



## Statistical Calculations (SD Mode)

- Press **MODE** **▢** to enter the SD Mode for statistical calculations using standard deviation.
- If FIX or SCI is on the display, press **MODE** **9** first.
- Data input always starts with **SHIFT** **SAC**.

**Example:** To calculate  $\sigma_{n-1}$ ,  $\sigma_n$ ,  $\bar{x}$ ,  $n$ ,  $\Sigma x$ , and  $\Sigma x^2$  for the following data: 55, 54, 51, 55, 53, 53, 54, 52

Enter SD Mode. **MODE** **▢** **SD** **0.**

Input Data. **SHIFT** **SAC** **55** **DATA**  
**54** **DATA** **51** **DATA**  
**55** **DATA** **53** **DATA** **DATA**  
**54** **DATA** **52** **DATA** **SD** **52.**

Sample standard deviation **SHIFT** **σn-1** **1.407885953**

Population standard deviation **SHIFT** **σn** **1.316956719**

Arithmetic mean **SHIFT** **Σx** **53.375**

Number of data **SHIFT** **n** **8.**

Sum of values **SHIFT** **Σx** **427.**

Sum of squares of values **SHIFT** **Σx²** **22805.**

- DATA** **DATA** inputs the same data twice (as above).
- You can also input multiple entries of the same data using **X**. To input the data 110 ten times, for example, press **110** **X** **10** **DATA**.
- The above results can be obtained in any order, and not necessarily that shown above.
- To delete data you have just input, press **SHIFT** **DEL**.

### ■ Making Corrections During Data Input

**Example 1:** To change data you have just input.

Correct	Actual	Correction
51 <b>DATA</b>	50 <b>DATA</b>	<b>SHIFT</b> <b>DEL</b> <b>51</b> <b>DATA</b>
130 <b>X</b> <b>31</b> <b>DATA</b>	120 <b>X</b> <b>31</b> <b>DATA</b>	<b>AC</b> <b>130</b> <b>X</b> <b>31</b> <b>DATA</b>
130 <b>X</b> <b>31</b> <b>DATA</b>	120 <b>X</b> <b>31</b> <b>DATA</b>	<b>AC</b> <b>130</b> <b>X</b> <b>31</b> <b>DATA</b>

**Example 2:** To change data you previously input.

Correct	Actual	Correction
51 <b>DATA</b>	49 <b>DATA</b>	<b>49</b> <b>SHIFT</b> <b>DEL</b> <b>51</b> <b>DATA</b>
130 <b>X</b> <b>31</b> <b>DATA</b>	120 <b>X</b> <b>30</b> <b>DATA</b>	<b>120</b> <b>X</b> <b>30</b> <b>SHIFT</b> <b>DEL</b> <b>130</b> <b>X</b> <b>31</b> <b>DATA</b>

## Technical Information

### ■ Keys and Their Functions

#### • General

All clear **AC**

Arithmetic calculations **+**, **-**, **X**, **÷**, **=**

Backspace **▸**

Clear (retains memory) **C**

Number input **0** - **9**, **▢**

Power on; All reset **ON**

Sign change **±**

#### • Memory

Memory in **SHIFT** **(Min)**

Memory minus **SHIFT** **(M-)**

Memory plus **SHIFT** **(M+)**

Memory recall **SHIFT** **(MR)**

#### • Special

Display/memory swap **SHIFT** **(X-Y)**, **SHIFT** **(X-M)**

Exponent **EXP**

Internal rounding **SHIFT** **(RND)**

Parentheses **(**, **)**, **(-)**

Pi (3.1415926536) **SHIFT** **(π)**

Select mode **MODE**

Sexagesimal **1** - **9**, **SHIFT** **(1/2)**

Shifts key functions **SHIFT**

#### • Scientific Functions

Arc cosine **SHIFT** **(COS)**

Arc sine **SHIFT** **(SIN)**

Arc tangent **SHIFT** **(TAN)**

Common antilogarithm **SHIFT** **(10<sup>x</sup>)**

Common logarithm **log**

Convert to degrees **SHIFT** **(MODE)** **4**

Convert to grads **SHIFT** **(MODE)** **6**

Convert to radians **SHIFT** **(MODE)** **5**

Cosine **COS**

Cube **SHIFT** **(x<sup>3</sup>)**

Cube root **SHIFT** **(√<sup>3</sup>)**

Engineering **SHIFT** **(ENG)**, **SHIFT** **(ENG)**

Factorial **SHIFT** **(x!)**

Fraction\* **a/b**

Fraction\* **SHIFT** **(d/c)**

Hyperbolic **hyp**

Natural antilogarithm **SHIFT** **(e<sup>x</sup>)**

Natural logarithm **ln**

Percent **SHIFT** **(%)**

Polar-to-rectangular **SHIFT** **(P-R)**

Power **x<sup>y</sup>**

Random number **SHIFT** **(RAND)**

Reciprocal **SHIFT** **(1/x)**

Rectangular-to-polar **SHIFT** **(R-P)**

Root **SHIFT** **(x<sup>1/y</sup>)**

Sine **SIN**

Square **x<sup>2</sup>**

Square root **SHIFT** **(√)**

Tangent **TAN**

Permutation **SHIFT** **(nPr)**

Combination **SHIFT** **(nCr)**

\* fx-82SOLAR II/fx-260SOLAR II only

### • Statistics (SD Mode)

Arithmetic mean **SHIFT** **(Σx)**

Data delete **SHIFT** **(DEL)**

Data input **DATA**

Number of data **SHIFT** **(n)**

Population standard deviation **SHIFT** **(σn)**

Sample standard deviation **SHIFT** **(σn-1)**

Statistical register clear **SHIFT** **(SAC)**

Sum of squares of values **SHIFT** **(Σx²)**

Sum of values **SHIFT** **(Σx)**

### ■ Exponential Display Formats

This calculator can display up to 10 digits. Larger values are automatically displayed using exponential notation. In the case of decimal value, you can select between two formats that determine at what point exponential notation is used.

#### • NORM 1

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.

#### To switch between NORM 1 and NORM 2

Press **MODE** **9**. There is no indication on the display of which format is currently in effect, but you can determine the setting by performing the following calculation.

$$1 \div 200 = 5. \text{ }^{-03} \text{ NORM 1 format}$$

$$0.005 \text{ NORM 2 format}$$

- All of the examples in this manual show calculation results using the NORM 1 format.

### ■ When you have a problem.....

If calculation results are not what you expect or if an error occurs, perform the following steps.

- MODE** **0** (COMP mode)
- MODE** **4** (DEG mode)
- MODE** **9** (NORM mode)
- Check the formula you are working with to confirm it is correct.
- Enter the correct modes to perform the calculation and try again.

### ■ Making Corrections During Calculations

- If you make a mistake when inputting a value (but did not yet press an operator key), use **▸** to backspace and delete input digits one-by-one. Or you can press **C** to clear the input entirely and start again.
- In a series of calculations, press **C** while an intermediate result is displayed to clear only the last calculation performed.
- To change the operator key (**+**, **-**, **X**, **÷**, **x<sup>y</sup>**, **SHIFT** **(x<sup>1/y</sup>)**, etc.) you just pressed, simply press the correct operator key. In this case, the operator of the last key you press is used, but the operation retains the order of precedence of the operation for the first key you pressed.

### ■ Overflow or Error Check

The following conditions make further calculation impossible.

- When a result (whether intermediate or final) or a total accumulated in memory is greater than  $\pm 9.999999999 \times 10^{99}$ . (“E-” indicator appears on the display.)
- When function calculations are performed using a value that exceeds the input range. (“E-” indicator appears on the display.)
- When an illogical operation (such as an attempt to calculate  $\bar{x}$  and  $\sigma_n$  while  $n = 0$ ) is performed during statistical calculations. (“E-” indicator appears on the display.)
- When an illegal mathematical operation (such as division by zero) is performed. (“E-” indicator appears on display.)
- The total number of nested parentheses levels exceeds six, or when more than 18 pairs of parentheses are used. (“E-” indicator appears on the display.)

- To clear any of the above conditions, press **AC** and perform the calculation from the beginning.
- In the case of condition e, you could also press **C**. This clears the intermediate result just prior to the overflow, so you can continue with the calculation from that point.
- No error occurs when the result is within the range of  $+(1 \times 10^{-99})$  to  $-(1 \times 10^{-99})$ . Instead, the display shows all zeros.

### ■ Power Supply

This calculator is powered by a solar cell that converts available light into electrical power.

#### Solar Cell Precautions

- The solar cell requires at least 50 lux of light to provide power.
- If available light is too low, the display may become dim, calculation functions may become impossible, or the contents of the independent memory may be lost. If this happens, move to an area with more light.

### ■ Order of Operations and Levels

Operations are performed in the following order of precedence.

- Functions
  - $x^y$ ,  $x^{1/y}$ , R  $\rightarrow$  P, P  $\rightarrow$  R, nPr, nCr
  - $\times$ ,  $\div$
  - $+$ ,  $-$
- 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.
  - Registers L<sub>1</sub> through L<sub>6</sub> store operations. There are six registers, so calculations up to six levels can be stored.
  - Each level can contain up to three open parentheses, so parentheses can be nested up to 18 times.

- Example:** The following operation uses 4 levels and 5 nested parentheses.

$$2 \times ((3 + 4 \times (5 \div 6)) \div 7)$$

The table below shows register contents following the above input.

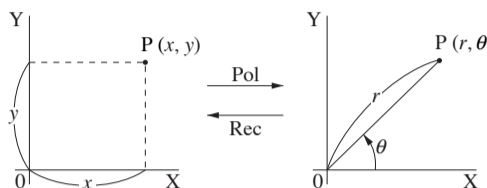
Register	Contents
x	4
L <sub>1</sub>	(( 5 +
L <sub>2</sub>	4 ×
L <sub>3</sub>	(( ( 3 +
L <sub>4</sub>	2 ×
L <sub>5</sub>	
L <sub>6</sub>	

### ■ Formulas and Ranges

The following are the formulas and ranges that are applied to various calculations that can be performed using this calculator.

#### Coordinate Transformation

- With polar coordinates,  $\theta$  can be calculated within a range of  $-180^\circ < \theta \leq 180^\circ$ . The calculation range is the same for radians and grads.



#### Permutation

- Input range:  $n \geq r \geq 0$  ( $n, r$ : integers)
- Formula:  $nPr = \frac{n!}{(n-r)!}$

#### Combination

- Input range:  $n \geq r \geq 0$  ( $n, r$ : integers)
- Formula:  $nCr = \frac{n!}{r!(n-r)!}$

#### Population Standard Deviation

$$\sigma_n = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}} = \sqrt{\frac{\sum x_i^2 - (\sum x_i)^2 / n}{n}}$$

#### Sample Standard Deviation

$$\sigma_{n-1} = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x_i^2 - (\sum x_i)^2 / n}{n-1}}$$

#### Arithmetic Mean

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} = \frac{\sum x}{n}$$

#### Input Ranges

Functions	Input Range
sin x cos x tan x	(DEG) $ x  < 9 \times 10^9$ (RAD) $ x  < 5 \times 10^7 \pi$ rad (GRA) $ x  < 1 \times 10^{10}$ grad
$\sin^{-1} x$ $\cos^{-1} x$	$ x  \leq 1$
$\tan^{-1} x$	$ x  < 1 \times 10^{100}$
sinh x cosh x	$ x  \leq 230.2585092$
tanh x	$ x  < 1 \times 10^{100}$
$\sinh^{-1} x$	$ x  < 5 \times 10^{99}$
$\cosh^{-1} x$	$1 \leq x < 5 \times 10^{99}$
$\tanh^{-1} x$	$ x  < 1$
log x / ln x	$1 \times 10^{-99} \leq x < 1 \times 10^{100}$
$10^x$	$-1 \times 10^{100} < x < 100$
$e^x$	$-1 \times 10^{100} < x \leq 230.2585092$
$\sqrt{x}$	$0 \leq x < 1 \times 10^{100}$
$x^2$	$ x  < 1 \times 10^{50}$
$x^3$	$ x  < 2.154434690 \times 10^{33}$
1/x	$ x  < 1 \times 10^{100}$ ; $x \neq 0$
$\sqrt[3]{x}$	$ x  < 1 \times 10^{100}$
x!	$0 \leq x \leq 69$ (x is an integer)
nPr/nCr	$0 \leq r \leq n$ $n < 1 \times 10^{10}$ (n and r are integers)
R $\rightarrow$ P	$\sqrt{x^2 + y^2} < 1 \times 10^{100}$
P $\rightarrow$ R	$0 \leq r < 1 \times 10^{100}$ (DEG) $ \theta  < 9 \times 10^9$ (RAD) $ \theta  < 5 \times 10^7 \pi$ rad (GRA) $ \theta  < 1 \times 10^{10}$ grad
o "	Input and Results: Total of hour, minutes, and seconds digits must be 10 or fewer (including separator symbols) Decimal $\leftrightarrow$ Sexagesimal Conversions $ x  \leq 2777777.777$
$x^y$	$x > 0$ : $-1 \times 10^{100} < y \log x < 100$ $x = 0$ : $y > 0$ 1 $x < 0$ : $y = n$ ; $\frac{1}{2n+1}$ (n is an integer) However: $-1 \times 10^{100} < y \log  x  < 100$
$x^{1/y}$	$x > 0$ : $y \neq 0$ $-1 \times 10^{100} < 1/y \log x < 100$ $x = 0$ : $y > 0$ $x < 0$ : $y = 2n+1$ ; $\frac{1}{m}$ ( $m \neq 0$ ; m and n are integers) However: $-1 \times 10^{100} < 1/y \log  x  < 100$
$a^b/c^*$	Total of integer, numerator, and denominator must be 10 digits or less (including division marks).

Functions	Input Range
SD	$ x  < 1 \times 10^{50}$ $ n  < 1 \times 10^{100}$ $\sigma_n, \bar{x}$ : $n \neq 0$ $\sigma_{n-1}$ : $n \neq 0, 1$

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- For a single calculation, calculation error is  $\pm 1$  at the 10th digit. (In the case of exponential display, calculation error is  $\pm 1$  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  $x^y$ ,  $x^{1/y}$ ,  $x!$ ,  $\sqrt[3]{x}$ , nPr, nCr, etc.) In the vicinity of a function's singular point and point of inflection, errors are cumulative and may become large.

#### Calculation Capacity:

- Input/Basic Calculations  
10-digit mantissa; or 10-digit mantissa plus 2-digit exponent up to  $10^{99}$

### ■ Specifications

**Power Supply:** Solar cell

**Operating Temperature:** 0°C–40°C (32°–104°F)

**Dimensions:** 9 (H)  $\times$  70.5 (W)  $\times$  121.5 (D) mm  
3/8" (H)  $\times$  2-3/4" (W)  $\times$  4-3/4" (D)

**Weight:** 55g (1.9oz)

**CE**

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