00
ACRSh=20.00
ACRS=1,700.00
BASISR SAVL LIFE ACRS% ACRS MORE
Lists and Statistics

The SUM menu (MAIN SUM) manages lists of numbers and calculates totals and statistics:

- **CALC**: Menu for statistics and graphics
- **INSRT**: Inserts a number into the list
- **DELET**: Deletes a number from the list
- **NAME**: Names the current list
- **GET**: Changes to a new or existing list
- **COPY**: Copies the list to another list
- **LABEL**: Labels entries in the list
- **START**: Marks the start of the subtotal range
- **SUBT**: Calculates the subtotal from start

To begin a new list, press **GET *NEW**. (You may need to clear or name the current list: press **CLEAR DATA**, or press **NAME**, type a name, and press **INPUT**.)

```
$ITEM(1)=
TOTAL=0.00
```

Enter or change the value pointed to by $ by keying in the new value and pressing **INPUT**.

Press $ or $ to move between values, and $ or $ to move to the top or bottom of the list.
Inserting & Deleting Values
To insert a new value, press \texttt{INSRT} when positioned at the value below the desired new value. Press \texttt{DELET} to delete the current value.

Labeling Values
To label values, press \texttt{LABEL}, type the label, then press \texttt{CURR} to label the current value or \texttt{GLOBL} to label all the values in the list.

Copying Values
To copy a value into the calculator line, press \texttt{RCL INPUT}. To make a copy of the current list, press \texttt{COPY} and enter the name of the new list.

Calculating Subtotals
To calculate a subtotal, move to the start of the desired subtotal range, press \texttt{START}, move to the last element of the range and press \texttt{SUBT}.

Clearing Labels or Numbers
Press \texttt{CLEAR DATA OTHER LABEL} to clear all the labels. Press \texttt{CLEAR DATA OTHER NUM} to clear just the numbers.

Deleting a List
To delete an entire list from memory, press \texttt{CLEAR DATA YES}.

Lists and Statistics 31
Statistics Calculations

The **CALC** menu calculates the following values using the numbers in the current SUM list:

- **TOTAL**: Sum of the list values
- **MEAN**: Mean of the list values
- **MEDN**: Median of the list
- **STDEV**: Standard deviation
- **RANG**: Difference between MIN and MAX
- **MIN**: Smallest value in the list
- **MAX**: Largest value in the list
- **SORT**: Sorts the list in ascending order
- **FRCST**: The FRCST menu (see Forecasting)
- **HIST**: Draws a histogram (see Histograms)

Starting from the **SUM** menu, try the CALC menu functions on the following data set:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>658</td>
<td>495</td>
<td>531</td>
<td>534</td>
<td>454</td>
</tr>
<tr>
<td>459</td>
<td>670</td>
<td>657</td>
<td>556</td>
<td>623</td>
</tr>
</tbody>
</table>

Enter all the numbers, starting like this:

**Keys:**

- **GET **
- **NEW**
- 658 **INPUT**

**Display:**

- ITEM(1)=
- TOTAL=0.00
- ITEM(1)=658.00
- TOTAL=658.00
... until the last number has been entered. Then calculate the range, mean, and standard deviation:

Keys:  
623 [INPUT]

Display:  
ITEM(10)=623.00  
ITEM(11)=  
TOTAL=5,637.00  
RANGE=216.00  
MEAN=563.70  
STDEV=83.09

Histograms
Continuing from the example above, press [HIST] to draw a 10-cell histogram:

To view a cell's data, press [ ] and [ ] to select the cell, then hold down [INPUT]. Press [PRNT] to print the histogram, and [EXIT] to return to the CALC menu.
Forecasting
The FRCST menu (SUM CALC MORE FRCST) does curve fitting and forecasting with two SUM lists using the following steps:

1. Prepare and name an x-value list.
2. Make the y-values the current list.
3. Press CALC MORE FRCST and press the menu key for the x-value list.
4. Select the model to use:
   - **LIN** Linear: \( y = B + Mx \)
   - **LOG** Logarithmic: \( y = B + M \ln x \)
   - **EXP** Exponential: \( y = Be^{Mx} \)
   - **PWR** Power curve: \( y = Bx^M \)
5. To display the curve fitting results, press CORR, M, or B.
6. To forecast a y-value (or x-value), key in the known value and press XLIST (YLIST) then press YLIST (XLIST) to display the forecast.
7. To plot the data and curve fit, press MORE PLOT. Press ↑ ↓ ← → to move the cursor, PRNT to print the display, or EXIT to return to the FRCST menu.
The FRCST menu keys do the following:

- **XLIST**: Stores or calculates an x-value
- **YLIST**: Stores or calculates a y-value
- **CORR**: Displays the correlation coefficient
- **M**: Displays the model's M value
- **B**: Displays the model's B value
- **PLOT**: Plots the data and curve fit
- **W.MN**: Calculates the weighted mean
- **G.SD**: Calculates grouped standard deviation
- **SIZE**: Displays the size of each list
- **ΣX**: Calculates the sum of the x-values
- **ΣY**: Calculates the sum of the y-values
- **ΣX2**: Calculates the sum of squares of the x-values (\(\Sigma X^2\))
- **ΣY2**: Calculates the sum of squares of the y-values (\(\Sigma Y^2\))
- **ΣXY**: Calculates the sum of products (\(\Sigma XY\))

**Forecasting Example**
Prepare and name two lists, XVAL and YVAL, with the following values:

<table>
<thead>
<tr>
<th>XVAL</th>
<th>3</th>
<th>7</th>
<th>9</th>
<th>13</th>
<th>15</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>YVAL</td>
<td>2</td>
<td>17</td>
<td>26</td>
<td>38</td>
<td>30</td>
<td>46</td>
</tr>
</tbody>
</table>

With the list YVAL current in the **SUM** menu, press **CALC** **MORE** **FRCST**, then **XVAL** to select the XVAL list for the x-values.
Select the linear model by pressing LIN, then display the correlation coefficient, slope (M), and y-intercept (B):

**Keys:**
- CORR
- M
- B

**Display:**
- CORR=0.95
- M=2.55
- B=-1.52

Press MORE PLOT to plot the data and fit:

Now compare the linear fit with a logarithmic fit:

**Keys:**
- EXIT
- LOG
- MORE

**Display:**
- SELECT A MODEL
- CORR=0.96

Notice the difference between the two models. The logarithmic model gives a slightly better correlation coefficient.
The TIME menu ( [MAIN] TIME ) displays the current time and date and the following menu:

03/11/1989  08:49:25 PM
SATURDAY
0.00
CALC  APPT  ADJST  SET

CALC  Menu for date calculations
APPT  Menu for setting and viewing appointments
ADJST  Menu for adjusting the clock setting
SET  Menu for setting the clock

Setting the Time and Date
The SET key displays the following menu:

DATE  Sets the current date
TIME  Sets the current time
A/PM  Switches between AM and PM
M/D  Switches between MM/DD/YYYY and DD/MM/YYYY formats
12/24  Switches between 12 & 24 hour formats
HELP  Displays a help message

To set the time, enter the time in HH.MMSS format and press TIME. Press A/PM to switch between AM and PM in 12 hour clock mode. To set the date, enter the date in MM/DD/YYYY (or DD/MM/YYYY) format and press DATE.
Setting Appointments

To view or set appointments, press **APPT**: 

<table>
<thead>
<tr>
<th>PENDING: 1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAST DUE:</td>
<td>NONE</td>
</tr>
<tr>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

Line 1 of this display shows that appointments 1 and 2 are pending, and line 2 shows that no appointments are past due.

To display an appointment, press one of the six appointment keys:

**THU 05/18/1989 01:30 PM**  
**BOARD MEETING**  
**0.00**

Line 1 shows the appointment time and date. Line 2 shows the related message.

Use the **DATE**, **TIME**, and **A/PM** keys to set the appointment time and date in the same manner as setting the clock. To enter the message, press **MSG**, type the message, and press **INPUT**.

For repeating messages, press **RPT**, enter the interval, and press the appropriate menu key, or press **NONE** for no repetitions.
Acknowledging Appointments
When an appointment arrives, the HP-19B beeps (unless BEEPER OFF mode is set), and the message is displayed in line 1. Press any key to acknowledge the appointment while the HP-19B is beeping. After 20 seconds, the appointment becomes past due, and can be acknowledged by pressing its menu key in the APPT menu. Past due appointments are indicated in the display with the (•) annunciator.

Date Calculations
Date calculations are performed in the TIME menu:

DATE1 Stores or calculates the oldest date
DATE2 Stores or calculates the newest date
DAYS Stores or calculates the actual number of days between DATE1 and DATE2
360D Calculates the difference between DATE1 and DATE2 using the 360 day calendar
365D Calculates the difference between DATE1 and DATE2 using the 365 day calendar (ignores leap years)
TODAY Displays today's date

Press CLEAR DATA to clear DATE1, DATE2, and DAYS.
Date Calculation Examples

Calculate the number of days between May 18, 1989 and June 23, 1995 using the actual calendar and the 360 day calendar (assuming MM.DDYYYY format) from TIME CALC:

Keys: Display:
5.181989 DATE1=05/18/1989 THU
6.231995 DATE2=06/23/1995 FRI
DAYS ACTUAL DAYS=2,227.00
360D 360 DAYS=2,195.00

Calculate the date which is 1000 days after September 2, 1989:

Keys: Display:
9.021989 DATE1=09/02/1989 SAT
1000 DAYS ACTUAL DAYS=1,000.00
DATE2 DATE2=05/29/1992 FRI
The TEXT menu manages lists of text information which may consist of individual entries or records consisting of groups of one or more entries. The lists below illustrate a simple list and a list using records:

<table>
<thead>
<tr>
<th>Price List</th>
<th>Phone List</th>
</tr>
</thead>
<tbody>
<tr>
<td>APC-01: $23.95</td>
<td>ACME MACHINE CO.</td>
</tr>
<tr>
<td>APC-19: $6.95</td>
<td>804-555-3839</td>
</tr>
<tr>
<td>APC-28: $7.95</td>
<td></td>
</tr>
<tr>
<td>JAD-47: $12.75</td>
<td>ARMSTRONG PUBLISHING</td>
</tr>
<tr>
<td>MCD-34: $33.90</td>
<td>503-757-0282</td>
</tr>
<tr>
<td>MHN-01: $94.25</td>
<td></td>
</tr>
<tr>
<td>RJD-01: $55.50</td>
<td>BRIDGE ENGINEERING CO</td>
</tr>
<tr>
<td>SGB-88: $35.50</td>
<td>601-555-7893</td>
</tr>
<tr>
<td>STN-54: $3.50</td>
<td></td>
</tr>
<tr>
<td>SZB-77: $125.60</td>
<td>GIBSON IMPORTED CARS</td>
</tr>
<tr>
<td>RGR-88: $2.50</td>
<td>555-760-5100</td>
</tr>
<tr>
<td>GBM-55: $34.99</td>
<td>ENGLISH SPORTS CARS</td>
</tr>
</tbody>
</table>

The price list contains 11 entries, while the phone list contains 4 records, each of which contains 2 entries, except the last, which contains 3 entries.
The TEXT menu contains the following entries:

- MARK: Adds a record marker after the pointer
- EDIT: Edits an existing entry
- DELET: Deletes the current entry
- NAME: Names the current list
- GET: Changes to a new or existing list
- ↑MORE↓: Moves to the previous record
- ↓MORE↑: Moves to the next record
- FIND: Edits an existing entry
- PREV: Moves to the previous record
- NEXT: Moves to the next record
- SORT: Sorts the list

To begin a new list, press **GET**  *NEW*. (You may need to clear or name the current list: press **CLEAR DATA**, or press **NAME**, type a name, and press **INPUT**.)

```
TYPE A TEXT ENTRY;
PRESS [INPUT]
` MARK EDIT DELET NAME GET MORE
```

Add a new entry after ▶ by keying in the new entry and pressing **INPUT**.

Press ↑ or ↓ to move between values, and ▼↑ or ▼↓ to move to the top or bottom of the list. Press **PREV** or **NEXT** to move between records.
Deleting Entries
Press \texttt{DELET} to delete the entry or record mark pointed to by \texttt{▼}.

Editing an Entry
To edit the entry pointed to by \texttt{▼}, press \texttt{EDIT}, edit the entry (you may use \texttt{INS}, \texttt{DEL}, \texttt{←}, and \texttt{→}), and press \texttt{INPUT}.

Separating Records
Press \texttt{MARK} to place a record mark after the current entry. A record mark may be deleted by pressing \texttt{DELET}.

Finding Information
To find a character string, press \texttt{FIND}, enter the string, and press \texttt{INPUT}, The HP-19B will begin searching below the current entry.

Sorting the List
Press \texttt{SORT \ YES} to sort the list in ascending alphabetical order. Records are sorted based on the first entry.

Deleting a List
To delete an entire list from memory, press \texttt{CLEAR DATA \ YES}.
Equation Solving

The SOLVE menu (MAIN SOLVE) is used for storing equations in an equation list and performing calculations using the equations. This is a sample list:

\[
\begin{align*}
\text{INVOICE: } & INV=QTY\times PRC+TA \\
\text{AREA: } & WIDTH\times LENGTH \\
\text{SELL: } & OLD\times%0VH+MKP \\
\end{align*}
\]

To move between equations, press \( \uparrow \) or \( \downarrow \). Press \( \uparrow \) or \( \downarrow \) to move to the top or bottom of the list.

To enter a new equation, press \( \downarrow \) to move the pointer to the bottom of the equation list, type the equation, and press [INPUT] or [CALC]. An equation may be named by using a leading label followed by a colon (:), such as INVOICE:.

Press [CALC] to display the variable menu for the equation pointed to by \( \uparrow \). Variables may be shared between two or more equations. To edit an equation, press [EDIT], correct the equation, and press [INPUT].

To view a long equation, press [EDIT], use the arrow keys to view the equation, then press [EXIT].

Press [DELET] to delete the current equation and (optionally) its associated variables.
Writing Solver Equations

Solver equations consist of one or more of the following elements:

- **Variables** hold the values that you store or calculate. Variable names can have up to 10 characters with no spaces, cannot contain the characters +, −, x, ÷, (, ), <, >, =, and :, and cannot begin with a number or decimal point.

- **Constants** are numbers: $12,000, 365 days, 7%.
  Constants must be entered without digit separators or other characters: 12000, 365, or 7.

- **Operators** perform arithmetic: +, −, x, ÷, ^.

- **Functions** do calculations: SQ(x), TAN(x).

The Solver uses the following order to control calculations:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Expressions within parentheses</td>
</tr>
<tr>
<td>2</td>
<td>Functions: SQRT(x), USFV(i%:n)</td>
</tr>
<tr>
<td>3</td>
<td>Power (^)</td>
</tr>
<tr>
<td>4</td>
<td>Multiply (x) and divide (÷)</td>
</tr>
<tr>
<td>5</td>
<td>Add (+) and subtract (−)</td>
</tr>
<tr>
<td>6</td>
<td>Relational operators: &gt; &lt; = ≥ ≤ &lt;&gt;</td>
</tr>
<tr>
<td>7</td>
<td>NOT</td>
</tr>
<tr>
<td>8</td>
<td>AND</td>
</tr>
<tr>
<td>9</td>
<td>OR and XOR</td>
</tr>
<tr>
<td>10</td>
<td>=</td>
</tr>
</tbody>
</table>

Equation Solving
Add-On to APR
This example converts between add-on interest rate (RATE) and annual percentage rate (APR).

Enter and use the equation as follows:

Keys: 

Display:

```
k
[MAIN]
SOLVE

ADDON: #MO/(1+(#MO/12)*
(RATE/100))=USPVY(APR/12
:#MO)
CALC EDIT DELETE
```

VERIFYING EQUATION...

```
ADDON: #MO/(1+(#MO/12)*
0.00
#MO RATE APR
```

To use the variable menu, store the known values, then press the menu key for the unknown value. For example, calculate the add-on rate for a 36-month loan with an APR of 13%:

Keys: 

Display:

```
36 #MO
13 APR
RATE

#MO=36.00
APR=13.00
RATE=7.10
```

Press [EXIT] to return to the equation list.
Using the IF Function

The IF function adds test capabilities to the Solver:

\[
\text{IF}(\text{test} : \text{expression-if-true} : \text{expression-if-false})
\]

The test may use one or more of the relational ( > < = ≥ ≤ <> ) or logical ( NOT AND OR XOR ) operators. Tests may be combined—the expression

\[ A > B \text{ AND } C < D \]

means A greater than B and C less than D.

If the test is true, the IF function returns the result of expression-if-true, otherwise the result of expression-if-false is returned.

Suppose a commodity sells for $12 per pound, or $11.50 for purchases over 50 pounds:

\[
\text{PRICE=} \text{IF}(LBS>50:11.5\times LBS; 12\times LBS)
\]

Starting from the equation’s variable menu, calculate the sales price for 50 and 51 pounds:

**Keys:**

\[ \begin{array}{|c|}
\hline
50 \text{ LBS} \\
\hline
\text{PRICE} \\
\hline
51 \text{ LBS} \\
\hline
\end{array} \]

**Display:**

\[ \begin{array}{|c|}
\hline
\text{LBS}=50.00 \\
\hline
\text{PRICE}=600.00 \\
\hline
\text{LBS}=51.00 \\
\hline
\text{PRICE}=586.50 \\
\hline
\end{array} \]
Using the S Function

The S function indicates whether a variable is being solved for, and can be used to combine two equations. To use the S function, rearrange the equations to place 0 on one side, and place them in an IF function:

\[
PAY = HRS \times WAGE + SALES \times 0.05
\]

\[
HRSLS = \frac{SALES}{HRS}
\]

\[
\text{IF}(S(PAY):PAY-HRS \times WAGE - SALES \times 0.05:HRSLS-SALES \div HRS)=0
\]

This equation reads: "If solving for PAY, use the PAY expression, otherwise use the HRSLS expression". The \( = 0 \) at the end is optional.

Suppose a salesperson earns $4.75 per hour and has sales of $11,250 in a 40-hour week. Starting from the equation’s variable menu, calculate the week’s pay (PAY) and average hourly sales (HRSLS):

**Keys:**

40 HRS
4.75 WAGE
11250 SALES
PAY

**Display:**

HRS=40.00
WAGE=4.75
SALES=11,250
PAY=752.50
HRSLS=281.25
## Solver Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS(x)</td>
<td>Absolute value</td>
</tr>
<tr>
<td>ACOS(x)</td>
<td>Arc cosine*</td>
</tr>
<tr>
<td>ACOSH(x)</td>
<td>Hyperbolic arc cosine</td>
</tr>
<tr>
<td>ALOG(x)</td>
<td>Base 10 antilogarithm: $10^x$</td>
</tr>
<tr>
<td>ANGLE(x:y)</td>
<td>$\angle$ polar coordinate for rectangular</td>
</tr>
<tr>
<td></td>
<td>coordinates $(x,y)$*</td>
</tr>
<tr>
<td>ASIN(x)</td>
<td>Arc sine*</td>
</tr>
<tr>
<td>ASINH(x)</td>
<td>Hyperbolic arc sine</td>
</tr>
<tr>
<td>ATAN(x)</td>
<td>Arc tangent*</td>
</tr>
<tr>
<td>ATANH(x)</td>
<td>Hyperbolic arc tangent</td>
</tr>
<tr>
<td>CDATE</td>
<td>Current date†</td>
</tr>
<tr>
<td>COMB(x:y)</td>
<td>Combinations of $x$ items</td>
</tr>
<tr>
<td></td>
<td>taken $y$ at a time</td>
</tr>
<tr>
<td>COS(x)</td>
<td>Cosine*</td>
</tr>
<tr>
<td>COSH(x)</td>
<td>Hyperbolic cosine</td>
</tr>
<tr>
<td>CTIME</td>
<td>Current time in H.MMSS (24-hr format)</td>
</tr>
<tr>
<td>DATE(date:n)</td>
<td>The date $n$ days after $date$</td>
</tr>
<tr>
<td>DDAYS(d1:d1:cal)</td>
<td>Number of days between $d1$† and $d2$†</td>
</tr>
<tr>
<td></td>
<td>cal</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>DEG(x)</td>
<td>Converts $x$ in radians to decimal degrees</td>
</tr>
<tr>
<td>EXP(x)</td>
<td>Natural antilogarithm $e^x$</td>
</tr>
</tbody>
</table>

* Uses the current angle mode – degrees or radians
† Uses the current date format (MM.DDYYYY or DD.MMYYYY)
<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPM1(x)</td>
<td>$e^x - 1$</td>
</tr>
<tr>
<td>FACT(x)</td>
<td>Factorial: $x$ is an integer $\geq 0$</td>
</tr>
<tr>
<td>FLOW(name:x)</td>
<td>Returns the value of FLOW(x) in the CFLO list with the specified name.</td>
</tr>
<tr>
<td>FP(x)</td>
<td>Fractional part</td>
</tr>
<tr>
<td>FV(n:i%yr:pv:pmt:</td>
<td>TVM function for future value</td>
</tr>
<tr>
<td>p/yr:m)</td>
<td></td>
</tr>
<tr>
<td>G(variable)</td>
<td>Returns contents of variable</td>
</tr>
<tr>
<td>HMS(x)</td>
<td>Converts decimal hours (degrees) to H.MMSS (D.MMSS) format</td>
</tr>
<tr>
<td>HRS(x)</td>
<td>Converts $x$ in H.MMSS (D.MMSS) format to decimal</td>
</tr>
<tr>
<td>IDIV(x:y)</td>
<td>Integer part of the quotient of $x \div y$</td>
</tr>
<tr>
<td>IF(con:alg1:alg2)</td>
<td>$con$ is a conditional, $alg1$ and $alg2$ are algebraic expressions</td>
</tr>
<tr>
<td>INT(x)</td>
<td>The greatest integer $\leq x$</td>
</tr>
<tr>
<td>INV(x)</td>
<td>Reciprocal, $1/x$</td>
</tr>
<tr>
<td>IP(x)</td>
<td>Integer part</td>
</tr>
<tr>
<td>ITEM(listname:x)</td>
<td>Returns value of ITEM(x) in the specified SUM list</td>
</tr>
<tr>
<td>I%YR(n:pv:pmt:fv:</td>
<td>TVM function for annual interest</td>
</tr>
<tr>
<td>p/yr:m)</td>
<td></td>
</tr>
<tr>
<td>L(variable:expr)</td>
<td>Assigns expr to variable</td>
</tr>
<tr>
<td>LN(x)</td>
<td>Natural (base e) log</td>
</tr>
<tr>
<td>LNP1(x)</td>
<td>$\ln(1 + x)$</td>
</tr>
<tr>
<td>LOG(x)</td>
<td>Common (base 10) log</td>
</tr>
<tr>
<td>MAX(x:y)</td>
<td>Larger of $x$ and $y$</td>
</tr>
<tr>
<td>MIN(x:y)</td>
<td>Smaller of $x$ and $y$</td>
</tr>
<tr>
<td>MOD(x:y)</td>
<td>The remainder of $x \div y$</td>
</tr>
<tr>
<td></td>
<td>$MOD(x:y) = x - y \times INT(x \div y)$</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>N(i%/yr:pv:pmt:fv:p/yr:m)</td>
<td>TVM function for number of payments</td>
</tr>
<tr>
<td>PERM(x:y)</td>
<td>Permutations of x items taken y at a time</td>
</tr>
<tr>
<td>PI</td>
<td>$\pi : 3.14159265359$</td>
</tr>
<tr>
<td>PMT(n:i%/yr:pv:fv:p/yr:m)</td>
<td>TVM function for payment</td>
</tr>
<tr>
<td>PV(n:i%/yr:pmt:fv:p/yr:m)</td>
<td>TVM function for present value</td>
</tr>
<tr>
<td>RAD(x)</td>
<td>Converts x in decimal degrees to radians</td>
</tr>
<tr>
<td>RADIUS(x:y)</td>
<td>$R$ polar coordinate for $(x,y)$ rectangular coordinates</td>
</tr>
<tr>
<td>RAN#</td>
<td>Pseudo-random number $(0 \leq r &lt; 1)$</td>
</tr>
<tr>
<td>RND(x:y)</td>
<td>x rounded to $</td>
</tr>
<tr>
<td></td>
<td>(when $0 \leq y \leq 11$), or to $y$ significant digits</td>
</tr>
<tr>
<td></td>
<td>(when $-12 \leq y \leq -1$). $y$ must be an integer</td>
</tr>
<tr>
<td>S(var)</td>
<td>Returns 1 if the variable is being solved for -</td>
</tr>
<tr>
<td></td>
<td>used with IF function to create a variable menu. var is a variable</td>
</tr>
<tr>
<td>SGN(x)</td>
<td>Sign of x (+1 if $x &gt; 0$, 0 if $x=0$, -1 if $x &lt; 0$)</td>
</tr>
<tr>
<td>$\Sigma(cv:c1:c2:s:alg)$</td>
<td>Sums values of the algebraic expressing alg for values of the counter variable cv.</td>
</tr>
<tr>
<td></td>
<td>$cv$ increments from $c1$ to $c2$ in steps of $s$</td>
</tr>
<tr>
<td>SIN(x)</td>
<td>Sine*</td>
</tr>
<tr>
<td>SINH(x)</td>
<td>Hyperbolic sine</td>
</tr>
<tr>
<td>SIZEC(name)</td>
<td>The group number of the last flow in the CFLO list with the specified name</td>
</tr>
</tbody>
</table>

* Uses the current angle mode – degrees or radians
<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZES(listname)</td>
<td>Returns the number of items in the specified SUM list</td>
</tr>
<tr>
<td>SPFV(i%:n)</td>
<td>Future value of $1.00: i% is the periodic interest rate, n is the number of compounding periods</td>
</tr>
<tr>
<td>SPPV(i%:n)</td>
<td>Present value of $1.00: i% is the periodic interest rate, n is the number of compounding periods</td>
</tr>
<tr>
<td>SQ(x)</td>
<td>$x^2$</td>
</tr>
<tr>
<td>SQRT(x)</td>
<td>$\sqrt{x}$</td>
</tr>
<tr>
<td>#T(name:x)</td>
<td>Returns #TIMES for FLOW(x) of the CFLO list with the specified name</td>
</tr>
<tr>
<td>TAN(x)</td>
<td>Tangent*</td>
</tr>
<tr>
<td>TANH(x)</td>
<td>Hyperbolic tangent</td>
</tr>
<tr>
<td>TRN(x:y)</td>
<td>x truncated to y decimal places (when $0 \leq y \leq 11$), or to $</td>
</tr>
<tr>
<td>USFV(i%:n)</td>
<td>Future value of a series of $1.00 payments: i% is the periodic interest rate, n is the number of compounding periods</td>
</tr>
<tr>
<td>USPV(i%:n)</td>
<td>Present value of a series of $1.00 payments: i% is the periodic interest rate, n is the number of compounding periods</td>
</tr>
<tr>
<td>XCOORD(R:)</td>
<td>x-coordinate of polar coordinates*</td>
</tr>
<tr>
<td>YCOORD(R:)</td>
<td>y-coordinate of polar coordinates*</td>
</tr>
<tr>
<td>+, -, *^</td>
<td>Arithmetic operators</td>
</tr>
<tr>
<td>&gt;, &lt;=</td>
<td>Relational operators</td>
</tr>
<tr>
<td>AND, OR, XOR, NOT</td>
<td>Logical operators</td>
</tr>
</tbody>
</table>

* Uses the current angle mode – degrees or radians
Math Functions

The math functions are available from almost every menu. Press \[ \text{MATH} \] to display math functions, and \[ \text{EXIT} \] to return to the menu you were previously viewing.

\[
\begin{array}{c|c|c|c|c|c|c|c}
RND & PI & LOGS & TRIG & CONV & PROB
\end{array}
\]

- **RND** rounds to the current display setting
- **PI** returns the number \( \pi \) (3.14159265359)
- **LOGS** displays the logarithmic functions
- **LOGS** **HYP** displays the hyperbolic functions
- **TRIG** displays the trigonometric functions
- **CONV** displays the conversion functions
- **PROB** displays the probability functions

The trigonometric functions interpret angles in degrees or radians, depending on the current mode. Press \[ \text{D/R} \] in the MODES or CONV menu to switch between degrees and radians modes.
Key:

Function:

- **LOG**  10\(^X\)
- **LN**  **EXP**
- **SINH**  **ASINH**
- **COSH**  **ACOSH**
- **TANH**  **ATANH**
- **SIN**  **ASIN**
- **COS**  **ACOS**
- **TAN**  **ATAN**
- **>DEG**  **>RAD**
- **>HR**  **>HMS**
- **XCORD**
- **YCORD**
- **R**
- **\(\angle\)**
- **D/R**
- **X**  **Y**
- **C X,Y**
- **P X,Y**
- **N!**
- **RAN#**

Base 10 log, antilog

Base e log, antilog

Hyperbolic sine, inverse

Hyperbolic cosine, inverse

Hyperbolic tangent, inverse

Sine, arc sine

Cosine, arc cosine

Tangent, arc tangent

Radians to degrees, inverse

H.MMSSss to decimal, inverse

Store X or calculate X & Y

Store Y or calculate X & Y

Store R or calculate R & \(\angle\)

Store \(\angle\) or calculate R & \(\angle\)

Toggle degrees/radians mode

Store X & Y for C X,Y and P X,Y

Combinations of X items Y at a time

Permutations of X items Y at a time

Factorial

Displays random number 0 \(\leq n < 1\)

Conversion Functions

To convert a number from decimal hours (or degrees) to H.MMSSss (D.MMSSss) format press **[MATH] CONV**:

Keys: 12.575 **HMS**

Display: 12.34

**[SHOW]**

FULL PRECISION IS:

12.343
To find the polar coordinates of $X=3$ and $Y=4$, press **MORE**:

**Keys:**

3 **XCORD**  
4 **YCORD**  
**R**

**Display:**

$$XCOORD=3.00$$  
$$YCOORD=4.00$$  
$$\angle=53.13$$  
$$RADIUS=5.00$$

Both the radius and angle are returned:

<table>
<thead>
<tr>
<th>YCOORD</th>
<th>4.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\angle)</td>
<td>53.13</td>
</tr>
<tr>
<td>RADIUS</td>
<td>5.00</td>
</tr>
</tbody>
</table>

(This example assumes Degrees mode. Use **D/R** to switch between Degrees and Radians modes.) To convert the angle of 53.13 degrees to radians, press **MORE** ➔ **RAD** and the angle is then expressed as 0.93 radians.

**Probability Functions**

To find the number of combinations of 6 items taken 4 at a time, use the **MATH** **PROB** menu:

**Keys:**

6 **X**  
4 **Y**  
**C X,Y**

**Display:**

$$X=6.00$$  
$$Y=4.00$$  
$$C X,Y=15.00$$
The CURRX menu ( MAIN BUS CURRX ) contains currency exchange functions. Calculations are performed with currency sets, each of which consists of two currencies and a rate expressing currency 2 in terms of currency 1. The CURRX menu displays the following entries:

- US$ Stores or calculates currency 1
- YEN Stores or calculates currency 2
- RATE Stores or calculates the conversion rate
- CSTO Stores the current currency set
- C.RCL Recalls the current currency set
- SELECT Displays the menu of currencies

Establishing A Currency Set
A currency set is established by selecting two currencies and entering or calculating the rate. For example, enter the conversion between British Pounds and Dollars:

**Keys:**

SELECT
UK£
US$

**Display:**

SELECT CURRENCY 1
CURRENCY 1 IS: UK£
SELECT CURRENCY 2
1 UK£ = 1.0000 US$
ENTER A RATE
1.87 RATE
1 UK£ = 1.8700 US$
RATE=1.87
A conversion rate can also be established by selecting the currencies, entering a value for each currency, then pressing `RATE` to calculate the rate:

**Keys:**
```
SELECT
UK£
US$
35 UK£
61.6 US$
RATE
```

**Display:**
```
SELECT CURRENCY 1
SELECT CURRENCY 2
ENTER A RATE
UK£=35.00
US$=61.60
1 UK£ = 1.7600 US$
RATE=1.76
```

**Exchange Calculations**
Once the two currencies are named and a rate has been established, calculations are performed like any other menu calculation (see *Calculating With Menus*). Using the conversion entered above, convert $354.25 to British Pounds:

**Keys:**
```
354.25 US$
UK£
```

**Display:**
```
US$=354.25
UK£=201.28
```

**Storing & Recalling Currency Sets**
Up to six currency sets can be stored for repeated use. To store the current currency set, press `C. STO` and press any blank menu key. If the menu...
key you select is not blank, its currency set will be overwritten. Recall a currency set by pressing **C.RCL** and selecting the desired menu key.

<table>
<thead>
<tr>
<th>Currency Choice</th>
<th>Symbol</th>
<th>Country/Currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>US$</td>
<td></td>
<td>U.S. Dollar</td>
</tr>
<tr>
<td>BF</td>
<td></td>
<td>Belgian Franc</td>
</tr>
<tr>
<td>DR</td>
<td></td>
<td>Greek Drachma</td>
</tr>
<tr>
<td>D.KR</td>
<td></td>
<td>Danish Krone</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td>Argentinean Austral</td>
</tr>
<tr>
<td>HK$</td>
<td></td>
<td>Hong Kong Dollars</td>
</tr>
<tr>
<td>$A</td>
<td></td>
<td>Australian Dollar</td>
</tr>
<tr>
<td>BAHT</td>
<td></td>
<td>Thai Baht</td>
</tr>
<tr>
<td>CAN$</td>
<td></td>
<td>Canadian Dollar</td>
</tr>
<tr>
<td>FL</td>
<td></td>
<td>Dutch Florin</td>
</tr>
<tr>
<td>ESC</td>
<td></td>
<td>Portuguese Escudo</td>
</tr>
<tr>
<td>N.KR</td>
<td></td>
<td>Norwegian Krone</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td>Venezuelan Bolivar</td>
</tr>
<tr>
<td>NT$</td>
<td></td>
<td>New Taiwan Dollar</td>
</tr>
<tr>
<td>M$</td>
<td></td>
<td>Malaysian Dollar</td>
</tr>
<tr>
<td>IN.RS</td>
<td></td>
<td>Indian Rupee</td>
</tr>
<tr>
<td>PK.RS</td>
<td></td>
<td>Pakistani Rupee</td>
</tr>
<tr>
<td>DM</td>
<td></td>
<td>W. German Mark</td>
</tr>
<tr>
<td>LIT</td>
<td></td>
<td>Italian Lira</td>
</tr>
<tr>
<td>IR£</td>
<td></td>
<td>Irish Pound</td>
</tr>
<tr>
<td>S.KR</td>
<td></td>
<td>Swedish Krona</td>
</tr>
<tr>
<td>CZ$</td>
<td></td>
<td>Brazilian Cruzado</td>
</tr>
<tr>
<td>RMB</td>
<td></td>
<td>Chinese Renminbi</td>
</tr>
<tr>
<td>NZ$</td>
<td></td>
<td>New Zealand Dollar</td>
</tr>
<tr>
<td>INTI</td>
<td></td>
<td>Peruvian Inti</td>
</tr>
<tr>
<td>S.KR</td>
<td></td>
<td>S. Korean Won</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td>Russian Rouble</td>
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<tr>
<td>HK$</td>
<td></td>
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<td>NT$</td>
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<tr>
<td>M$</td>
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<td>Malaysian Dollar</td>
</tr>
<tr>
<td>IN.RS</td>
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<td>Indian Rupee</td>
</tr>
<tr>
<td>PK.RS</td>
<td></td>
<td>Pakistani Rupee</td>
</tr>
<tr>
<td>FF</td>
<td></td>
<td>French Franc</td>
</tr>
<tr>
<td>PTS</td>
<td></td>
<td>Spanish Pesetas</td>
</tr>
<tr>
<td>SF</td>
<td></td>
<td>Swiss Franc</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>Austrian Schilling</td>
</tr>
<tr>
<td>NIS</td>
<td></td>
<td>New Israeli Shekel</td>
</tr>
<tr>
<td>UK£</td>
<td></td>
<td>British Pound</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td>Russian Rouble</td>
</tr>
<tr>
<td>PESO</td>
<td></td>
<td>Mexican Pesos</td>
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<tr>
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<tr>
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<td>Singapore Dollar</td>
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<tr>
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</tr>
<tr>
<td>CURR2</td>
<td></td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>
Unit Conversions

The UNITS menu (MAIN BUS UNITS) contains five categories of unit conversions:

<table>
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<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Feet to meters</td>
</tr>
<tr>
<td>Area</td>
<td>Acres to hectares</td>
</tr>
<tr>
<td>Volume</td>
<td>Gallons to liters</td>
</tr>
<tr>
<td>Mass</td>
<td>Pounds to kilograms</td>
</tr>
<tr>
<td>Temperature</td>
<td>Fahrenheit to Celsius</td>
</tr>
</tbody>
</table>

To convert from one unit to another, key in the value, press the menu key for the original unit, then press the menu key for the new unit. For example, convert 185 pounds to stones:

Keys: MASS 185 LB MORE STONE

Display: MASS CONVERSIONS LB=185.00 STONES=13.21
To add mixed units, use \( \text{STO } + \). For example, add 2 slugs to the previous answer:

Keys: \[ 2 \text{ STO } + \text{SLUG} \]

Display: \[ 2.00 \] STONES=17.81

Unit Conversion Choices

Press \text{UNITS } \text{LENG} \) for length conversions:

- FEET \( \text{feet} \)
- INCH \( \text{inches} \)
- M \( \text{meters} \)
- CM \( \text{centimeters} \)
- MM \( \text{millimeters} \)
- MILE \( \text{miles} \)
- N.MI \( \text{nautical miles} \)
- KM \( \text{kilometers} \)
- YARD \( \text{yards} \)
- FATH \( \text{fathoms} \)
- ST.MI \( \text{US statute miles} \)
- ROD \( \text{rods} \)
- CHAIN \( \text{chains} \)
- SU.FT \( \text{survey feet} \)

Press \text{UNITS } \text{AREA} \) for area conversions:

- SQ.YD \( \text{square yards} \)
- SQ.FT \( \text{square feet} \)
- SQ.IN \( \text{square inches} \)
- SQ.M \( \text{square meters} \)
- SQ.CM \( \text{sq. centimeters} \)
- SQ.MI \( \text{square miles} \)
- ACRE \( \text{acres} \)
- SQ.RD \( \text{square rods} \)
- SQ.K \( \text{sq. kilometers} \)
- HA \( \text{hectares} \)
Press **UNITS VOL** for volume conversions:

<table>
<thead>
<tr>
<th>US gallons</th>
<th>imperial gallons</th>
<th>quarts</th>
<th>pints</th>
<th>liters</th>
</tr>
</thead>
<tbody>
<tr>
<td>CU. YD cubic yards</td>
<td>CU. FT cubic feet</td>
<td>CU. IN cubic inches</td>
<td>CU. M cubic meters</td>
<td>AC. FT acre-feet</td>
</tr>
<tr>
<td>CUP cups</td>
<td>TBSP tablespoons</td>
<td>TSP teaspoons</td>
<td>FL. OZ US fluid ounces</td>
<td>ML milliliters</td>
</tr>
<tr>
<td>BU bushels</td>
<td>PECK pecks</td>
<td>D. GAL dry gallons</td>
<td>BD. FT board feet</td>
<td>BBL barrel of oil</td>
</tr>
</tbody>
</table>

Press **UNITS MASS** for mass conversions:

<table>
<thead>
<tr>
<th>LB pounds</th>
<th>OZ ounces</th>
<th>KG kilo-grams</th>
<th>GRAM grams</th>
<th>MG milli-grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>TON short tons</td>
<td>L. TON long tons</td>
<td>CWT short hundredweights</td>
<td>L. CWT long hundredweights</td>
<td>T metric tons</td>
</tr>
<tr>
<td>SLUG slugs</td>
<td>STONE stones</td>
<td>OZ.T troy ounces</td>
<td>DRAM drams</td>
<td>GR grains</td>
</tr>
</tbody>
</table>

Press **UNITS TEMP** for temperature conversions:

| °F degrees Fahrenheit | °C degrees Celsius | °R degrees Rankine | °K degrees Kelvin |
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