ativa™
empowering technology

2-LINE DISPLAY
Scientific Calculator Owner's Manual

EXPOSITION À 2 LIGNES
Calculatrice Scientifique Manuel de Propriétaires

2 DESPLIEGUE DE LÍNEA
Calculadora Científica Manual de Dueños

AT-30S

For Ativa™ tech support:
1-877-777-HELP(1-877-777-4357)
www.ativaproducts.com

Safety Precautions

Be sure to read the following safety precautions before using this calculator. Keep this manual handy for later reference.

Batteries

- After removing the batteries from the calculator, put them in a safe place where there is no danger of them getting into the hands of small children and accidently swallowed.
- Keep batteries out of the reach of children. If accidentally swallowed, consult with a physician immediately.
- Never charge batteries, try to take batteries apart, or allow batteries to become shorted. Never expose batteries to direct heat or dispose of them by incineration.
- Misuse of batteries can cause them to leak acid that can cause damage to nearby items and creates the possibility of fire and personal injury.
- Always make sure that a battery's positive (+) and negative (–) sides are facing correctly when you load it into the calculator.
- Remove the batteries if you do not plan to use the calculator for a long time.
- Use only the type of batteries specified for this calculator in this manual.
- Dim figures on the display of the calculator indicate that battery power is low. Continued use of the calculator when the battery is low can result in improper operation. Replace the battery as soon as possible when display figures become dim.

Disposing of the Calculator

- Never dispose of the calculator by burning it. Doing so can cause certain components to suddenly burst, creating the danger of fire and personal injury.
- The displays and illustrations (such as key markings) shown in this Owner's Manual are for illustrative purposes only, and may differ somewhat from the actual items they represent.
- The contents of this manual are subject to change without notice.

Before Starting Calculations

Modes

Before starting a calculation, you must first enter the correct mode as indicated in the table below.

To perform this type of calculation:	Perform this key operation:	To enter this mode:
Basic arithimetic calculations	[Mode][1]	COMP
Standard deviation	[Mode][2]	SD
Regression calculations	[Mode][3]	REG

- Pressing the **[MODE]** key more than once displays additional setup screens. Setup screens are described in the sections of this manual where they are actually used to change the calculator setup.

Note:
- To return the calculation mode and setup to the initial defaults shown below, press **[SHIFT] [CLR] [2] [=]**.

Calculation Mode:	COMP
Angle Unit:	Deg
Exponential Display Format:	Norm 1
Fraction Display Format:	a b/c
Decimal Point Character:	Dot

- Mode indicators appear in the upper part of the display.
- Be sure to check the current calculation mode (SD, REG, COMP) and angle unit setting (Deg, Rad, Gra) before beginning a calculation.

Input Capacity

- The memory area used for calculation input can hold 79 "steps". One step is taken up each time you press a number key or arithmetic operator key (+, −, ×, ÷). A **[SHIFT]** or **[ALPHA]** key operation does not take up a step, so inputting **[SHIFT] [nPr]**, for example, takes up only one step.
- You can input up to 79 steps for a single calculation. Whenever you input the 73rd step of any calculation, the cursor changes from "_" to "■" to let you know memory is running low. If you need to input more than 79 steps, you should divide your calculation into two or more parts.

Handling Precautions

- Be sure to press the "ON" key before using the calculator for the first time.
- Even if the calculator is operating normally, replace the battery at least once every three years. Dead battery can leak, causing damage to and malfunction of the calculator. Never leave the dead battery in the calculator.
- The battery that comes with this unit discharges slightly during shipment and storage. Because of this, it may require replacement sooner than the normal expected battery life.
- Low battery power can cause memory contents to become corrupted or lost completely. Always keep written records of all important data.
- Avoid use and storage in areas subjected to temperature extremes. Very low temperatures can cause slow display response, total failure of the display, and shortening of battery life. Also avoid leaving the calculator in direct sunlight, near a window, near a heater or anywhere else it might become exposed to very high temperatures. Heat can cause discoloration or deformation of the calculator's case, and damage to internal circuitry.
- Avoid use and storage in areas subjected to large amounts of humidity and dust. Take care never to leave the calculator where it might be splashed by water or exposed to large amounts of humidity or dust. Such elements can damage internal circuitry.
- Never drop the calculator or otherwise subject it to strong impact.
- Never twist or bend the calculator. Avoid carrying the calculator in the pocket of your trou-sers or other tight-fitting clothing where it might be subjected to twisting or bending.
- Never try to take the calculator apart.
- Never press the keys of the calculator with a ball-point pen or other pointed object.
- Use a soft, dry cloth to clean the exterior of the unit. If the calculator becomes very dirty, wipe it off with a cloth moistened in a weak solution of water and a mild neutral household detergent. Wring out all excess moisture before wiping the calculator. Never use thinner, benzine or other volatile agents to clean the calculator. Doing so can remove printed markings and damage the case.

- Pressing the **[Ans]** key recalls the last result obtained, which you can use in a subsequent calculation. See "Answer Memory" for more information about using the **[Ans]** key.

Making Corrections During Input

- Use **[◂]** and **[▸]** to move the cursor to the location you want.
- Press **[DEL]** to delete the number or function at the current cursor position.
- Press **[SHIFT] [INS]** to change to an insert cursor "⌷". Inputting something while the insert cursor is on the display inserts the input at the insert cursor position.
- Pressing **[SHIFT] [INS]**, or **[=]** returns to the normal cursor from the insert cursor.

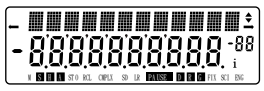
Replay Function

- Every time you perform a calculation, the Replay Function stores the calculation formula and its result in replay memory. Pressing the **[▲]** key displays the formula and result of the calculation you last performed. Pressing **[▲]** again back steps sequentially (new to old) through past calculations.
- Pressing the **[◂]** or **[▸]** key while a replay memory calculation is on the display changes to the editing screen.
- Pressing the **[◂]** or **[▸]** key immediately after you finish a calculation displays the editing screen for that calculation.
- Pressing **[AC]** does not clear Replay memory, so you can recall the last calculation even after you press **[AC]**.
- Replay memory capacity is 128 bytes for storage of both expressions and results.
- Replay memory is cleared by any of the following actions:-
  *When you press the **[ON]** key.
  *When you initialize modes and settings by pressing **[SHIFT] [CLR] [2] [=]**.
  *When you change from one calculation mode to another.
  *When you turn off the calculator.

Error Locator

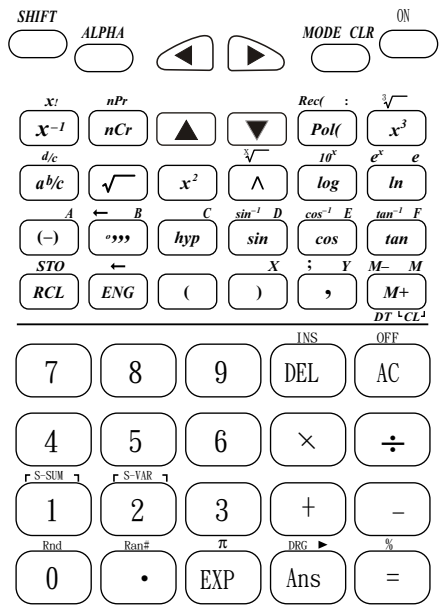
- Pressing **[▸]** or **[◂]** after an error occurs displays the calculation with the cursor positioned at the location where the error occured.

Two-lines Display



You can simultaneously check the calculation formula and its answer. The first line displays the calculation formula. The second line displays the answer.

Keys Layout



Multi-statements

A multi-statement is an expression that is made up of two or more smaller expressions, which are joined using a colon **[:]**.
Example: 2+3 and then multiply the result by 4.
2 [+] 3 [ALPHA] [:] [Ans] [×] 4 [=]

```
2+3
                5.
```

[=]

```
Ans×4
               20.
```

Exponential Display Formats

This calculator can display up to 10 digits. Larger values are automatically displayed using exponential notation. In the case of decimal values, you can select between two formats that determine at what point exponential notation is used.
- To change the exponential display format, press the **[MODE]** key a number of times until you reach the exponential display format setup screen shown below.

```
Fix Sci Norm
1   2   3
```

- Press **[3]**. On the format selection screen that appears, press **[1]** to select "Norm 1" or **[2]** for "Norm 2".

• Norm1
With Norm 1, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than two decimal places.

• Norm 2
With Norm 2, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than nine decimal places.

- All of the examples in this manual show calculation results using the Norm1 format.

Decimal Point and Separator Symbols

You can use the display setup (Disp) screen to specify the symbols you want for the decimal point and 3-digit separator.
- To change the decimal point and separator symbol setting, press the **[MODE]** key a number of times until you reach the setup screen shown below.

```
Disp
1
```

- Display the selection screen. **[1] [▸]**
- Press the number key (**[1]** or **[2]**) that corresponds to the setting you want to use.
  [1] (dot): Period decimal point, comma separator
  [2] (comma): Comma decimal point, period separator

Stacks

This calculator uses memory areas, called "stacks", to temporarily store values (numeric stack) and commands (command stack) according to their precedence during calculations. The numeric stack has 10 levels and the command stack has 24 levels. A stack error (Stack ERROR) occurs whenever you try to perform a calculation that is so complex that the capacity of a stack is exceeded.
- Calculations are performed in sequence according to "Calculation Priority Sequence". Commands and values are deleted from the stack as the calculation is performed.

Overflow and Errors

If the operational range of the unit is exceeded, or incorrect inputs are made, an error message will appear on the display and subsequent operation will be impossible. This is carried out by the error check function. The following operations will result in errors :-

1. The answer, whether intermediate or final, or any value in memory exceeds the value of $\pm 9.999999999 \times 10^{99}$.
2. An attempt is made to perform function calculations that exceed the input range.
3. Improper operation during statistical calculations, e.g., attempting to obtain x or xσn without data input.
4. The capacity of the numeric value stack or the command stack is exceeded.
5. Input errors are made, e.g. 5 × × 3 = .

case (1) to case (3) Math ERROR
case (4) Stack ERROR
case (5) Syntax ERROR

The calculator is locked up while an error message is on the display. Press **[AC]** to clear the error, or press **[◂]** or **[▸]** to display the calculation and correct the problem. See "Error Locator" for details.

*Internal digits: 12
For a single calculation, calculation errors is ±1 at the 10th digit. (In the case of exponential display, calculation error is ±1 at the last significant digit.) Errors are cumulative in the case of consecutive calculations, which can also cause them to become large. (This is also true of internal consecutive calculations that are performed in the case of ^(x^y, ˣ√, x!, ∛, nPr, nCr etc.)
In the vicinity of a function's singular point and point of inflection, errors are cumulative and may become large.

Calculation Priority Sequence

Calculations are performed in the following order of precedence :-
1. Coordinate transformation: Pol(x, y),Rec(r, θ)
2. Type A functions :-
   With these functions, the value is entered and then the function key is pressed: x^3, x^2, x^{-1}, x!, °'", $\hat{x}$, $\hat{x}1$, $\hat{x}2$, $\hat{y}$, angle unit conversions.
3. Powers and roots, ^(x^y), ˣ√
4. Fractions, a b/c
5. Abbreviated multiplication format in front of π, memory name or variable name, such as 2π, 5A, πA, etc.
6. Type B functions :-
   With these functions, the function key is pressed and then the value is entered.
   √, ∛, log, ln, e^x, 10^x, sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$, (–).
7. Abbreviated multiplication format in front of Type B functions: 2√3, A log2, etc.
8. Permutation, combination, nPr, nCr
9. ×, ÷
10. +, –

- Operations of the same precedence are performed from right to left :- $e^x \ln\sqrt{120}$? $e^x\{\ln(\sqrt{120})\}$.
- Other operations are performed from left to right.
- Operations enclosed in parentheses are performed first.

Initializing the Calculator

- Perform the following key operation when you want to initialize the calculation mode and setup, and clear replay memory and variables.

[SHIFT] [CLR] [3] [=]

Basic Calculations

Arithmetic Calculations

Use the **[MODE]** key to enter the COMP Mode when you want to perform basic calculations (**[MODE] [1]**).

- Negative values inside of calculations must be enclosed within parentheses.

sin –1.23 → **[sin] [(] [(–)] 1.23 [)]**

- It is not necessary to enclose a negative exponent within parentheses.

sin 2.34 × 10^{-5} → **[sin] 2.34 [EXP] [(–)] 5**

Example	Operation	Display (Lower)
23 + 4.5 −53 =−25.5	23 [+] 4.5 [−] 53 [=]	−25.5
56×(−12)÷(−2.5)=268.8	56[×][(–)]12[÷][(–)]2.5[=]	268.8
12369×7532×74103= 6.903680613×10^{12}	12369[×] 7532 [×] 74103[=]	6.903680613^{12}
(4.5×10^{75})×(−2.3×10^{-79}) = −1.035×10^{-3}	4.5[EXP]75 [×] [(–)]2.3 [EXP] [(–)]79 [=]	−1.035^{-03}
(2+3)×10^2=500	[(] 2 [+] 3 [)][×] 1 [EXP]2 [=]	500.
(1×10^5)÷7= 14285.71429	1[EXP]5 [÷] 7 [=]	14285.71429
(1×10^5)÷7−14285= 0.7142857	1[EXP]5[÷]7 [−] 14285 [=]	0.71428571
please note that internal calculation is calculated in 12 digits for a mantissa and the result is displayed and rounded off to 10 digits.		

Example	Operation	Display (Lower)
3 + 5 × 6 = 33	3 [+] 5 [×] 6 [=]	33.
7 × 8 − 4 × 5 = 36	7 [×] 8 [−] 4 [×] 5 [=]	36.
1 + 2 − 3 × 4 ÷ 5 + 6 = 6.6	1 [+] 2 [−] 3 [×] 4 [÷] 5 [+] 6 [=]	6.6
100 − (2+3) × 4 = 80	100 [−][(] 2 [+] 3[)] [×] 4 [=]	80.
2 + 3 × (4 + 5) = 29	2 [+] 3 [×] [(] 4 [+] 5 [=] Closed parentheses occurring immediately before operation of the [=] key may be omitted.	29.
(7 − 2) × (8 + 5) = 65	[(] 7 [−] 2 [)][(] 8 [+] 5 [=] A multiplication sign [×] occurring immediately before an open parantheses can be omitted.	65.
10 − { 2 + 7 × (3 + 6)} = −55	10 [−][(] 2 [+] 7 [(] 3 [+] 6 [=]	−55.

Percentage Calculations

Example	Operation	Display (Lower)
Percentage 26% of $15.00	15 [×]26 [SHIFT] [%]	3.9
Premium 15% increase from $36.20	36.2[×]15 [SHIFT] [%] [+]	41.63
Discount 4% discount from $47.50	47.5[×]4 [SHIFT] [%] [−]	45.6
Ratio 75 is what % of 250?	75[÷]250 [SHIFT] [%]	30.
Rate of change 141 is an increase of what % from 120?	141[−]120 [SHIFT] [%]	17.5
Rate of change 240 is a decrease of what % from 300?	240[−]300 [SHIFT] [%]	−20.

Fractions

Example	Operation	Display (Lower)
$^2/_5+3^1/_4=3^{13}/_{20}$	2[a b/c]5[+]3[a b/c]1 [a b/c]4[=] (conversion to decimal)[a b/c] Fractions can be converted to decimals, and then converted back to fractions.	3 ⌟13 ⌟20. 3.65
$3^{456}/_{78}=8^{11}/_{13}$	3[a b/c]456[a b/c]78[=] [SHIFT][d/c]	8 ⌟11 ⌟13. 115 ⌟13.
$^1/_{2578}+^1/_{4572}$ = 6.066202547×10^{-4}	1[a b/c]2578[+]1[a b/c] 4572[=] When the total number of characters, including integer, numerator, denominator and delimiter mark exceeds 10, the input fraction is automatically displayed in decimal format.	6.066202547^{-04}
$^1/_2\times0.5=0.25$	1[a b/c]2[×].5[=]	0.25
$^1/_3\times(-^4/_5)-^5/_6=-1^1/_{10}$	1[a b/c]3[×][(–)]4[a b/c]5 [−]5[a b/c]6[=]	−1 ⌟1 ⌟10.
$^1/_2\times^1/_3+^1/_4\times^1/_5$ = $^{13}/_{60}$	1[a b/c]2[×]1[a b/c]3[+] 1[a b/c]4[×]1[a b/c]5[=]	13 ⌟60.
$(^1/_2)/3=^1/_6$	[(]1[a b/c]2[)][a b/c]3[=]	1 ⌟6.
$^1/(^1/_3+^1/_4)=1^5/_7$	1[a b/c][(]1[a b/c]3[+] 1[a b/c]4[)][=]	1 ⌟5 ⌟7.

- You can use the display setup (Disp) screen to specify the display format when a fraction calculation result is greater than one.
- To change the fraction display format, press the **[MODE]** key a number of times until you reach the setup screen shown below:-

```
Disp
1
```

- Display the selection screen. **[1]**
- Press the number key (**[1]** or **[2]**) that corresponds to the setting you want to use. **[1]** (a b/c): mixed fraction. **[2]** (d/c): improper fraction.
- An error occurs if you try to input a mixed fraction while the d/c display format is selected.

Degrees, Minutes, Seconds Calculations

You can perform sexagesimal calculations using degrees (hours), minutes and seconds, and convert between sexagesimal and decimal values.

Example	Operation	Display
To express 2.258 degrees in deg/min/sec.	2.258[°′″][=]	2°15°28.8
To perform the calculation: 12°34′56″×3.45	12[°′″]34[°′″]56[°′″][×] 3.45[=]	43°24°31.2

FIX, SCI, RND

As the number of decimal places is specified, the intermediate result will be automatically rounded to the specified decimal places. However, the stored intermediate result is not rounded. In order to match the displayed value and the stored value, **[SHIFT] [RND]** can be input.

- To change the settings for the number of decimal places, the number of significant digits, or the exponential display format, press the **[MODE]** key a number of times until you reach the setup screen shown below:-

```
Fix Sci Norm
1   2   3
```

- Press the number key (**[1]**, **[2]**, or **[3]**) that corresponds to the setup item you want to change.
  [1] (Fix): Number of decimal places
  [2] (Sci): Number of significant digits
  [3] (Norm): Exponential display format

Example	Operation	Display (Lower)
200÷7×14 = 400	200[÷]7[×]14[=]	400.
rounded to 3 decimal places	[Mode]...[1] (Fix) [3]	400.000
	200[÷]7[=]	28.571
	The intermediate result is automatically rounded to the specified three decimal places.	
round the stored intermediate result to the specified three decimal places	[SHIFT] [RND]	28.571
	[×]	Ans × (upper display)
	14[=]	399.994
Cancel specification by specifying Norm1 again.	[Mode]...[3] (Norm) [1]	399.994

Example	Operation	Display (Lower)
sin 63°52′41" = 0.897859012	[Mode]...[1] (Deg) [sin] 63 [°′″] 52 [°′″] 41 [°′″][=]	0.897859012
cos (π/3 rad) = 0.5	[Mode]...[2] (Rad) [cos][(] [SHIFT][π][÷]3 [)] [=]	0.5
tan (–35 grad) = –0.612800788	[Mode]...[3] (Grad) [tan] [(–)] 35 [=]	–0.612800788
2sin45°×cos65° = 0.597672477	[Mode]...[1] (Deg) 2[sin] 45 [cos] 65 [=]	0.597672477
$\sin^{-1}$ 0.5 = 30	[SHIFT][$\sin^{-1}$] 0.5 [=]	30.
$\cos^{-1}$ (√2/2) = 0.785398163 rad = π/4 rad	[Mode]...[2] (Rad) [SHIFT][$\cos^{-1}$][(][√]2 [÷]2 [)][=] [÷][SHIFT][π][=]	0.785398163 0.25
$\tan^{-1}$ 0.741 = 36.53844577° = 36°32′ 18.4"	[Mode]...[1] (Deg) [SHIFT][$\tan^{-1}$]0.741[=] [SHIFT] [←°′″]	36.53844577 36°32°18.4
2.5×($\sin^{-1}$0.8−$\cos^{-1}$0.9) = 68°13′13.53"	2.5[×] [(] [SHIFT] [$\sin^{-1}$]0.8 [−] [SHIFT] [$\cos^{-1}$] 0.9 [)] [=] [SHIFT] [←°′″]	68°13°13.53

Hyperbolic/Inverse Hyperbolic Functions

Example	Operation	Display (Lower)
sinh3.6= 18.28545536	[hyp][sin] 3.6 [=]	18.28545536
cosh1.23 = 1.856761057	[hyp][cos] 1.23 [=]	1.856761057
tanh2.5= 0.986614298	[hyp][tan] 2.5 [=]	0.986614298
cosh1.5−sinh1.5 = 0.22313016	[hyp][cos] 1.5 [−][hyp] [sin] 1.5 [=]	0.22313016
$\sinh^{-1}$ 30 = 4.094622224	[hyp][SHIFT][$\sin^{-1}$] 30 [=]	4.094622224
$\cosh^{-1}$ (20/15) = 0.795365461	[hyp][SHIFT][$\cos^{-1}$][(] 20 [÷] 15 [)][=]	0.795365461
x = ($\tanh^{-1}$ 0.88) / 4 = 0.343941914	[hyp][SHIFT][$\tan^{-1}$]0.88 [÷]4[=]	0.343941914
$\sinh^{-1}$ 2×$\cosh^{-1}$1.5 = 1.389388923	[hyp][SHIFT][$\sin^{-1}$]2[×] [hyp][SHIFT][$\cos^{-1}$]1.5[=]	1.389388923
$\sinh^{-1}$ (2/3)+$\tanh^{-1}$(4/5) = 1.723757406	[hyp][SHIFT][$\sin^{-1}$][(]2[÷] 3[)][+][hyp][SHIFT][$\tan^{-1}$] [(]4[÷]5[)][=]	1.723757406

Example	Operation	Display
Define degree first	[Mode]...[1] (Deg)	
Change 20 radian to degree	20[SHIFT][DRG ▸][2][=]	20^r 1145.91559
To perform the following calculation :- 10 radians+25.5 gradients The answer is expressed in degree.	10[SHIFT][DRG ▸][2][=] [+]25.5[SHIFT][DRG ▸] [3][=]	10^r+25.5^g 595.9077951

Coordinate Conversion {Pol(x, y), Rec(r, θ)}

- Calculation results are automatically assigned to variables E and F.

Example	Operation	Display (Lower)
x=14 and y=20.7, what are r and θ°?	[Mode]...[1] (Deg) [Pol()14 [,]20.7[)][=] [RCL][F]	24.98979792(r) 55°55°42.2(θ)
x=7.5 and y=–10, what are r and θ rad?	[Mode]...[2] (Rad) [Pol()7.5[,][–]10[)][=] [RCL][F]	12.5(r) –0.927295218(θ)

- Press **[RCL] [E]** to display value of r, or **[RCL] [F]** to display value of θ.

Example	Operation	Display (Lower)
r=25 and θ= 56°, what are x and y?	[[Mode]...[1] (Deg) [SHIFT][Rec()25 [,]56[)][=] [RCL][F]	13.97982259(x) 20.72593931(y)
r=4.5 and =2π/3 rad, what are x and y?	[Mode]...[2] (Rad) [SHIFT][Rec()4.5[,][(]2[÷] 3[×][SHIFT][π][)][)][=] [RCL][F]	–2.25(x) 3.897114317(y)

- Press **[RCL] [E]** to display value of x, or **[RCL] [F]** to display value of y.

Engineering Notation Calculations

Example	Operation	Display (Lower)
123m×456 = 56088m = 56.088km	123[×]456 [=] [ENG]	56088. 56.088^{03}
78g×0.96 = 74.88g = 0.07488kg	78[×]0.96 [=] [SHIFT] [ENG]	74.88 0.07488^{03}

- Always start data input with **[SHIFT] [CLR] [1] [=]** to clear statistical memory.
- Input data using the key sequence shown below.
  <x-data> [,] <y-data> [DT]
- The values produced by a regression calculation depend on the values input, and results can be recalled using the key operations shown in the table below.

To recall this type of value:	Perform this key operation:
$\sum x^2$	[SHIFT] [S-SUM] [1]
$\sum x$	[SHIFT] [S-SUM] [2]
n	[SHIFT] [S-SUM] [3]
$\sum y^2$	[SHIFT] [S-SUM] [▸] [1]
$\sum y$	[SHIFT] [S-SUM] [▸] [2]
$\sum xy$	[SHIFT] [S-SUM] [▸] [3]
$\sum x^3$	[SHIFT] [S-SUM] [▸] [▸] [1]
$\sum x^2y$	[SHIFT] [S-SUM] [▸] [▸] [2]
$\sum x^4$	[SHIFT] [S-SUM] [▸] [▸] [3]
$\bar{x}$	[SHIFT] [S-VAR] [1]
$x\sigma_n$	[SHIFT] [S-VAR] [2]
$x\sigma_{n-1}$	[SHIFT] [S-VAR] [3]
$\bar{y}$	[SHIFT] [S-VAR] [▸] [1]
$y\sigma_n$	[SHIFT] [S-VAR] [▸] [2]
$y\sigma_{n-1}$	[SHIFT] [S-VAR] [▸] [3]
Regression coefficient A	[SHIFT] [S-VAR] [▸] [▸] [1]
Regression coefficient B	[SHIFT] [S-VAR] [▸] [▸] [2]
Regression calculation other than quadratic regression	
Correlation coefficient r	[SHIFT] [S-VAR] [▸] [▸] [▸] [3]
$\hat{x}$	[SHIFT] [S-VAR] [▸] [▸] [▸] [1]
$\hat{y}$	[SHIFT] [S-VAR] [▸] [▸] [▸] [2]

- The following table shows the key operations you should use to recall results in the case of quadratic regression.

To recall this type of value:	Perform this key operation:
Regression coeffinient C	[SHIFT] [S-VAR] [▸] [▸] [▸] [3]
$\hat{x}_1$	[SHIFT] [S-VAR] [▸] [▸] [▸] [▸] [1]
$\hat{x}_2$	[SHIFT] [S-VAR] [▸] [▸] [▸] [▸] [2]
$\hat{y}$	[SHIFT] [S-VAR] [▸] [▸] [▸] [▸] [3]

- The values in the above tables can be used inside of expressions the same way you use variables.

Memory Calculations

Answer Memory

- Whenever you press **[=]** after inputting values or an expression, the calculated result automatically updates Answer Memory contents by storing the result.
- In addition to **[=]**, Answer Memory contents are also updated with result whenever you press **[SHIFT] [%]**, **[M+]**, **[SHIFT] [M–]** or **[SHIFT] [STO]** followed by a letter (A through F, or M, X, or Y).
- You can recall Answer Memory contents by pressing **[Ans]**.
- Answer Memory can store up to 12 digits for the mantissa and two digits for the exponent.
- Answer Memory contents are not updated if the operation performed by any of the above key operations result in an error.

Consecutive Calculations

- A calculation result produced by pressing **[=]** can be used in the next calculation.
- The result of a calculation can also be used with a subsequent Type A function (x^2, x^3, x^{-1}, x!), +, –, ^(x^y), $\sqrt[x]{}$, ×, ÷, nPr, nCr and °′″,

Independent Memory

- Values can be input directly into memory, added to memory, or substracted from memory. Independent memory is convenient for calculating cumulative totals.
- Independent memory uses the same memory area as variable M.
- To clear independent memory (M), input **[0] [SHIFT] [STO] [M]**.

Example: Input 123 to independent memory.
AC] [1] [2] [3]

```
123_
          0.
```

[M+]

```
123
        123.
```

Recall memory data
[AC]

```
_
          0.
```

[RCL] [M]

```
M=
        123.
```


Common and Natural Logarithms/Antilogarithms

Example	Operation	Display (Lower)
log1.23 = 8.9905111×10^{-2}	[log] 1.23 [=]	0.089905111
ln90 = 4.49980967	[ln] 90 [=]	4.49980967
log456÷ln456 = 0.434294481	[log]456÷[ln]456 [=]	0.434294481
$10^{1.23}$ = 16.98243652	[SHIFT][10^x] 1.23 [=]	16.98243652
$e^{4.5}$ = 90.0171313	[SHIFT][e^x]4.5[=]	90.0171313
$10^4\cdot e^{-4}+1.2\cdot10^{2.3}$ = 422.5878667	[SHIFT][10^x]4[×][SHIFT][e^x] [(–)]4[+]1.2[×][SHIFT][10^x] 2.3[=]	422.5878667
$(-3)^4$ = 81	[(][(–)] 3 [)] [^] 4 [=]	81.
-3^4 = –81	[(–)] 3 [^] 4 [=]	–81.
$5.6^{2.3}$ = 52.58143837	5.6 [^] 2.3 [=]	52.58143837
$(78-23)^{-12}$ = $1.305111829\times10^{-21}$	[(]78[−]23[)][^][(–)]12[=]	1.305111829^{-21}
$2\times3.4^{(5+6.7)}$ = 3306232	2[×]3.4[^][(]5[+]6.7[)][=]	3306232.001

Square Roots, Cube Roots, Roots, Squares, Cubes, Reciprocals, Factorials, Random Numbers, π

Example	Operation	Display (Lower)
√2+√5 = 3.65028154	[√]2[+][√]5[=]	3.65028154
$\sqrt[3]{5}+\sqrt[3]{(-27)}$ = –1.290024053	[SHIFT][$\sqrt[3]{}$]5[+][SHIFT][$\sqrt[3]{}$] [(][(–)]27[)][=]	–1.290024053
$\sqrt[7]{123}$ = 1.988647795	7 [SHIFT][$\sqrt[x]{}$] 123 [=]	1.988647795
$2^2+3^2+4^2+5^2$ = 54	2[x^2][+]3[x^2][+]4[x^2] [+]5[x^2][=]	54.
$(-3)^2$ = 9	[(][(–)]3[)][x^2][=]	9.
12^3 = 1728	12[x^3][=]	1728
1/(1/3–1/4) = 12	[(]3[x^{-1}][−]4[x^{-1}][)] [x^{-1}][=]	12.
8! = 40320 $\sqrt[3]{}$(36×42×49) = 42	8[SHIFT][x!][=] [SHIFT][$\sqrt[3]{}$][(]36[×]42[×] 49[)][=]	40320. 42.
Random number generation (number is in the range of 0.000 to 0.999)	[SHIFT][Ran#][=]	0.792 (random)
3π = 9.424777961	3[SHIFT]π[=]	9.424777961

Standard Deviation

Use the **[MODE]** key to enter the SD Mode when you want to perform statistical calculations using standard deviation (**[MODE] [2]**).

- Always start data input with **[SHIFT] [CLR] [1] [=]** to clear statistical memory (Scl).
- Input data using the key sequence shown below.
  <x-data> [DT]
- Input data is used to calculate values for n, $\sum x$, $\sum x^2$, $\bar{x}$, $x\sigma n$ and $x\sigma n-1$, which you can recall using the key operations noted nearby.

To recall this type of value:	Perform this key operation:
$\sum x^2$	[SHIFT][S-SUM][1]
$\sum x$	[SHIFT][S-SUM][2]
n	[SHIFT][S-SUM][3]
$\bar{x}$	[SHIFT][S-VAR][1]
$x\sigma n$	[SHIFT][S-VAR][2]
$x\sigma n-1$	[SHIFT][S-VAR][3]

Example	Operation	Display
Data 55, 54, 51, 55, 53, 53, 54, 52	[MODE] [2] (SD Mode) [SHIFT][CLR][1][=] (Stat clear) 55[DT]54[DT]51[DT] 55[DT][DT][DT]54[DT] 52[DT]	0. 0. 52.
What is deviation of the unbiased variance, and the mean of the above data?	[SHIFT][S-SUM][3](Number of data) [SHIFT][S-SUM][2](Sumof data) [SHIFT][S-SUM][1] (Sum of square of data) [SHIFT][S-VAR][1](Mean) [SHIFT][S-VAR][2](Population SD) [SHIFT][S-VAR][3](Sample SD)	8. 427. 22805. 53.375 1.316956719 1.407885953

Data Input Precautions

- **[DT] [DT]** inputs the same data twice.
- You can also input multiple entries of the same data using **[SHIFT] [;]**. To input the data 110 ten times, for example, press **110 [SHIFT] [;] 10 [DT]**.
- You can perform the above key operations in any order, and not necessarily that shown above.
- While inputting data or after inputting data is complete, you can use the **[▲]** and **[▼]** keys to scroll through data you have input. If you input multiple entries of the same data using **[SHIFT] [;]** to specify the data frequency (number of dat items) as described above, scrolling through data shows both the data item and a separate screen for the data frequency (Freq).

Linear Regression

The regression formula for linear regression is: y = A + Bx

Example	Operation	Display
Temperature and length of a steel bar Temp Length 10°C 1003mm 15°C 1005mm 20°C 1010mm 25°C 1011mm 30°C 1014mm Using this table, the regression formula and correlation coefficient can be obtained. Based on the coefficient formula, the length of the steel bar at 18°C and the temperature at 1000mm can be estimated. Furthermore the critical coefficient (r^2) and covariance can also be calculated.	[MODE][3][1] (Linear regression) [SHIFT][CLR][1][=] (Stat clear) 10[,]1003[DT] 15[,]1005[DT] 20[,]1010[DT] 25[,]1011[DT] 30[,]1014[DT] [SHIFT][S-VAR][▸][▸][1][=] (Regression coefficient A) [SHIFT][S-VAR][▸][▸][2][=] (Regression coefficient B) [SHIFT][S-VAR][▸][▸][3][=] (Correlation coefficient r) 18[SHIFT][S-VAR][▸][▸][▸] [2][=] (Length at 18°C) 1000[SHIFT][S-VAR][▸][▸] [▸][1][=] (Temp at 1000mm) [SHIFT][S-VAR][▸][▸][3][x^2] [=] (Critical coefficient) [(][SHIFT][S-SUM][▸][3][−] [SHIFT][S-SUM]3[×][SHIFT] [S-VAR][1][×][SHIFT][S-VAR] [▸][1][)][÷][(][SHIFT][S-SUM] [3][−]1[)][=] (Covariance)	0. 0. 1. 2. 3. 4. 5. 997.4 0.56 0.982607368 1007.48 4.642857143 0.965517241 35.

Logarithmic, Exponential, Power, and Inverse Regression

- Use the same key operations as linear regression to recall results for these types of regression.
- The following shows the regression formulas for each type of regression.

Logarithmic Regression	y = A+B•ln x
Exponential Regression	$y = A\cdot e^{B\cdot x}$ (ln y = ln A+Bx)
Power Regression	$y = A\cdot x^B$ (ln y = ln A+B ln x)
Inverse Regression	y = A+B•1/x

Quadratic Regression

- The regression formula for quadratic regression is:
  $y = A+Bx+Cx^2$

Add 25, subtract 12
25 [M+] 12 [SHIFT] [M–]

```
12
          12.
```

Recall memory data
[AC]

```
_
          0.
```

[RCL] [M]

```
M=
        136.
```


Scientific Function Calculations

Use the **[MODE]** key to enter the COMP Mode when you want to perform basic calculations (**[MODE] [1]**).

- Certain types of calculations may take a long time to complete.
- Wait for the result to appear on the display before starting the next calculation.
- π = 3.14159265359

Trigonometric/Inverse Trigonometric Functions

- To change the default angle unit (degrees, radians, grads), press the **[MODE]** key a number of times until you reach the angle unit setup screen shown below:-

```
Deg Rad Gra
1   2   3
```

- Press the number key (**[1]**, **[2]** or **[3]**) that corresponds to the angle unit you want to use.

(90° = π/2 radians = 100 grads)

Permutation and Combination

Total number of permutations nPr = n!/(n−r)!
Total number of combinations nCr = n!/(r!(n−r)!)

Example	Operation	Display (Lower)
Taking any four out of ten items and arranging them in a row, how many different arrangements are possible? 10P4 = 5040	10[SHIFT][nPr]4[=]	5040.
Using any four numbers from 1 to 7, how many four digit even numbers can be formed if none of the four digits consist of the same number? (3/7 of the total number of permutations will be even.) 7P4×3÷7 = 360	7[SHIFT][nPr]4[×]3[÷] 7[=]	360.
If any four items are removed from a total of 10 items, how many different combinations of four items are possible? 10C4 = 210	10[nCr]4[=]	210.
If 5 class officers are being selected for a class of 15 boys and 10 girls, how many combinations are possible? At least one girl must be included in each group. 25C5−15C5 = 50127	25[nCr]5[−]15[nCr]5[=]	50127.

Angle Unit Conversion

- Press **[SHIFT] [DRG ▸]** to display the following menu:-

```
D   R   G
1   2   3
```

- Press **[1]**, **[2]** or **[3]** converts the displayed value to the corresponding angle unit.

You can then edit the displayed data, if you want. Input the new value and then press the **[=]** key to replace the old value with the new one.

- Pressing the **[DT]** key instead of **[=]** after changing a value on the display registers the value you input as a new data item, and leaves the old value as it is.
- You can delete a data value displayed using **[▲]** and **[▼]** by pressing **[SHIFT] [CL]**. Deleting a data value causes all values following it to be shifted up.
- Data values you register are normally stored in calculator memory. The message "Data Full" appears and you will not be able to input any more data if there is no memory left for data storage. If this happens, press the **[=]** key to display the screen shown below.

```
EditOFF   ESC
1     2     3
```

Press **[2]** to exit data input without registering the value you just input.
Press **[1]** if you want to register the value you just input, without saving it in memory. If you do this, however, you will not be able to display or edit any of the data you have input.

- To delete data you have just input, press **[SHIFT] [CL]**.

Regression Calculations

Use the **[MODE]** key to enter the REG Mode when you want to perform statistical calculations using regression (**[MODE] [3]**).

- Entering the REG Mode displays screens like the ones shown below.

```
Lin Log Exp→
1   2   3
←Pwr Inv Quad
1   2   3
```

- Press the number key (**[1]**, **[2]** or **[3]**) that corresponds to the type of regression you want to use.

[1] (Lin): Linear regression
[2] (Log): Logarithmic regression
[3] (Exp): Exponential regression
[▸][1] (Pwr): Power regression
[▸][2] (Inv): Inverse regression
[▸][3] (Quad): Quadratic regression

Example	Operation	Display
x i y i 29 1.6 50 23.5 74 38 103 46.4 118 48 Through quadratic regression of the above data, the regression formula and correlation coefficient are obtained. Furthermore, the regression formula is used to obtain the respective estimated values of y and x, when xi= 16 and yi= 20.	[MODE][3][▸][3] (Quadratic regression) [SHIFT][CLR][1][=] (Stat clear) 29[,]1.6[DT] 50[,]23.5[DT] 74[,]38[DT] 103[,]46.4[DT] 118[,]48[DT] [SHIFT][S-VAR][▸][▸][1][=] (Regression coefficient A) [SHIFT][S-VAR][▸][▸][2][=] (Regression coefficient B) [SHIFT][S-VAR][▸][▸][3][=] (Regression coefficient c) 16[S-VAR][▸][▸][▸][3][=] (y when xi=16) 20[S-VAR][▸][▸][▸][1][=] (x1 when yi=20) 20[S-VAR][▸][▸][▸][2][=] (x2 when yi=20)	0. 0. 1. 2. 3. 4. 5. –35.59856934 1.495939413 -6.71629667^{-03} –13.38291067 47.14556728 175.5872105

Data Input Precautions

- **[DT] [DT]** inputs the same data twice.
- You can also input multiple entries of the same data using **[SHIFT] [;]**. To input the data "20 and 30" five times, for example, press **20 [,] 30 [SHIFT] [;] 5 [DT]**.
- The above results can be obtained in any order, and not necessarily that shown above.
- Precautions when editing data input for standard deviation also apply for regression calculations.

To replace the battery:-

- Remove the two screws that hold the back cover in place and then remove the back cover,
- Remove the old battery,
- Wipe off the side of the new battery with a dry, soft cloth. Load it into the unit with the positive(+) side facing up.
- Replace the battery cover and secure it in place with the two screws.
- Press **[ON]** to turn power on.
- Battery Contains Mercury. Do not Put in Trash. Recycle or Manages as Hazardous Waste. Do not dispose of batteries in fire, batteries may explode or leak.

Auto Power Off

Calculator power automatically turns off if you do not perform any operation for about six minutes. When this happens, press **[ON]** to turn power back on.

Specifications

Power supply:single LR1130(Ø11.4x3mm)battery & Solar(battery included)
Operating temperature: 0° ~ 40°C (32°F ~ 104°F)