VICTOR®

Owner's Guide
930-2 Scientific Calculator

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Preface

Congratulations on your purchase of the 930-2 scientific calculator from Victor Technology. Victor has been serving customers since 1918. Today, Victor offers a complete line of printing, handheld, desktop, scientific, and financial calculators. For more information please see our website at www.victortech.com or call us at 1-800-628-2420.

Victor: The Choice of Professionals

A Spanish version of this instruction manual is available at www.victortech.com.

Una version en español de este manual de instrucciones esta´ disponible en www.victortech.com.

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1. GENERAL GUIDE

1-1) Modes

To put the calculator into a desired operating mode, press [MODE] first, then [BIN], [OCT], [DEC], [HEX] or [SD]

[MODE] [BIN] - "BIN" is displayed. Calculations and conversions are performed in the Base-2 mode (Binary).

[MODE] [OCT] - "OCT" is displayed. Calculations and conversions are performed in the Base-8 mode (Octal).

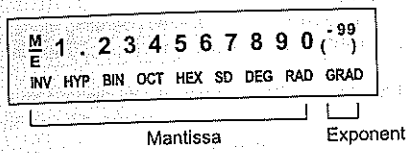
[MODE] [DEC] -Calculations and conversions are performed in the Base-10 mode (Decimal).

[MODE] [HEX] - "HEX" is displayed. Calculations and conversions are performed in the Base-16 mode (Hexadecimal).

[MODE] [SD] -"SD" is displayed. Change to the statistical calculations mode.

Pressing of [AC] key at any moment will clear all the memories and display contents and return the calculator to Bass-10 mode (Decimal) and angular unit in DEG.

1-2) The display



LCD Diagram

The display shows input data, interim results and answers to calculations. The mantissa section displays up to 10 digits. The exponent section displays up to ±99.

-E-	Error indication (see page 13)
INV	Pressing of INV
M	Something is being stored in the memory (see page 18)
HYP	Pressing of HYP (see page 30)
BIN, OCT, HEX	BASE-N mode (see page 21)
SD	Statistical calculations (see page 35)
DEG, RAD, GRAD	Angular unit (see page 29)
FIX	Decimal places of a displayed value is being designated (see page 33)
SCI	Converts a displayed value to exponent display (see page 33)

ENG	Converts a displayed value to exponent display of which exponent is a multiple of 3 and mantissa is between 0 to 999 (see page 33).
FLO	Convert a SCI or ENG form display to normal display value (see page 33).
45_12_123	45-12/23 (see page 29)
12°3'45.6"	12°3'45.6" (see page 29)

Exponent displays

The display can show calculation results only up to 10 digits long. When an intermediate value or a final result is longer than 10 digits, the calculator automatically switches over to exponential notation. Values greater than 9,999,999,999 are always displayed exponentially.

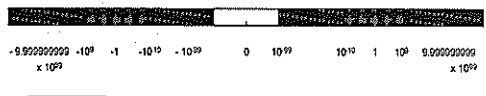
2. ORDER OF OPERATIONS AND LEVELS

Operation are performed in the following order of precedence :

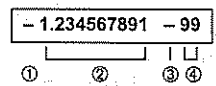
1. Functions	4. +, –	BASE-N mode
2. y^x , $\sqrt[x]{y}$,R→P, P→R	5. AND	
3. ×, ÷	6. OR, XOR, XNOR	

Operations with the same precedence are performed from left to right, with operations enclosed in parentheses performed first. If parentheses are nested, the operations enclosed in the innermost set of parentheses are performed first.

3. CALCULATION RANGE AND SCIENTIFIC NOTATION



When the answer exceeds the normal display capacity, it is automatically shown by scientific notation, 10-digit mantissa and exponents of 10 up to ±99.



1. The minus (–) sign for mantissa
2. The mantissa
3. The minus (–) sign for exponent
4. The exponent of ten

The whole display is read : $-1.234567891 \times 10^{-99}$

* Entry can be made in scientific notation by using the EXP key after entering the mantissa.

EXAMPLE	OPERATION	READ-OUT
$-1.234567891 \times 10^{-3} (= -0.001234567891)$		
	1 • 234567891 [+/-]	-1.234567891
	[EXP]	-1.234567891 00
	3 [+/-]	-1.234567891 -03

4. CORRECTIONS

If you notice a mistake during a value input, simply press [→] to clear the last entered digit.

If you notice an input mistake before you press the arithmetic operation key, simply press [C/CE] to clear the value and enter it again.
In a series of calculations, you can correct errors in intermediate results by recalculating correctly when the error appears and then continuing with the original series from where you interrupted it.

If you make a mistake by pressing the wrong key when entering [+], [−], [X], [÷], [y^x], or [INV] [$\sqrt[x]{y}$] simply press the appropriate key to correct. In this case, the most recently pressed key operation is used, but it retains the order of precedence of the original operation entered.

5. OVERFLOW OR ERROR CHECK

Overflow or error is indicated by the " -E- " sign and stops further calculation.
Overflow or error occurs :

a) When an answer, whether intermediate or final, or accumulated total in the memory is more than 1×10^{100} (" -E- " sign appears).
b) When function calculations are performed with a number exceeding the input range (" -E- " sign appears).
c) When the ranges for any of the number systems used in the BASE-N mode are exceeded. (" -E- " sign appears).
d) When unreasonable operations are performed in statistical calculations (" -E- " sign appears).
e) When the total number of levels of explicity and/or implicity (with addition-subtraction versus multiplication-division including [y^x] and [$\sqrt[x]{y}$]) nested parentheses exceeds 6, or more than 15 pairs of parentheses are used.
Ex.) You have pressed the [(] key 16 times continuously before designating the sequence of [2] [+] [3] [x].

To release these overflow checks, press the [C/CE] key.

Memory protection :

The content of the memory is protected against overflow or error and the accumulated total is recalled by pressing the [RM] key after the overflow check is released by the [C/CE] key.

6. BATTERY REPLACEMENT

- **Power source**
  This calculator uses two power sources : a silicon solar cell and a alkaline manganese battery (LR43)

- **When to replace battery**
  Memory contents disappear or when the display darkens under poor light conditions and cannot be restored by pressing the [AC] key.

- **Precautions about battery**
  Improper handling of the battery may cause battery fluid leakage or explosion. So keep the following in mind :

- Look at "+" on battery to make sure the battery is installed in the correct orientation.
- Do not leave exhausted battery in calculator. Fluid may leak from the battery and damage the calculator.
- Should the battery fluid leak, wipe it off completely from the case.
- Do not throw the battery in fire or into water, otherwise it may explode.
- Keep the battery out of the reach of children.

- **Battery replacement procedure**

a) Remove one screw on the back of the calculator. Then, slide the body slightly toward the direction of the arrow. (Fig.1)

! BE CAREFUL NOT TO LOSE THESE SCREWS.

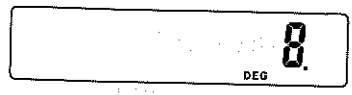
b)Slide the calculator back casing slightly and lift it to remove.

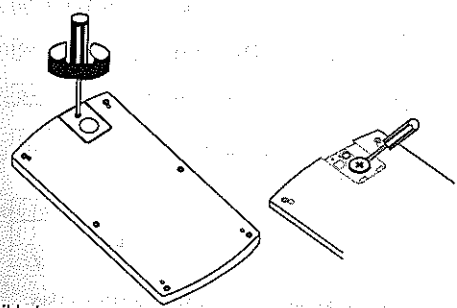
c)Use a ball-point pen to remove the old battery as shown below. (Fig.2)

d)Install new battery so that the (+) side points upward.

e)Put back the back casing and tighten the four screws.

f)Check to see if the following is displayed. If not, or nothing is displayed, repeat the above procedure all over again.





silde to open

Fig 1

Fig 2

7. NORMAL CALCULATIONS

- Calculations can be performed in the same sequence as the written formula (true algebraic logic).
- Nesting of up to 15 parentheses at 6 levels is allowed.

7-1) Four basic calculations (incl. parenthesis calculations)

EXAMPLE	OPERATION	READ-OUT
23 + 4.5 - 53 =	23 [+] 4 [.] 5 [−] 53 [=]	-25.5
56 x (-12) ÷ (-2.5) =	56 [x] 12 [+/-] [÷] 2 [.] 5 [+/-] [=]	268.8
$2+3 \times (1 \times 10^{20})$ =	2 [+] 3 [x] 1 [EXP] 20 [=]	6.666666667 19
$\frac{7 \times 8}{4 \times 5}$ (= 56 - 20)=	7 [x] 8 [÷] 4 [x] 5 [=]	36.
1 + 2 - 3 x 4 ÷ 5 + 6 =	1 [+] 2 [−] 3 [x] 4 [÷] 5 [+] 6 [=]	6.6
$\frac{6}{4 \times 5}$ =	4 [x] 5 [+] 6 [INV] [x⇔y] [=]	0.3
2x{7 + 6 x (5 + 4)}=	2 [x] [(]	0. ( )
	7 [+] 6 [x] [(]	0. ( )
	5 [+] 4 [)] [)] [=]	122.

* It is unnecessary to press the [)] key before the [=] key.

10 - {7 x (3 + 6)} =	10 [−] [(] 7 [x] [(] 3 [+] 6 [=]	- 53.

7-2) Constant calculations

3 + 2.3 =	3 [+] [+] 2 [.] 3 [=]	5.3.
6 + 2.3 =	6 [=]	8.3.
2.3 x 12 =	2 [.] 3 [x] [x] 12 [=]	27.6.
(- 9) x 12 =	9 [+/-] [=]	- 108.
17+17+17+17=	17 [+] [+] [=]	34.
	[=]	51.
	[=]	68.
1.7^2 =	1 [.] 7 [x] [x] [=]	2.89.
1.7^3 =	[=]	4.913.
1.7^4 =	[=]	8.3521.
4x3x6	4 [x] [x] [(] 3 [x] 6 [=]	72.
(-5)x3x6	5 [+/-] [=]	-90.
$\frac{56}{4 \times (2+3)}$ =	56 [+] [÷] [(] 4 [x] [(] 2 [+] 3 [=]	2.8.
$\frac{23}{4 \times (2+3)}$ =	23 [=]	1.15.

7-3) Memory calculations using the independent memory

- When a new number is entered into the independent memory by the [X→M] key, the previous number stored is automatically cleared and the new number is put in the independent memory.
- The "M" sign appears when a number is stored in the independent memory.
  To clear the contents press [0] [X→M] or [AC] [X→M] in sequence.
- The content of "M" and display data are exchanged by the [X↔M] key.

```
 53+6 =  59
 23-8 =  15
 56x2 =  112
+) 99+4 =  24.75
          210.75
```

Keys		Display
53 [+] 6 [=]	[X→M]	M 59.
23 [−] 8 [=]	[M+]	M 15.
56 [x] 2 [=]	[M+]	M 112.
99 [+] 4 [=]	[M+]	M 24.75
	[RM]	M 210.75

7+7-7+(2x3)+(2x3)+(2x3)-(2x3) =

Keys		Display
7	[X→M]	M 7.
[M+]	[+/-] [M+] 2 [x] 3	M 19.
[=]	[M+] [M+] [M+] [+/-] [M+] [RM]	

```
 12x3 =  36
-) 45x3 =  135
 78x3 =  234
          135
```

Keys		Display
12 [x] [x] 3 [=]	[X→M]	M 36.
45 [=]	[+/-] [M+]	M -135.
78 [=]	[M+]	M 234.
	[RM]	M 135.

Continuing from above

Keys		Display
2 [+] 3 [x] 4 [INV] [X↔M] [=]		M 407.
	[RM]	M 4.

7-4) Fraction calculations

- Total of integer, numerator and denominator must be within 10 digits (includes division marks).
- A fraction can be transferred to the memory.
- When a fraction is extracted, the answer is displayed as a decimal.
- A press of [AB/C] key after the [=] key converts the fraction answer to the decimal scale.

$$4\frac{5}{6} \times \left(3\frac{1}{4} + 1\frac{2}{3}\right) \div 7\frac{8}{9} =$$

Keys		Display
4 [A⁶/c] 5 [A⁶/c] 6 [x] [(] 3 [A⁶/c]		
1 [A⁶/c] 4 [+] 1 [A⁶/c] 2 [A⁶/c] 3 [)]		
[÷] 7 [A⁶/c] 8 [A⁶/c] 9 [=]		3 _7 J568.
	[A⁶/c]	3.012323944
	[A⁶/c]	3 _7 J568.

$$2\frac{4}{5} + \frac{3}{4} - 1\frac{1}{2}$$

Keys		Display
2 [A⁶/c] 4 [A⁶/c] 5 [+] 3 [A⁶/c] 4 [−]		3 _11J 20
	[A⁶/c]	3.55
1 [A⁶/c] 1 [A⁶/c] 2 [=]		2 _1 J20.

$$(1.5\times10^{7}) - \{(2.5\times10^{6}) \times \frac{3}{100}\} =$$

Keys	Display
1 [•] 5 [EXP] 7 [−] 2 [•]	
5 [EXP] 6 [x] 3 [A⁶/c] 100 [=]	149250000.

• During a fraction calculation, a figure is reduced to the lowest terms by pressing a function command key ([+], [x], [+], or [−]) or the [=] key if the figure is reducible.

$3\frac{456}{78} = 8\frac{11}{13}$ (Reduction)

3 [A b/c] 456 [A b/c] 78	3_456⌋78.
[=]	8_11⌋13

- By pressing [INV] [D/C] continuously, the displayed value will be converted to the improper fraction.

$\frac{12}{45} - \frac{32}{56} =$

Continuing from above [INV] [D/C]	115⌋13.
12 [A b/c] 45 [−]	4⌋15.
32 [A b/c] 56 [=]	-32⌋105.

- The answer in a calculation performed between a fraction and a decimal is displayed as a decimal.

$\frac{41}{52} \times 78.9 =$

41 [A b/c] 52 [x]	41⌋52.
78 [•] 9 [=]	62.20961538

7-5) Percentage calculations

12% of 1500	1500 [x] 12 [INV] [%] [=]	180.
Percentage of 660 against 880		
	660 [÷] 880 [INV] [%] [=]	75.
15%add-on of 2500	2500 [+] 15 [INV] [%]	375.
	[=]	2875.
25% discount of 3500	3500 [−] 25 [INV] [%]	875.
	[=]	2625.

If you made $80 last week and $100 this week, what is the percent of the new income to the old income?

100 [+] 80 [INV] [%] [=]	125.
	(%)

12% of 1200	12 [INV] [%] [x] [x] 1200 [=]	144.
18% of 1200	18 [INV] [%] [=]	216.
23% of 1200	23 [INV] [%] [=]	276.
26% of 2200	2200 [x] [x] 26 [INV] [%] [=]	572.
26% of 3300	3300 [=]	858.
26% of 3800	3800 [=]	988.
Percentage of 30 against 192		
	30 [+] [+] 192 [INV] [%] [=]	15.625
Percentage of 156 against 192	156 [=]	81.25

- How many percent is 138 grams to 150 grams ?
- How many percent is 129 grams to 150 grams ?

138 [÷] [÷] 150 [INV] [%] [=]	92.
129 [=]	86.

8. BINARY / OCTAL / DECIMAL / HEXADECIMAL CALCULATIONS

- Binary / octal / decimal / hexadecimal calculations and conversions are performed in the BASE-N mode.
- Base values are set by pressing one of the following keys :

KEY	BASE
[MODE] [DEX]	Decimal
[MODE] [HEX]	Hexadecimal
[MODE] [BIN]	Binary
[MODE] [OCT]	Octal

- Calculation range after conversion

BASE	DIGITS	RANGE
Binary	10 digits	Positive : $0 \leqq x \leqq 111111111$ Negative : $1000000000 \leqq x \leqq 1111111111$
Octal	10digits	Positive : $0 \leqq x \leqq 3777777777$ Negative : $4000000000 \leqq x \leqq 7777777777$
Decimal	10 digits	Positive : $0 \leqq x \leqq 9999999999$ Negative : $-9999999999 \leqq x < 0$
Hexadecimal	10 digits	Positive : $0 \leqq x \leqq 2540BE3FF$ Negative : $FDABF41C01 \leqq x \leqq FFFFFFFFFF$

- Valid values

BASE	VALUE
Binary :	0, 1
Octal :	0, 1, 2, 3, 4, 5, 6, 7
Decimal :	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Hexadecimal :	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- Values other than noted above cannot be entered while each respective base is in effect. The letters B and D are displayed in lower case for hexadecimal.
- You cannot specify the unit of angular measurement (degrees, radians, grads) or the display format (FIX, SCI) while the calculator is in the BASE-N mode. Such specifications can only be made if you first exit the BASE-N mode.

8-1) Binary / Octal / Decimal / Hexadecimal conversions

Conversion of 22_{10} to binary

22 [MODE] [BIN] → 10110.

Conversion of 22_{10} to octal

[MODE] [OCT] → 26.

Conversion of 22_{10} to hexadecimal

[MODE] [HEX] → 16.

Conversion of 513_{10} to binary

513 [MODE] [BIN] → 0.

- Conversion may sometimes be impossible if calculation range of original value is greater than range of result value.

Conversion of $7FFFFFFF_{16}$ to decimal

[MODE] [HEX] 7FFFFFFF [MODE] [DEC] → 2147483647.

Conversion of 4000000000_8 to decimal

[MODE] [OCT] 4000000000 [MODE] [DEC] → -536870912.

Conversion of 123456_{10} to octal

123456 [MODE] [OCT] → 361100.

Conversion of 1100110_2 to decimal

[MODE] [BIN] 1100110 [MODE] [DEC] → 102.

8-2) Negative expressions

- Negative values can be obtained by pressing the [NEG] key. The two's complement is produced for negation of binary, octal, decimal and hexadecimal values.

Negative of 1010_2

[MODE] [BIN] 1010 [INV] [NEG] → BIN 1111110110.

Conversion to decimal [MODE] [DEC] → -10.

Negation of 1_2 [MODE] [BIN] 1 [INV] [NEG] → BIN 1111111111.

Negation of 2_8 [MODE] [OCT] 2 [INV] [NEG] → OCT 7777777776.

Negation of 34_{16} [MODE] [HEX] 34 [INV] [NEG] → HEX FFFFFFFFCC.

8-3) Binary / Octal / Decimal / Hexadecimal calculations

- Memory and parenthesis calculations can be used with binary, octal, decimal and hexadecimal number systems.

$10111_2 + 11010_2 = 110001_2$

[MODE] [BIN] 10111 [+] 11010 [=] → BIN 110001.

$123_8 \times ABC_{16}$
$= 37AF4_{16}$
$= 228084_{10}$

[MODE] [OCT] 123 [X]
[MODE] [HEX] ABC [=] → HEX 37AF4.
[MODE] [DEC] → 228084.

$1F2D_{16} - 100_{10}$

[MODE] [HEX] 1F2D [−]
$= 7881_{10}$ [MODE] [DEC] 100 [=] → 7881.
$= 1EC9_{16}$ [MODE] [HEX] → HEX 1EC9.

$7654_8 + 12_{10}$

[MODE] [OCT] 7654 [+]
$= 334.33\ldots._{10}$ [MODE] [DEC] 12 [=] → 334.3333333
$= 516_8$ [MODE] [OCT] → OCT 516.

- Fractional parts of calculation results are truncated.

$110_2 + 456_8 \times 78_{10} \div 1A_{16}$
$= 390_{16}$
$= 912_{10}$

[MODE] [BIN] 110 [+] [MODE] [OCT] 456 [X]
[MODE] [DEC] 78 [+] [MODE] [HEX] 1A [=] → HEX 390.

[MODE] [DEC] → 912.

- Multiplication and division are given priority over addition and subtraction in mixed calculations.

$BC_{16} \times (14_{10} + 69_{10}) = 15604_{10}$
$= 3CF4_{16}$

[MODE] [HEX] BC [X] [(] [MODE] [DEC]
14 [+] 69 [)] [=] → 15604.
[MODE] [HEX] → HEX 3CF4.

$23_8 + 963_{10} = 982_{10}$

MODE OCT 23 X→M + MODE DEC 963 = | M 982.

$23_8 + 101011_2 = 111110_2$

RM + MODE BIN 101011 = | M 111110.

$2A56_{16} \times 23_8 = 32462_{16}$

MODE HEX 2A56 × RM = | M 32462.

8-4) Logical operations

- The AND, OR, XOR, XNOR, NEG and NOT keys can be used to perform the respective binary, octal, decimal and hexadecimal logical operations.

19_{16} AND $1A_{16} = 18_{16}$

MODE HEX 19 AND 1A = | HEX 18.

1110_2 AND $36_8 = 1110_2$

MODE BIN 1110 AND MODE OCT 36 = | OCT 16.

MODE BIN | BIN 1110.

23_8 OR $61_8 = 63_8$

MODE OCT 23 OR 61 = | OCT 63.

120_{16} OR $1101_2 = 12D_{16}$

MODE HEX 120 OR MODE BIN 1101 = | BIN 100101101.

MODE HEX | HEX 12d.

5_{16} XOR $3_{16} = 6_{16}$

MODE HEX 5 XOR 3 = | HEX 6.

$2A_{16}$ XNOR $5D_{16} = FFFFFFFF88_{16}$

MODE HEX 2A XNOR 5D = | HEX FFFFFFFF88.

1010_2 AND $(A_{16}$ OR $7_{16}) = 1010_2$

MODE BIN 1010 AND (MODE HEX A

OR 7) = | HEX A.

MODE BIN | BIN 1010.

$1A_{16}$ AND $2F_{16} = A_{16}$

MODE HEX 1A AND AND 2F = | HEX A.

$3B_{16}$ AND $2F_{16} = 2B_{16}$ 3B = | HEX 2b.

NOT of 10110_2 MODE BIN 10110 NOT | BIN 1111101001.

NOT of 1234_8 MODE OCT 1234 NOT | OCT 7777776543.

NOT of $2FFFED_{16}$ MODE HEX 2FFFED NOT | HEX FFFFd00012.

9. FUNCTION CALCULATIONS

Scientific function keys can be utilized as subroutines of four basic calculations (including parenthesis calculations).

- This calculator computes as $\pi = 3.141592654$ and $e = 2.718281828$
- In some scientific functions, the display disappears momentarily while complicated formulas are being processed. So do not enter numerals or press the function key until the previous answer is displayed.
- You cannot specify the unit of angular measurement (degrees, radians, grads) or the display format (FIX, SCI) while the calculator is performing BASE-N calculation. Such specifications can only be made if you first exit the BASE-N mode by pressing the [AC] key.
- For each input range of the scientific functions, see page 39.

9-1) Sexagesimal ↔ Decimal conversion

The [→DEG] key converts the sexagesimal figure (degree, minute and second) to decimal notation. Operation of [INV] [→DMS] converts the decimal notation to the sexagesimal notation.

14°25'36" = 14 [•] 2536 [→DEG] → 14.42666667

[INV] [→DMS] → 14°25'36"

- For the DMS display format, the integer part of the display data is regarded as degree, 2 digits below the decimal point as minute, and 3rd digits and below as second. Therefore 14°25'36" = 14.2536

  14. Degree 25 Minute 36 Second

9-2) Angular conversion of data

45°= 0.785398163 rad = 50 grad

45 [INV] [DRG►] → RAD 0.785398163.

[INV] [DRG►] → GRAD 50.

[INV] [DRG►] → DEG 45.

9-3) Trigonometric / Inverse trigonometric functions

$\sin(\frac{\pi}{6}\text{rad}) =$ "RAD" [INV] [π] [÷] 6 [=] [sin] → RAD 0.5

cos 63°52'41"=

"DEG" 63 [•] 5241 [• DEG] → DEG 63.87805556

[cos] → 0.440283084

tan (- 35 gra) = "GRAD" 35 [+/-] [tan] → GRAD -0.612800788

2 • sin45°xcos65°=

"DEG" 2 [X] 45 [sin] [X] 65 [cos] [=] → 0.597672477

$\cot 30° = \frac{1}{\tan 30°} =$ "DEG" 30 [tan] [1/x] → 1.732050808

$\sec\left(\frac{\pi}{3}\text{ rad}\right) = \frac{1}{\cos\left(\frac{\pi}{3}\text{ rad}\right)}$

"RAD" (INV) (π) (+) 3 (=) (cos) (1/x) | RAD 2.

$\text{cosec } 30° = \frac{1}{\sin 30°}$ = "DEG" 30 (sin) (1/x) | 2.

$\cos^{-1}\frac{\sqrt{2}}{2}$ =

"RAD" 2 (INV) (√) (+) 2 (=) (INV) (cos-1) | 0.785398163

$\tan^{-1}0.6104$ = "DEG" (•) 6104 (INV) (tan-1) | 31.39989118

(INV) (•) (DMS) | 31°23'59"6

9-4) Hyperbolic functions and inverse hyperbolic functions

sinh 3.6= 3 (•) 6 (HYP) (sin) | 18.28545536

tanh 2.5= 2 (•) 5 (HYP) (tan) | 0.986614298

cosh 1.5 - sinh 1.5 =

1 (•) 5 (X• M) (HYP) (cos) (−) | M 2.352409615

(RM) (HYP) (sin) (=) | M 0.22313016

(ln) | M -1.5

$\sinh^{-1} 30$ = 30 (INV) (HYP) (sin-1) | 4.094622224

Solve tanh 4x = 0.88

$x = \frac{\tanh^{-1} 0.88}{4}$ =

(•) 88 (INV) (HYP) (tan-1) (÷) 4 (=) | 0.343941914

9-5) Common & Natural logarithms / Exponentiations (Common antilogarithms, Natural antilogarithms, Powers and Roots)

$\log 1.23$ (=$\log_{10} 1.23$) = 1 (•) 23 (log) | 0.089905111

Solve $4^x = 64$.

$x = \frac{\log 64}{\log 4}$ 64 (log) (÷) 4 (log) (=) | 3.

$\ln 90$ (= $\log_e 90$) = 90 (ln) | 4.49980967

log 456 + ln 456 =

456 (X→M) (log) (+) (RM) (ln) (=) | M 0.434294481

$10^{0.4} + 5 \cdot e^{-3}$ = (•) 4 (INV) (10^x) (+) 5 (X) 3 (+/-) (INV) (e^x) (=) | 2.760821773

$5.6^{2.3}$ = 5 (•) 6 (y^x) 2 (•) 3 (=) | 52.58143837

$123^{1/7}$ (= $\sqrt[7]{123}$) = 123 (INV) ($\sqrt[x]{y}$) 7 (=) | 1.988647795

$(78 - 23)^{-12}$ =

( ) 78 (−) 23 ( ) (y^x) 12 (+/-) (=) | 1.305111829 - 21

$3^{12} + e^{10} =$ 3 [y^x] 12 [+] 10 [INV] [e^x] [=] | 553467.4658

log sin 40° + log cos 35°
40 [sin] [log] [+] 35 [cos] [log] [=] | - 0.278567983

$15^{1/5} + 25^{1/6} + 35^{1/7} =$
15 [INV] [$\sqrt[y]{}$] 5 [+] 25 [INV] [$\sqrt[y]{}$]
6 [+] 35 [INV] [$\sqrt[y]{}$] 7 [=] | 5.090557037

9-6)Square roots, Cube roots, Squares, Reciprocals & Factorials

$\sqrt{2} + \sqrt{3} \times \sqrt{5} =$
2 [INV] [$\sqrt{}$] [+] 3 [INV] [$\sqrt{}$] [x] 5
[INV] [$\sqrt{}$] [=] | 5.287196909

$\sqrt[3]{5} + \sqrt[3]{-27} =$
5 [INV] [$\sqrt[3]{}$] [+] 27 [+/-] [INV] [$\sqrt[3]{}$] [=] | -1.290024053

$123 + 30^2 =$ 123 [+] 30 [x^2] [=] | 1023.

$\frac{1}{\frac{1}{3} - \frac{1}{4}} =$ 3 [1/x] [−] 4 [1/x] [=] [1/x] | 12.

8! (= 1 x 2 x 3 x .... x 7 x 8)= 8 [INV] [n!] | 40320

9-7) Miscellaneous functions (FIX, SCI, ENG, FLO)

1.234 +1.234 =
"FIX2" ([INV] [FIX] 2) 1 [•] 234 [+] | 1.23
1 [•] 234 [=] | 2.47
[INV] [FIX] [•] | 2.468

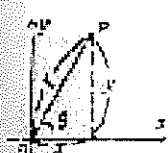
1÷3+1÷3 =
"FIX2" ([INV] [FIX] 2) 1 [÷] 3 [+] | 0.33
[INV] [SCI] | 3.33-01
1 [÷] 3 [=] | 6.67-01
[INV] [FLO] | 0.67
[INV] [FIX] [•] | 0.666666666

123m x 456 = 56088m 123 [x] 456 [=] | 56088
= 56.088km [INV] [ENG] | 56.088 03
7.8g ÷ 96 = 0.08125g
7 [•] 8 [÷] 96 [=] | 0.08125
= 81.25mg [INV] [ENG] | 81.25 - 03

9-8) Polar to rectangular co-ordinates conversion

Formula : x = r • cosθ y = r • sinθ
Ex.) Find the value of x and y when the point P is shown as θ = 60°and length r = 2 in the polar co-ordinates.

"DEG" 2 [INV] [X• Y] 60 [INV] [P• R] | 1.
(x)
[INV] [X• Y] | 1.732050808
(y)
[INV] [X• Y] | 1.
(x)



9-9) Rectangular to polar co-ordinates conversion

Formula : $r = \sqrt{x^2 + y^2}$

$$\theta = \tan^{-1}\frac{y}{x} \quad (-180° < \theta \leqq 180°)$$

Ex.)Find the length r and angle θ in radian when the point P is shown as x = 1 and y = $\sqrt{3}$ in the rectangular coordinates.

"RAD" 1 [INV] [X·Y] 3 [INV] [√] [R·P]	2. (r)
[INV] [X·Y]	1.047197551 (θ in radian)
[INV] [X·Y]	2. (r)

10. STATISTICAL CALCULATIONS

- Set the function mode to "SD" by pressing [MODE] [SD]

Ex.)Find $\acute{O}_{n-1}$, $\acute{O}_n$, x, n, Σx and Σx^2 based on the data 55, 54, 51, 55, 53, 53, 54, 52.

[MODE] [SD] [55] [DATA] [54] [DATA] [51] [DATA] [55] [DATA] [53] [X→M] [DATA] [RM] [DATA] [54] [DATA] [52] [DATA] → sD 8.

(Sample standard deviation)	[INV] [$\acute{O}_{n-1}$]	sD 1.407885953
(Population standard deviation)	[INV] [$\acute{O}_n$]	sD 1.316956719
(Arithmetical mean)	[INV] [$\bar{x}$]	sD 53.375
(Number of data)	[INV] [n]	sD 8.
(Sum of value)	[INV] [Σx]	sD 427.
(Sum of square value)	[INV] [Σx^2]	sD 22805.

Note : The sample standard deviation $\acute{O}_{n-1}$ is defined as

$$\sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}}$$

the population standard deviation $\acute{O}_n$ is defined as

$$\sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n}}$$

and the arithmetical mean x is defined as

$$\frac{\Sigma x}{n}$$

- Pressing [σn-1], [σn], [x̄], [n], [Σx], [Σx²] key need not be done sequentially.

Ex.) Find n, x & σ_{n-1} based on the data : 1.2, - 0.9 , -1.5, 2.7, -0.6, 0.5, 0.5, 0.5, 0.5, 1.3, 1.3, 1.3, 0.8, 0.8, 0.8, 0.8, 0.8.

[MODE] [SD] 1 [•] 2
[DATA] [•] 9 [+/-] [DATA] → sd 2.

(1) (Mistake) 2 [•] 5 [+/-] → sd -2.5

(1) (To correct) [CCE] → sd 0.
1 [•] 5 [+/-] [DATA] → sd 3.
2 [•] 7 [DATA] → sd 4.

(2) (Mistake) [DATA] → sd 5.

(3) (Mistake) 1 [•] 6 [+/-] [DATA] → sd 6.

(3) (To correct) 1 [•] 6 [+/-] [INV] [DEL] → sd 5.
[•] 6 [+/-] [DATA] → sd 6.

(2) (To correct) 4 [INV] [DEL] → sd 5.
[•] 5 [X] → sd 0.5
4 [DATA] → sd 9.

(4) (Mistake) 1 [•] 4 [X] → sd 1.4

(4) (To correct) [CCE] → sd 0.
1 [•] 3 [X] 3 [DATA] → sd 12.
[•] 8 [X] → sd 0.8

(4) (Mistake) 6 [DATA] → sd 18.

(5) (To correct) [•] 8 [X] 6 [INV] [DEL] → sd 12.
[•] 8 [X] 5 [DATA] → sd 17.
[INV] [n] → sd 17.
[INV] [x̄] → sd 0.635294117
[INV] [σn-1] → sd 0.95390066

11. SPECIFICATIONS

BASIC OPERATIONS

4 basic calculations, constants for + / - / x / ÷ / y^x / $\sqrt[x]{y}$ / AND / OR / XOR / XNOR / NEG, parenthesis calculations and memory calculations.

BUILT-IN FUNCTIONS

Trigonometric / inverse trigonometric functions (with angle in degrees, radians or grads), hyperbolic / inverse hyperbolic functions, common / natural logarithms, exponential functions (common antilogarithms, natural antilogarithms), powers, roots, square roots, cube roots, squares, reciprocals, factorials, conversion of coordinate system (R→P , P→R), π, fractions, percentages, binary, octal, decimal and hexadecimal calculations and logical operations.

STATISTICAL FUNCTIONS

Sample standard deviation, Population standard deviation, Arithmetical mean, Number of data, Sum of value and Sum of square value.

MEMORY

1 independent memory.

CAPACITY

Entry / basic calculations

10-digit mantissa, or 10-digit mantissa plus 2-digit exponent up to $10^{\pm 99}$.

Fraction calculations

Total of integer, numerator and denominator must be within 10 digits (includes division marks).

Scientific functions Input range

sin x / cos x / tan x	$\|x\| < 4.5 \times 10^{10}$ degrees ($< 25 \times 10^7$ π rad, $< 5 \times 10^{10}$grad)
$\sin^{-1} x$ / $\cos^{-1} x$	$\|x\| \leqq 1$
$\tan^{-1} x$	$\|x\| < 10^{100}$
sinhx / coshx	$\|x\| \leqq 230.2585092$
tanhx	$\|x\| < 10^{100}$
$\sinh^{-1} x$	$\|x\| < 5 \times 10^{99}$
$\cosh^{-1} x$	$1 \leqq x < 5 \times 10^{99}$
$\tanh^{-1} x$	$\|x\| < 1$
logx /lnx	$10^{-99} \leqq x < 10^{100}$
e^x	$-10^{100} < x \leqq 230.2585092$
10^x	$-10^{100} < x < 100$
y^x	$y > 0 \rightarrow -10^{100} < x \cdot \log y < 100$ $y = 0 \rightarrow x > 0$ $y < 0 \rightarrow x$: integer or 1/2n + 1 (n : integer)
$\sqrt[x]{y}$	$y > 0 \rightarrow x \neq 0 : -10^{100} < 1/x \cdot \log y < 230.2585092$ $y = 0 \rightarrow x > 0$ $y < 0 \rightarrow x$: odd number or 1/n (n : integer)

$\sqrt{x}$	$0 \leqq x < 10^{100}$
x^2	$\lvert x \rvert < 10^{50}$
$\sqrt[3]{x}$	$\lvert x \rvert < 10^{100}$
$1/x$	$\lvert x \rvert < 10^{100}$ ($x \neq 0$)
$n!$	$0 \leqq x < 69$ (x : integer)
REC → POL	$\sqrt{x^2 + y^2} < 10^{100}$
POL → REC	$\lvert\theta\rvert < 4.5 \times 10^{10}$ degrees ($< 25 \times 10^7$ π rad, $< 5 \times 10^{10}$ grad), $0 \leqq r \leqq 10^{100}$
DMS → DEG	$\lvert x \rvert \leqq 10^{100}$
DEG → DMS	$\lvert x \rvert \leqq 10^7$
π	10 digits

Binary	Positive :0 ≦ x ≦ 111111111
	Negative: 1000000000 ≦ x ≦ 1111111111
Octal	Positive : 0 ≦ x ≦ 3777777777
	Negative: 4000000000 ≦ x≦ 7777777777
Decimal	Positive : 0 ≦x ≦ 9999999999
	Negative: - 9999999999 ≦ x < 0
Hexadecimal	
	Positive : 0 ≦ x ≦ 2540BE3FF
	Negative: FDABF41C01 ≦ x ≦ FFFFFFFFFF

- Errors are cumulative with such internal continuous calculations as x^y , $\sqrt[x]{y}$, n!, $\sqrt[3]{}$ so accuracy may be adversely affected.
- In tanx, $\lvert x \rvert \neq 90°$ x (2n + 1), $\lvert x \rvert \neq \pi$ / 2rad x (2n + 1), $\lvert x \rvert \neq$ 100grad x (2n + 1) (n is an integer.)
- With sinhx and tanhx, errors are cumulative and adversely affected when x = 0.

READ-OUT

Liquid crystal display, suppressing unnecessary 0's (zeros).

POWER SOURCE

Power source : solar cell, alkaline manganese battery (LR43).

AMBIENT TEMPERATURE RANGE

0°C - 40°C (32°F - 104°F)

DIMENSIONS

155.5mmH x 76.5mmW x 16mmD

NET WEIGHT

102g