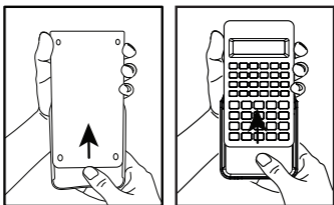# Canon

**F-605**
Scientific Calculator
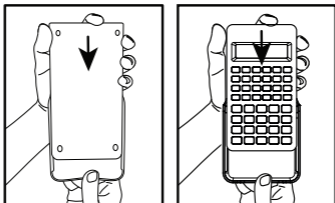
# CONTENTS

**IMPORTANT: READ BEFORE USE**

Please read the following instructions and safety precautions before using the Scientific Calculator. Keep this manual on hand for future reference.

## HOW TO OPEN / CLOSE THE COVER

Open or close the cover by sliding as shown in the figures.



**OPEN**



**CLOSE**

## DISPLAY



Memory Sign · Status Indicators · Exponent · Error sign · Mantissa minus sign · Mantissa · Exponent minus sign
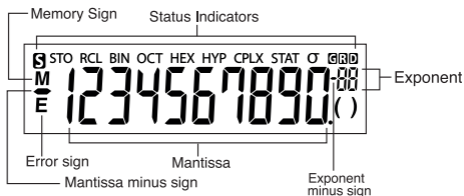
| | | |
|---|---|---|
| $\mathbf{S}$ | : | Shift Key |
| STO | : | Store Memory |
| RCL | : | Recall Memory |
| BIN | : | Binary Mode |
| OCT | : | Octal Mode |
| HEX | : | Hexadecimal Mode |
| HYP | : | Hyperbolic |
| CPLX | : | Complex Mode |
| STAT | : | Statistics Mode |
| σ | : | Standard Deviation of Population |
| $\mathbf{G}$ | : | Gradient Mode |
| $\mathbf{D}$ | : | Degree Mode |
| $\mathbf{R}$ | : | Radian Mode |

**Note:** For possible errors, see page 25 "Errors".

**Examples:**

Fraction (e.g. $1\frac{2}{5}$):

$$lu2\_5$$

Hexadecimal numbers A ~ F:

$$AbCdEF$$

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# GETTING STARTED

## 1. Check the Current Calculation Mode

Be sure to check the status indicators that indicate the current calculation mode (DEG, BIN, STAT and CPLX) and display formats setting (Floating mode).

**Note!** If you get into trouble, hold $\boxed{\text{SHIFT}}$ + $\boxed{\bullet \text{ RESET}}$ to reset the calculator.

## 2. Key Symbols

**Example ( $\boxed{\overset{\sin^{-1} \ D}{\sin}}$ ):**

$\boxed{\sin}$    To use a function printed on a key, press the key.

$\boxed{\sin^{-1}}$    To use a function printed above a key, press the $\boxed{\text{SHIFT}}$ key while in decimal mode.

$\boxed{^D}$    The "D" key is colored in gray.
To use a function printed above a key in gray, press the $\boxed{\text{SHIFT}}$ key while in Hexadecimal mode.

**Note:**
The blue keys are active in Statistic mode only. In Statistic mode ("STAT" indicator lights up), they work as follows.

**Example ( $\boxed{\overset{n \ \ \Sigma x}{(\ )}}$ ):**

$\boxed{^n}$    Calculate the number of data samples when it is pressed.

$\boxed{\Sigma x}$    **2nd function key**: Calculate the summation of " $\Sigma x$ " data were input when it is pressed immediately after $\boxed{\text{SHIFT}}$ .

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## Power ON, OFF

### ■ First time operation:

1. Pull out the battery insulation sheet, then the battery will be loaded and the calculator can be powered on.

2. Hold $\boxed{\text{SHIFT}}$ + $\boxed{\cdot\text{RESET}}$ to reset the calculator.

$\boxed{\substack{\text{ON}\\\text{CA}}}$ **Power ON/Clear Key:** Turns the calculator on. When power is turned on, all registers except the memory registers are cleared.

$\boxed{\text{SHIFT}}$ + $\boxed{\text{OFF}}$ **Power OFF Key:** Turns the calculator off.

$\boxed{\text{CE}}$ **Clear Entry Key:** Clears the content just entered.

$\boxed{\text{SHIFT}}$ + $\boxed{\cdot\text{RESET}}$ **Reset Key:** Reset the calculator when these keys are pressed. The memory is cleared, and the calculation mode is reset to Decimal Calculation (Floating mode).

---
**Auto Power Off Function**

When the calculator is not used for about 7 minutes, the calculator will automatically power off.

---

## Numeric Entry and Mode Selection Keys

| 0 | ~ | 9 |   **Numeric Keys:** Enters numbers.

| ▪ |   **Decimal Point Key:** Enters a decimal point.

| EXP |   **Exponential Key:** Uses to enter exponents.

**Example:** $35 \times 10^{43}$ → | 3 | | 5 | | EXP | | 4 | | 3 |   (35.⁴³)

| (−) |   **Sign Change Key:** For changing the sign (+ or −) of the displayed mantissa or exponents.

**Example:** 123 → | 1 | | 2 | | 3 | | (−) |   (−123.)

| ▶ |   **Backspace Key:** Clears the last digit entered and shifts any remaining digits one place to the right.

**Example:**

| Value | Operation | Display |
|-------|-----------|---------|
| 12345 | \| 1 \| \| 2 \| \| 4 \|  incorrect entry | 124. |
|       | \| ▶ \| | 12. |
|       | \| 3 \| \| 4 \| \| 5 \| | 12345. |

| SHIFT |   **Shift Key:** For performing second functions indicated above the keys.

**Example:** sin⁻¹ 0.5 → | ▪ | | 5 | | SHIFT | | sin⁻¹ |   (30.)

## Mode Selection

To specify the calculation mode:

| Operation | Mode | Display Indicator |
|---|---|---|
| `SHIFT` `▶DEC` | Decimal Calculation (Degree) Mode | D |
| `SHIFT` `▶BIN` | Binary Calculation Mode | BIN |
| `SHIFT` `▶OCT` | Octal Calculation Mode | OCT |
| `SHIFT` `▶HEX` | Hexadecimal Calculation Mode | HEX |
| `SHIFT` `STAT` | Statistical Calculation Mode | STAT |
| `SHIFT` `CPLX` | Complex Number Calculation Mode | CPLX |

### Display Mode Keys

`ENG` : Engineering Exponential mode.

`◀ENG` : Return to previous mode from Engineering Exponential mode.

`F↔S` : Switch between Floating mode and Scientific Exponential mode.

### Example:

| Operation | Display | Explanation |
|---|---|---|
| | 0. | Floating Mode |
| `1` `2` `3` `×` | | |
| `1` `0` `=` | 1230. | |
| `F↔S` | $1.23^{\,03}$ | Scientific Exponential Mode |
| `ENG` | $1.23^{\,03}$ | Engineering Exponential Mode |
| `ENG` | $1230.^{00}$ | |
| `ENG` | $1230000.^{-03}$ | |
| `SHIFT` `◀ENG` | $1230.^{00}$ | Reverse Engineering Exponential |

**Display Range:**
Floating Mode
$10^{10} \leqq |x| < 10^{100}$     For exponential display
$10^{-99} \leqq |x| < 10^{-9}$     For exponential display
$x = 0$ or $10^{-9} \leqq |x| < 10^{10}$     For mantissa display

- Scientific Exponential Mode
$x = 0$, and $10^{-99} \leqq |x| < 10^{100}$

- Engineering Exponential Mode
$x = 0$, and $10^{-99} \leqq |x| < 10^{100}$
Exponent: Multiple of 3

**Decimal Point Selection Key**

$\overset{FIX}{\square}$ Specify the number of decimal places in the
mantissa of the decimal calculation results.
Press $\boxed{0}$ ~ $\boxed{9}$ after $\overset{SHIFT}{\square}$ $\overset{FIX}{\square}$ to
specify the number of decimal places.

**Note!** To reset the decimal places, press $\overset{SHIFT}{\square}$,
$\overset{FIX}{\square}$, then $\boxed{\blacksquare}$.

**Example:**

| Operation | Display | Explanation |
|---|---|---|
| $\overset{SHIFT}{\square}$ $\overset{FIX}{\square}$ $\boxed{3}$ $\boxed{1}$ $\boxed{2}$ $\boxed{3}$ $\boxed{4}$ $\boxed{5}$ $\boxed{6}$ $\boxed{7}$ $\boxed{8}$ $\boxed{9}$ | 0.000 | 3 decimal places |
| $\boxed{\times}$ | 123456789.0 | |
| $\boxed{\blacksquare}$ $\boxed{0}$ $\boxed{0}$ | | |
| $\boxed{1}$ $\boxed{=}$ | 123456.789 | |
| $\overset{SHIFT}{\square}$ $\overset{FIX}{\square}$ $\boxed{0}$ | 123457.[*1] | 0 decimal places |
| $\overset{SHIFT}{\square}$ $\overset{FIX}{\square}$ $\boxed{5}$ | 123456.7890[*2] | 5 decimal places |
| $\overset{SHIFT}{\square}$ $\overset{FIX}{\square}$ $\boxed{\blacksquare}$ | 123456.789 | Reset decimal places |

*1 The displayed value is rounded up within the specified range, but the actual calculation result is retained in the register.

*2 The number is displayed with left justification. In this case, 5 decimal places are specified, but only the 10 most significant digits are displayed. The 5th decimal place is not displayed.

## Degree / Radian / Gradient Mode Key

DRG    Change angle units.

SHIFT DRG▶  **Angle Unit Conversion Mode:** For converting angle values to different units. (DEG → RAD → GRAD)

• Relationship of units: $200^{GRAD} = 180^o = \pi^{RAD}$

### Example (in Degree mode):

1 8 0 SHIFT DRG▶    (    3.141592654$^R$ )

## Basic Calculation Keys

$\boxed{+}$ $\boxed{-}$ $\boxed{\times}$ $\boxed{\div}$ $\boxed{=}$ **Arithmetic Keys:** Uses for basic arithmetic calculation.

$\boxed{\overset{\%}{\square}}$ **Percent key:** Uses for percentage, add-on and discount calculations.

**Example:** $\boxed{1}$ $\boxed{2}$ $\boxed{3}$ $\boxed{\text{SHIFT}}$ $\boxed{\overset{\%}{\square}}$        (1.23)

$\boxed{(}$ $\boxed{)}$ **Open, Close Parenthesis Keys**

**Example:**

| Value | Operation | Display |
|-------|-----------|---------|
| $2 \times (3 + 4) = 14$ | $\boxed{2}$ $\boxed{\times}$ $\boxed{(}$ $\boxed{3}$ $\boxed{+}$ $\boxed{4}$ $\boxed{)}$ $\boxed{=}$ | 14. |
| $1 + [(4 - 3.6 + 5) \times 0.8 - 6] \times 4.2$ $= -6.056$ | $\boxed{1}$ $\boxed{+}$ $\boxed{(}$ $\boxed{(}$ $\boxed{4}$ $\boxed{-}$ $\boxed{3}$ $\boxed{.}$ $\boxed{6}$ $\boxed{+}$ $\boxed{5}$ $\boxed{)}$ $\boxed{\times}$ $\boxed{.}$ $\boxed{8}$ $\boxed{-}$ $\boxed{6}$ $\boxed{)}$ $\boxed{\times}$ $\boxed{4}$ $\boxed{.}$ $\boxed{2}$ $\boxed{=}$ | $-6.056$ |

- Up to 15 consecutive open parentheses can be used at one time.

  **Example:** $5 \times \underbrace{(\,(\,(\,\ldots\;(\,(\,4 + 2) \times 3) + 8\,\ldots}_{\text{Up to 15 parentheses}}$

- $\boxed{(}$ and $\boxed{)}$ are always used together. If either key is pressed alone during an operation, the intended result cannot be obtained.

- $\boxed{(}$ key is effective only when pressed immediately after a calculation instruction.

- When $\boxed{(}$ is effective, "0" will be displayed. Parentheses indicators ( ) appear on the display.

## Fraction Calculation Keys

$\boxed{a\frac{b}{c}}$ **Fraction Key:** Use this key to enter both mixed and improper fractions.

$\frac{d}{c}$ : d (numerator) → $\boxed{a\frac{b}{c}}$ → c (denominator).

$a\frac{b}{c}$ : a (integer) → $\boxed{a\frac{b}{c}}$ → b (numerator) → $\boxed{a\frac{b}{c}}$ → c (denominator)

■ The fraction $\frac{2}{3}$ is displayed as "2⌐3", and $1\frac{2}{5}$ as "1⊔2⌐5".

**Example:**

| Value | Operation | Display |
|---|---|---|
| $\frac{2}{3}$ | $\boxed{2}$ | 2. |
|  | $\boxed{a\frac{b}{c}}$ | 2⌐. |
|  | $\boxed{3}$ | 2⌐3. |
| $1\frac{2}{5}$ | $\boxed{1}$ | 1. |
|  | $\boxed{a\frac{b}{c}}$ | 1⌐. |
|  | $\boxed{2}$ | 1⌐2. |
|  | $\boxed{a\frac{b}{c}}$ | 1⊔2⌐. |
|  | $\boxed{5}$ | 1⊔2⌐5. |

## Note!

• Fraction calculation results will be displayed in decimal format automatically whenever the total digits of a fractional value (integer + numerator + denominator + separator marks) exceeds 10.

• $\boxed{a\frac{b}{c}}$ can convert the results of fractional calculations to decimal notation, and vice versa.

**Example:** Calculate $1\frac{2}{3} + 4\frac{5}{6}$ and convert the result to a decimal fraction.

| Operation | Display |
|---|---|
| 1  a⅜c  2  a⅜c  3  + | 1⌴2⌴3. |
| 4  a⅜c  5  a⅜c  6  = | 6⌴1⌴2. |
| a⅜c | 6.5 |
| a⅜c | 6⌴1⌴2. |

SHIFT  d/c    **Mixed / Improper Fraction Conversion Key:** It converts mixed fractions to improper fractions and vice versa. It changes alternatively each time the key is pressed.

**Example:** Enter $\frac{10}{3}$ and convert it to a mixed fraction.

| Operation | Display |
|---|---|
| 1  0  a⅜c  3 | 10⌴3. |
| = | 3⌴1⌴3. |
| SHIFT  d/c | 10⌴3. |

## Memory Keys

**Independent Memory:** The data in the independent memory is retained even when the calculator is turned off.

[M+] [M-] **Memory Plus and Minus Key:** Add or Substract numbers to the independent memory.

[MR] **Memory Recall Key:** Retrieve the value of the independent memory.

[X→M] **Exchange Memory By Display Value:** Replaces the displayed number with the contents of the independent memory.

**Memory Variables:** You can assign a specific value or a calculation result to a variable. There are 6 memory variables (A, B, C, D, E and F) to store data, results, or dedicated values.

[STO] **Store Values Key:** To store variable into memory.

[RCL] **Recall Values Key**: To recall the memory variable.

**Example: Using the independent memory:**

| Operation | Display | Memory contents | Explanation |
|-----------|---------|-----------------|-------------|
| [1] [2] [3] | 123. | 0 | Enter 123 |
| [M+] | M 123. | 123 | Store 123 |
| [4] [5] [6] [M+] | M 456. | 579 | Add 456 |
| [MR] | M 579. | 579 | Recall from memory |
| [7] [8] [9] | M 789. | 579 | Enter 789 |
| [X→M] | M 789. | 789 | Replace memory with display |
| [ON/CA] | M   0. | 789 | Clear display |
| [X→M] | 0. | 0 | Clear memory |

**Example: Using the memory variable**

| Operation | Display | Memory contents | Explanation |
|---|---|---|---|
| $1$ $2$ $\times$ $3$ $=$ | 36. | 0 | Enter value |
| SHIFT STO A | 36. | 36 | Store value to variable A |
| $4$ $5$ $+$ $6$ $=$ | 51. | 0 | Enter value |
| SHIFT STO C | 51. | 51 | Store value to variable C |
| ON CA | 0. | A= 36 C= 51 | Clear display |
| RCL A | 36. | 36 | Recall the contents of variable A |
| RCL C | 51. | 51 | Recall the contents of variable C |

## Binary / Octal / Hexadecimal Number Keys

[SHIFT] + ▸DEC / ▸BIN / ▸OCT / ▸HEX : To specify the
numbering system as Decimal / Binary / Octal /
Hexadecimal.

**Binary Number Entry Keys:** [0] ~ [1]
[2] ~ [9] are ignored in Binary mode.

**Octal Number Entry Keys:** [0] ~ [7]
[8] and [9] are ignored in Octal mode.

**Hexadecimal Number Entry Keys (0~9):** [0] ~ [9]

**Hexadecimal Number Entry Keys (10~15):**
A ~ F

**Example:**

| Value | Operation | Display |
|---|---|---|
| AB7C | [SHIFT] ▸HEX  A B [7] C | (HEX.) Ab7C. |

## Random Number Generation

Rand    **Random Key:** To generate a random number
     * The value being generated will differ each time
     between 0.000 and 0.999.

**Example:** [SHIFT] [Rand]        (0.132)*

## Complex Number Calculation

[SHIFT] [CPLX] : To enter complex mode.

[a] **Real Part Key:** For storing the real number in Complex mode.

[b] **Imaginary Part Key:** For storing the imaginary number in Complex mode.

**Example:**

| Value | Operation | Display |
|---|---|---|
| $(12 - 3i) - (4 + 7i)$ | [SHIFT] [CPLX] [1] [2] [a] [3] [(−)] [b] [(−)] [4] [a] [7] | (CPLX) |
| $= 8 - 10i$ | [b] [=] | 8. |
| | [b] | −10. |
| $(6 - 7i) \times (-8 + 9i)$ | [6] [a] [7] [(−)] [b] [×] [8] [(−)] [a] [9] | |
| $= 15 + 110i$ | [b] [=] | 15. |
| | [b] | 110. |

**Rectangular ⟷ Polar Conversion**
See P.36 "Basic Function Calculations".

## 3. Order Of Operations

The calculator will automatically determine the operation priority of each individual command as follows:

### HIGHEST PRIORITY

1. Calculation within parentheses **( )**.
2. Exponent (EXP):
3. Function keys:
   $x^3$, $x^2$, $x^{-1}$, $x!$, $\circ\,{}'''$ , $\blacktriangleleft\circ\,{}'''$ , %
   Angle unit conversions (DRG▶, DRG)
   $\sqrt{\ }$ , $\sqrt[3]{\ }$ , log, ln, $e^x$, $10^x$,
   sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$
4. Fractions (ab/c, d/c)
5. Negative value ((−))
6. Powers and roots: $x^y$, $x\sqrt{\ }$
7. Permutations (nPr) and combinations (nCr)
8. ×, ÷
9. +, −

**Example:** $5 \div 4^2 \times 7 + 3 \times 0.5^{\cos 60°} = 4.308820344$
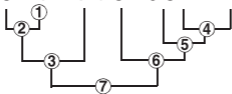


### Levels of calculations (Stack Memory)

During actual calculation, lower precedence calculations are stored in the stack memory and then processed in turn. This stack memory can store up to 5 levels of calculations.

**Example:** $1 + 2 \times (\sin 30° + 6 \times (2 + 3 \times 2.2)\,) = 105.2$
levels ...........
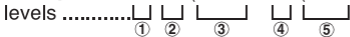
## 4. Calculation Range

- If the result of a calculation is out of the range indicated here, an error occurs.
- For the calculation range during function calcula-tion, refer to P.36 "Operation Range and Accuracy".

### Decimal Numbers

A maximum of 10 digits in the mantissa, or 10 digits in the mantissa with 2 digits in the exponent, can be entered or displayed. A negative value is indicated by adding a minus (–) sign, the calculation range is defined as follows:

↑ Out of Range

Positive Value
$+9.999999999 \times 10^{99}$
$\wr$
$+ 1 \times 10^{-99}$
0

Negative Value
$-1 \times 10^{-99}$
$\wr$
$-9.999999999 \times 10^{99}$

Calculation Range

↓ Out of Range
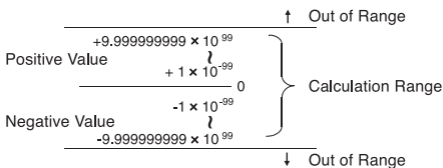
### Binary Numbers

Binary integers of up to 10 digits can be entered and displayed. Negative binary values are expressed by their two's complement. The calculation range is defined as follows:

↑ Out of Range

Positive Value
111111111.
$\wr$
1.
0

Negative Value
1111111111.
$\wr$
1000000000.

Calculation Range

↓ Out of Range
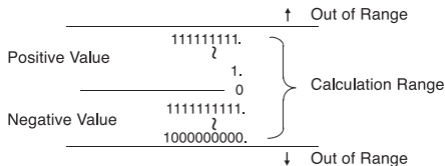
## Octal Number

A maximum of 10 octal digits can be entered and displayed. Negative octal values are expressed by their two's complement. The calculation range is defined as follows:

```
                                      ↑ Out of Range
                   3777777777.
Positive Value         ₹
                       1.
                   ─────────0        Calculation Range
                   7777777777.
Negative Value         ₹
                   4000000000.
                                      ↓ Out of Range
```
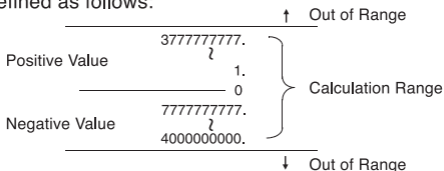
## Hexadecimal Numbers

A maximum of 10 hexadecimal digits can be entered and displayed. Negative hexadecimal values are expressed by their two's complement. The calculation range is defined as follows:

```
                                      ↑ Out of Range
                   2540BE3FF.
Positive Value         ₹
                       1.
                   ─────────0        Calculation Range
                   FFFFFFFFFF.
Negative Value         ₹
                   FDABF41C01.
                                      ↓ Out of Range
```
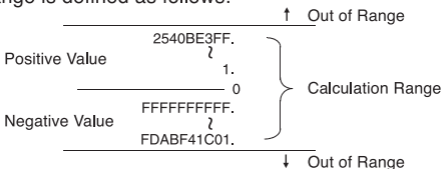
## Two's Complement Calculation

In computer calculations the complement is used to express negative values without using + and − signs. Subtraction is performed by adding the complement.

**Example:** Enter 1 in binary and subtract 1 three times.

| Operation | Display | Decimal |
|---|---|---|
| ON/CA  SHIFT  ▶BIN | (BIN)          0. | |
| 1 | 1. | 1 |
| − 1 = | 0. | 0 |
| = | 1111111111. | −1 |
| = | 1111111110. | −2 |

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## 5. Statistical Calculations

### Basic procedure

- Press $\boxed{\text{SHIFT}}$, $\boxed{\text{STAT}}$. The **"STAT"** indicator lights up.
- Enter the first data and press $\boxed{\text{Data}}$.
- After entering the data, press the statistical calculation keys (e.g. $\boxed{\text{S}}$, $\boxed{\overline{x}}$ ... ).
- Press $\boxed{\text{SHIFT}}$, $\boxed{\text{STAT}}$ to exit the statistical calculation mode and clear the statistical calculation memory.

**Example:**

| Operation | Display | Explanation |
|---|---|---|
| $\boxed{\text{ON}\atop\text{CA}}$ $\boxed{\text{SHIFT}}$ $\boxed{\text{STAT}}$ | (STAT) 0. | Statistic mode |
| $\boxed{1}$ $\boxed{0}$ | 10. | Enter 10 |
| $\boxed{\text{Data}}$ | 1. | Data 1 entry |
| $\boxed{2}$ $\boxed{0}$ | 20. | Enter 20 |
| $\boxed{\text{Data}}$ | 2. | Data 2 entry |
| $\boxed{3}$ $\boxed{0}$ | 30. | Enter 30 |
| $\boxed{\text{Data}}$ | 3. | Data 3 entry |
| $\boxed{4}$ $\boxed{0}$ | 40. | Enter 40 |
| $\boxed{\text{Data}}$ | 4. | Data 4 entry |
| $\boxed{5}$ $\boxed{0}$ $\boxed{=}$ | 50. | Enter 50 |
| $\boxed{\text{Data}}$ | 5. | Data 5 entry |
| $\boxed{\overline{x}}$ | 30. | Mean of x |
| $\boxed{n}$ | 5. | Total number of data sample |
| $\boxed{\text{S}}$ | 15.8113883. | Sample Standard Deviation of x |
| $\boxed{\text{SHIFT}}$ $\boxed{[\Sigma x]}$ | 150. | Summation of x |
| $\boxed{\text{SHIFT}}$ $\boxed{[\Sigma x^2]}$ | 5500. | Sum of Square of the value |
| $\boxed{\text{SHIFT}}$ $\boxed{[\sigma]}$ | 14.14213562. | Population of Standard Deviation of x |
| $\boxed{\text{SHIFT}}$ $\boxed{[\min x]}$ | 10. | The min data |
| $\boxed{\text{SHIFT}}$ $\boxed{[\max x]}$ | 50. | The max data |

### Add / Delete Statistical Data

• Use ⬚ₒₐₜₐ and ⬚ₛₕᵢfₜ ⬚₍cD₎

**Example: Add LCD current display**

| Operation | Display | Explanation |
|-----------|---------|-------------|
| ⬚SHIFT ⬚STAT | (STAT) 0. | Statistic mode |
| ⬚1 ⬚0 | 10. | Enter 10 |
| ⬚Data | 1. | Data 1 entry |
| ⬚2 ⬚0 | 20. | Enter 20 |
| ⬚Data | 2. | Data 2 entry |
| ⬚Data | 3. | Data 3 entry |

**Example: Delete LCD display**

| Operation | Display | Explanation |
|-----------|---------|-------------|
| ⬚SHIFT ⬚STAT | (STAT) 0. | Statistic mode |
| ⬚1 ⬚0 | 10. | Enter 10 |
| ⬚Data | 1. | Data 1 entry |
| ⬚2 ⬚0 | 20. | Enter 20 |
| ⬚Data | 2. | Data 2 entry |
| ⬚3 ⬚0 | 30. | Enter 30 |
| ⬚Data | 3. | Data 3 entry |
| ⬚4 ⬚0 | 40. | Enter 40 |
| ⬚Data | 4. | Data 4 entry |
| ⬚SHIFT ⬚(CD) | 3. | Delete data |
| ⬚SHIFT ⬚Σx1 | 96. | |

## Output of Statistical Calculation Results

| Output | Operation | Equation |
|---|---|---|
| Number of data sample | $n$ | -- |
| Mean of x | $\bar{x}$ | $\bar{x} = \sum\limits_{i=1}^{n} x_i / n$ |
| Sample standard deviation of x | S | $s = \sqrt{\sum\limits_{i=1}^{n} (x_i - \bar{x})^2 / (n-1)}$ |
| Population standard deviation of x | SHIFT [σ] | $\sigma^n = \sqrt{\sum\limits_{i=1}^{n} (x_i - \bar{x})^2 / n}$ |
| Variance of sample | S $x^2$ | $v^{n-1} = \sum\limits_{i=1}^{n} (x_i - \bar{x})^2 / (n-1)$ |
| Variance of population | SHIFT $x^2$ | $v^n = \sum\limits_{i=1}^{n} (x_i - \bar{x})^2 / n$ |
| Summation of x | SHIFT [Σx] | $\Sigma x$ |
| Sum of Square | SHIFT [Σx²] | $\Sigma x^2$ |

## Statistical Calculation Examples

You bought 20 pieces of pizza. However, the diameter of each pizza is varied as shown in the following table. Please calculate the statistic based on this information.

| Diameter | Midpoint | Frequency |
|----------|----------|-----------|
| 27.6 ~ 28.5 | 28 | 2 |
| 28.6 ~ 29.5 | 29 | 4 |
| 29.6 ~ 30.5 | 30 | 5 |
| 30.6 ~ 31.5 | 31 | 6 |
| 31.6 ~ 32.5 | 32 | 3 |
| | | (20 in total) |

| Operation | Display | Explanation |
|-----------|---------|-------------|
| ON/CA  SHIFT  STAT | (STAT)  0. | Statistic mode |
| SHIFT  FIX  4 | 0.0000 | Decimal digit specification |
| 2  8  ×  2  Data | 2.0000 | Give the sum of frequency |
| 2  9  ×  4  Data | 6.0000 | |
| 3  0  ×  5  Data | 11.0000 | |
| 3  1  ×  6  Data | 17.0000 | |
| 3  2  ×  3  Data | 20.0000 | |
| $n$ | 20.0000 | Total number of data sample |
| $\bar{x}$ | 30.2000 | Mean of x |
| SHIFT  [$\Sigma x$] | 604.0000 | Summation of x |
| SHIFT  [$\Sigma x^2$] | 18270.0000 | Sum of Square of the value |
| $s$ | 1.2397 | Sample standard deviation of x |
| SHIFT  [$\sigma$] | 1.2083 | Population of standard deviation of x |

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## 6. Errors

The calculator will overflow in the following instances. Further calculations will not be possible as the calculator will be electronically locked.

- When the calculation result is outside the following range:

  $x = 0, 1 \times 10^{-99} \leqq |x| < 1 \times 10^{100}$

  x: Calculation result

- When the contents of the memory are outside the following range:

  $x = 0, 1 \times 10^{-99} \leqq |x| < 1 \times 10^{100}$

  x: Memory contents

  (The data stored before the overflow error are retained.)

- When numbers are entered outside the following range and a basic function key (+, −, ×, ÷) is pressed.

  $x = 0, 1 \times 10^{-99} \leqq |x| < 1 \times 10^{100}$

- When a ÷ 0 (division by 0) is performed.
- When data exceeds the range of any function or statistical calculation.
- During statistical calculation;
  (1) If **S** is calculated with only one data input
  (2) To find $\bar{x}$, $\sigma$ and **S** when n = 0
  (3) When any input is outside the allowable calculation range:

  $x = 0, 1 \times 10^{-99} \leqq |x| < 1 \times 10^{100}$

  x: calculation result

  (4) When any input is outside the allowable calculation range:

  $x = 0, 1 \times 10^{-99} \leqq |x| < 1 \times 10^{100}$

- When the number of operators stored in the calculator during parentheses and arithmetic calculation exceeds 5 levels.
- When more than 15 open paretheses are used at one time.

  The overflow display is: (E      0.)

  Press ⌷⌷, to clear the error.

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# CALCULATION EXAMPLES

## 1. Decimal Calculations (Degree Mode)
### Initial mode setting:

| | |
|---|---|
| Calculation Mode: | Decimal Degree Mode |
| | [SHIFT] [DRG▶]     (DEG) |
| Display Mode: | Floating Mode |
| Decimal Point: | Resetting |
| | [SHIFT] [FIX] [.]     (0.) |

### Addition and Subtraction

| Example | Operation | Display |
|---|---|---|
| 8 + 3 + 5.5 = 16.5 | [8] [+] [3] [+] [5] [.] [5] [=] | 16.5 |
| 4 − 7 − 3 = −6 | [4] [−] [7] [−] [3] [=] | −6. |

### Multiplication and Division

| Example | Operation | Display |
|---|---|---|
| 3.6 x 1.7 = 6.12 | [3] [.] [6] [×] [1] [.] [7] [=] | 6.12 |
| 592 ÷ 4.8 = 123.3333333 | [5] [9] [2] [÷] [4] [.] [8] [=] | 123.3333333 |

### Mixed Calculations

| Example | Operation | Display |
|---|---|---|
| 3 + 5 x 7 = 38 | [3] [+] [5] [×] [7] [=] | 38. |
| 6 x 9 + 3 ÷ 2 = 55.5 | [6] [×] [9] [+] [3] [÷] [2] [=] | 55.5 |

**Exponential Calculations**

| Example | Operation | Display |
|---|---|---|
| $(321 \times 10^{-14}) \times$ $(65 \times 10^{28}) =$ $2.0865 \times 10^{18}$ | [3] [2] [1] [EXP] [1] [4] [(−)] [×] [6] [5] [EXP] [2] [8] [=] | $2.0865^{18}$ |

**Fractional Calculations**

| Example | Operation | Display |
|---|---|---|
| $\frac{2}{3} + 3\frac{4}{7} - \frac{5}{4} = 2\frac{83}{84}$ | [2] [a%] [3] [+] [3] [a%] [4] [a%] [7] [−] [5] [a%] [4] [=] | 2⌐83⌐84. |
| $(\frac{3}{5} + 2\frac{3}{8}) \times \frac{2}{5} \div 2 - 1$ $= -\frac{81}{200}$ | [(] [3] [a%] [5] [+] [2] [a%] [3] [a%] [8] [)] [×] [2] [a%] [5] [÷] [2] [−] [1] [=] | −81⌐200. |

**Constant Calculations**

| Example | Operation | Display |
|---|---|---|
| 2 + 3 = 5 | [2] [+] [3] [=] | 5. |
| 4 + 3 = 7 | [4] [=] | 7. |
| 1 − 2 = −1 | [1] [−] [2] [=] | −1. |
| 2 − 2 = 0 | [2] [=] | 0. |
| 3 x 2 = 6 | [3] [×] [2] [=] | 6. |
| 3 x 4 = 12 | [4] [=] | 12. |
| 6 ÷ 3 = 2 | [6] [÷] [3] [=] | 2. |
| 9 ÷ 3 = 3 | [9] [=] | 3. |

**Parentheses Calculations**

| Example | Operation | Display |
|---|---|---|
| 3 + [(4 − 3.6 + 5) x 0.8 − 6] x 4.2 = −4.056 | [3] [+] [(] [(] [4] [−] [3] [.] [6] [+] [5] [)] [×] [.] [8] [−] [6] [)] [×] [4] [.] [2] [=] | −4.056 |

## Percentage Calculations

| Example | Operation | Display |
|---|---|---|
| 200 x 17% = 34 | [2] [0] [0] [×] [1] [7] [SHIFT] [%] [=] | 34. |
| $\frac{456}{789}$ × 100 = 57.79467681% | [4] [5] [6] [÷] [7] [8] [9] [SHIFT] [%] [=] | 57.79467681 |

## Constant Percentage Calculations

| Example | Operation | Display |
|---|---|---|
| 12% x 1200 = 144 | [1] [2] [SHIFT] [%] [×] [1] [2] [0] [0] [=] | 144. |
| 12% x 1500 = 180 | [1] [5] [0] [0] [=] | 180. |
| $\frac{765}{987}$ x 100% = 77.50759878% | [7] [6] [5] [÷] [9] [8] [7] [SHIFT] [%] [=] | 77.50759878 |
| $\frac{654}{987}$ x 100% = 66.26139818% | [6] [5] [4] [=] | 66.26139818 |

## Add-On (Mark Up) Calculation

| Example | Operation | Display |
|---|---|---|
| 200 + (200 x 20%) = 240 | [2] [0] [0] [+] [2] [0] [SHIFT] [%] [=] | 240. |

## Discount Calculation

| Example | Operation | Display |
|---|---|---|
| 200 – (200 x 20%) = 160 | [2] [0] [0] [–] [2] [0] [SHIFT] [%] [=] | 160. |

**Independent Memory Calculation**

| Example | Operation | Display |
|---|---|---|
| | [ON/CA] [X→M] | 0. |
| 20 x 30 = 600 | [2][0][×][3][0][=] | |
| | [M+] | M 600. |
| 40 x 50 = 2000 | [4][0][×][5][0][=] | |
| | [M+] | M 2000. |
| +) 15 x 20 = 300 | [1][5][×][2][0][=] | |
| | [M+] | M 300. |
| 2900 | [MR] | M 2900. |
| −) 125 x 40 = −5000 | [1][2][5][×][4][0] | |
| | [=] [SHIFT] [M-] | M 5000. |
| −2100 | [MR] | M −2100. |
| | [ON/CA] [X→M] | 0. |

**Memory Variable Calculation**

| Example | Operation | Display |
|---|---|---|
| 9 x 6 + 3 = 57 | [9][×][6][+][3][=] | |
| | [SHIFT] [STO] [A] | 57. |
| x) 5 x 8 = 40 | [5][×][8][=] [SHIFT] | |
| | [STO] [B] | 40. |
| | [RCL] [A] | 57. |
| | [×] [RCL] [B] | 40. |
| 2,280 | [=] | 2280. |

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## 2. Binary / Octal / Hexadecimal Calculations

### Binary Calculations
**• Addition and Subtraction (BIN):** ON/CA  SHIFT  ▸BIN

| Example | Operation | Display |
|---|---|---|
| 10101011 + 1100 + 1110 = 11000101 | `1` `0` `1` `0` `1` `0` `1` `1` `+` `1` `1` `0` `0` `+` `1` `1` `1` `0` `=` | 11000101. |
| 11100011 − 10101100 = 110111 | `1` `1` `1` `0` `0` `0` `1` `1` `−` `1` `0` `1` `0` `1` `1` `0` `0` `=` | 110111. |

### • Multiplication and Division (BIN)

| Example | Operation | Display |
|---|---|---|
| 11 x 1001 = 11011 | `1` `1` `×` `1` `0` `0` `1` `=` | 11011. |
| 1101110 ÷ 1010 = 1011 | `1` `1` `0` `1` `1` `1` `0` `÷` `1` `0` `1` `0` `=` | 1011. |

### Octal Calculations
**• Addition and Subtraction (OCT):** ON/CA  SHIFT  ▸OCT

| Example | Operation | Display |
|---|---|---|
| 654 + 321 = 1175 | `6` `5` `4` `+` `3` `2` `1` `=` | 1175. |
| 741 − 357 = 362 | `7` `4` `1` `−` `3` `5` `7` `=` | 362. |

## • Multiplication and Division (OCT)

| Example | Operation | Display |
|---|---|---|
| 56 x 23 = 1552 | 5 6 × 2 3 = | 1552. |
| 621 ÷ 12 = 50 | 6 2 1 ÷ 1 2 | |
| | = | 50. |

## • Mixed Calculations (OCT)

| Example | Operation | Display |
|---|---|---|
| 52 + 63 x 14 = | 5 2 + 6 3 × | |
| 1216 | 1 4 = | 1216. |

## Hexadecimal Calculations
### • Addition and Subtraction (HEX): ON/CA SHIFT ▶HEX

| Example | Operation | Display |
|---|---|---|
| AAA + BB + C = | A A A + B B | |
| B71 | + C = | b71. |
| DEF − EFE = | D E F − E F | |
| FFFFFFFEF1 | E = | FFFFFFFEF1. |

## • Multiplication and Division (HEX)

| Example | Operation | Display |
|---|---|---|
| FEDC x A9 = | F E D C × A | |
| A83F3C | 9 = | A83F3C. |
| CA11 ÷ DF = E7 | C A 1 1 ÷ D | |
| | F = | E7. |

## • Mixed Calculations (HEX)

| Example | Operation | Display |
|---|---|---|
| (AB + 9) x D ÷ F = | ( A B + 9 ) | |
| 9C | × D ÷ F = | 9C. |

## 3. Basic Function Calculations

### Pi Function: $\pi$

| Example | Operation | Display |
|---------|-----------|---------|
| $\pi \times 10$ | [SHIFT] [$\pi$] [×] [1] [0] [=] | 31.41592654 |

### Trigonometric Functions: [sin] [cos] [tan]

| Example | Operation | Display |
|---------|-----------|---------|
| sin53 = 0.79863551 | [DEG mode] [5] [3] [sin] | 0.79863551 |
| $\cos \frac{\pi}{6}^{RAD}$ = | [RAD mode] [SHIFT] [$\pi$] [÷] | |
| 0.866025403 | [6] [=] [cos] | 0.866025403 |
| tan65$^{GRAD}$ = | [GRAD mode] [6] [5] [tan] | |
| 1.631851687 | | 1.631851687 |

### Inverse Trigonometric Functions: $\sin^{-1}$ $\cos^{-1}$ $\tan^{-1}$

| Example | Operation | Display |
|---------|-----------|---------|
| sin$^{-1}$ 0.3 = | [DEG mode] [.] [3] [SHIFT] | |
| 17.45760312º | [$\sin^{-1}$] | 17.45760312 |
| cos$^{-1}$ 0.8 = | [DEG mode] [.] [8] [SHIFT] | |
| 36.86989765º | [$\cos^{-1}$] | 36.86989765 |
| tan$^{-1}$ 1.5 = | [DEG mode] [1] [.] [5] | |
| 56.30993247º | [SHIFT] [$\tan^{-1}$] | 56.30993247 |

### Logarithmic Functions: [log] [ln]

| Example | Operation | Display |
|---------|-----------|---------|
| log123 = | [1] [2] [3] [log] | |
| 2.089905111 | | 2.089905111 |
| ln123 = | [1] [2] [3] [ln] | |
| 4.812184355 | | 4.812184355 |

**Logarithmic Mean:** $\boxed{\ln}$

| Example | Operation | Display |
|---|---|---|
| $L = \dfrac{4-8}{\ln 4 - \ln 8} =$ <br> 5.770780164 | $( \boxed{4} \boxed{-} \boxed{8} \boxed{)} \boxed{\div}$ <br> $( \boxed{4} \boxed{\ln} \boxed{-} \boxed{8} \boxed{\ln}$ <br> $\boxed{)} \boxed{=}$ | <br><br>5.770780164 |

**Exponential Functions:** $\boxed{10^x}$ / $\boxed{e^x}$

| Example | Operation | Display |
|---|---|---|
| $e^{22} = 3584912846$ | $\boxed{2} \boxed{2} \boxed{\text{SHIFT}} \boxed{e^x}$ | 3584912846 |
| $10^{2.3} = 199.5262315$ | $\boxed{2} \boxed{.} \boxed{3} \boxed{\text{SHIFT}} \boxed{10^x}$ | 199.5262315 |

**Square Calculations:** $\boxed{x^2}$

| Example | Operation | Display |
|---|---|---|
| $1.25^2 = 1.5625$ | $\boxed{1} \boxed{.} \boxed{2} \boxed{5} \boxed{x^2}$ | 1.5625 |

**Cubic Calculations:** $\boxed{x^3}$

| Example | Operation | Display |
|---|---|---|
| $5.43^3 =$ <br> 160.103007 | $\boxed{5} \boxed{.} \boxed{4} \boxed{3} \boxed{\text{SHIFT}} \boxed{x^3}$ <br> $\boxed{=}$ | <br>160.103007 |

**Power Calculations:** $\boxed{x^y}$

| Example | Operation | Display |
|---|---|---|
| $2.11^5 =$ <br> 41.82272021 | $\boxed{2} \boxed{.} \boxed{1} \boxed{1} \boxed{x^y} \boxed{5}$ <br> $\boxed{=}$ | <br>41.82272021 |

**Constant Power Calculations:** $\boxed{x^y}$

| Example | Operation | Display |
|---|---|---|
| $2^{2.34} =$ <br> 5.063026376 | $\boxed{2} \boxed{x^y} \boxed{2} \boxed{.} \boxed{3} \boxed{4}$ <br> $\boxed{=}$ | <br>5.063026376 |
| $3^{2.34} = 13.07566351$ | $\boxed{3} \boxed{=}$ | 13.07566351 |
| $4^{2.34} = 25.63423608$ | $\boxed{4} \boxed{=}$ | 25.63423608 |

## Extraction of Square Root: $\boxed{\sqrt{\phantom{x}}}$

| Example | Operation | Display |
|---|---|---|
| $\sqrt{(5+6) \times 7} =$ <br> 8.774964387 | $\boxed{(}\ \boxed{5}\ \boxed{+}\ \boxed{6}\ \boxed{)}$ <br> $\boxed{7}\ \boxed{=}\ \boxed{\sqrt{\phantom{x}}}$ | 8.774964387 |

## Multiple Root: $\boxed{\sqrt[x^{1/y}]{\phantom{}}}$

| Example | Operation | Display |
|---|---|---|
| $^{5.3}\sqrt{100} =$ <br> 2.384286779 | $\boxed{1}\ \boxed{0}\ \boxed{0}\ \boxed{\text{SHIFT}}\ \boxed{x^{1/y}}\ \boxed{5}$ <br> $\boxed{.}\ \boxed{3}\ \boxed{=}$ | 2.384286779 |

## Constant Multiple Root Calculations: $\boxed{x^{1/y}}$

| Example | Operation | Display |
|---|---|---|
| $^{5}\sqrt{1024} = 4$ | $\boxed{1}\ \boxed{0}\ \boxed{2}\ \boxed{4}\ \boxed{\text{SHIFT}}\ \boxed{x^{1/y}}$ | |
| | $\boxed{5}\ \boxed{=}$ | 4. |
| $^{5}\sqrt{3125} = 5$ | $\boxed{3}\ \boxed{1}\ \boxed{2}\ \boxed{5}\ \boxed{=}$ | 5. |
| $^{5}\sqrt{7776} = 6$ | $\boxed{7}\ \boxed{7}\ \boxed{7}\ \boxed{6}\ \boxed{=}$ | 6. |

## Geometric Mean: $\boxed{x^{1/y}}$

| Example | Operation | Display |
|---|---|---|
| $\overline{G} = \sqrt[4]{1.23 \times 1.48 \times 1.96 \times 2.2}$ <br> $= 1.673830182$ | $\boxed{1}\ \boxed{.}\ \boxed{2}\ \boxed{3}$ <br> $\boxed{\times}\ \boxed{1}\ \boxed{.}\ \boxed{4}$ <br> $\boxed{8}\ \boxed{\times}\ \boxed{1}\ \boxed{.}$ <br> $\boxed{9}\ \boxed{6}\ \boxed{\times}\ \boxed{2}$ <br> $\boxed{.}\ \boxed{2}\ \boxed{=}\ \boxed{\text{SHIFT}}$ <br> $\boxed{x^{1/y}}\ \boxed{4}\ \boxed{=}$ | 1.673830182 |

## Extraction of Cubic Root: $\boxed{\sqrt[3]{\phantom{x}}}$

| Example | Operation | Display |
|---|---|---|
| $^{3}\sqrt{123} =$ <br> 4.973189833 | $\boxed{1}\ \boxed{2}\ \boxed{3}\ \boxed{\text{SHIFT}}\ \boxed{\sqrt[3]{\phantom{x}}}$ | 4.973189833 |

## Reciprocal Calculations: $x^{-1}$

| Example | Operation | Display |
|---|---|---|
| $\frac{1}{2 \times 3 + 4} = 0.1$ | [2] [×] [3] [+] [4] [=] [SHIFT] $x^{-1}$ | 0.1 |

## Trigonometric Calculations: $x^{-1}$

| Example | Operation | Display |
|---|---|---|
| cosec x = 1/sin x cosec 45° = 1.414213562 | [DEG mode] [4] [5] [sin] [SHIFT] $x^{-1}$ | 1.414213562 |

## Factorial Calculations: $x!$

| Example | Operation | Display |
|---|---|---|
| (4 x 2 – 3) ! = 120 | [4] [×] [2] [–] [3] [=] [SHIFT] $x!$ | 120. |

## Hyperbolic Functions: [hyp]

| Example | Operation | Display |
|---|---|---|
| cosh34 = 2.917308713 x 10$^{14}$ | [3] [4] [hyp] [cos] | 2.917308713$^{14}$ |
| tanh1.23 = 0.842579325 | [1] [.] [2] [3] [hyp] [tan] | 0.842579325 |

## Degree → Radian Conversion: [DRG▶]

| Example | Operation | Display |
|---|---|---|
| 60° = 1.047197551$^{RAD}$ | [DEG mode] [6] [0] [SHIFT] [DRG▶] | 1.047197551 |

## Radian → Gradient Conversion: [DRG▶]

| Example | Operation | Display |
|---|---|---|
| 2$^{RAD}$ = 127.3239545$^{GRAD}$ | [RAD mode] [2] [SHIFT] [DRG▶] | 127.3239545 |

### Gradient → Degree Conversion: <sup>DRG▶</sup>

| Example | Operation | Display |
|---------|-----------|---------|
| $120^{GRAD} = 108$ | [GRAD mode]<br>$\boxed{1}\ \boxed{2}\ \boxed{0}\ \boxed{\text{SHIFT}}\ \boxed{\text{DRG▶}}$ | 108. |
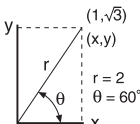
### Permutations (of n things taken r at a time): <sup>nPr</sup>

| Example | Operation | Display |
|---------|-----------|---------|
| $_nP_r = \frac{n!}{(n-r)!}$<br>$_5P_3 = \frac{5!}{(5-3)!} = 60$ | $\boxed{5}\ \boxed{\text{SHIFT}}\ \boxed{\text{nPr}}\ \boxed{3}\ \boxed{=}$ | 60. |
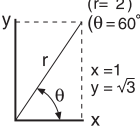
### Combinations (of n things taken r at a time): <sup>nCr</sup>

| Example | Operation | Display |
|---------|-----------|---------|
| $_nC_r = \frac{n!}{r!(n-r)!}$<br>$_5C_3 = \frac{5!}{3!(5-3)!} = 10$ | $\boxed{5}\ \boxed{\text{SHIFT}}\ \boxed{\text{nCr}}\ \boxed{3}\ \boxed{=}$ | 10. |

### Rectangular → Polar Conversion: <sup>R→P</sup>

| Example | Operation | Display |
|---------|-----------|---------|
| $(1,\sqrt{3})$<br>$(x,y)$<br>$r = 2$<br>$\theta = 60°$ | [DEG mode]<br>$\boxed{1}\ \boxed{a}\ \boxed{3}\ \boxed{\sqrt{}}\ \boxed{b}$<br>$\boxed{\text{SHIFT}}\ \boxed{\text{R→P}}$<br>$\boxed{b}$ | 2.<br>60. |

### Polar → Rectangular: <sup>R←P</sup>

| Example | Operation | Display |
|---------|-----------|---------|
| $(r = 2)$<br>$(\theta = 60°)$<br>$x = 1$<br>$y = \sqrt{3}$ | [DEG mode]<br>$\boxed{2}\ \boxed{a}\ \boxed{6}\ \boxed{0}\ \boxed{b}$<br>$\boxed{\text{SHIFT}}\ \boxed{\text{R←P}}$<br>$\boxed{b}$ | 1.<br>1.732050808 |

**Degrees-Minutes-Seconds (DMS) → Decimal Degrees:** `°'"`

| Example | Operation | Display |
|---|---|---|
| 123°45'06" → <br> 123.7516667° | `1` `2` `3` `°'"` `4` `5` `°'"` <br> `0` `6` `°'"` `=` `SHIFT` `°'"` | 123.7516667 |

**Decimal Degrees → Degrees-Minutes-Seconds:** `°'"`

| Example | Operation | Display |
|---|---|---|
| 2.3456 → <br> 2°20'44.16" | `2` `.` `3` `4` `5` `6` <br> `=` `SHIFT` `°'"` | 2°20'44"16 |

## 4. Applied Calculations
### Electricity - Integrating Circuit Problem

Obtain the voltage Vc across the capacitor at t=56ms after the switch is turned on.
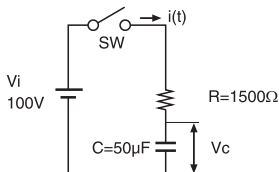


| Example | Operation | Display |
|---|---|---|
| $Vc = Vi\left(1 - e^{-\frac{t}{RC}}\right)$ <br> $= 100 \times \left(1 - e^{-\frac{56 \times 10^{-3}}{1500 \times 50 \times 10^{-6}}}\right)$ <br> $= 52.60562649$ | `1` `0` `0` `×` <br> `(` `1` `−` `(` <br> `1` `5` `0` `0` <br> `×` `5` `0` `EXP` <br> `6` `(-)` `÷` `5` <br> `6` `EXP` `3` `(-)` <br> `)` `SHIFT` `x⁻¹` `(-)` <br> `SHIFT` `eˣ` `)` `=` | 52.60562649 |

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## Algebra

The Root of a Quadratic Equation (only for problems having a real root)

| Example | Operation | Display |
|---|---|---|
| $4x^2 + 9x + 2 = 0$ <br><br> $X = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} =$ <br><br> $\dfrac{-9 \pm \sqrt{9^2 - 4 \times 4 \times 2}}{2 \times 4}$ <br><br> $x = \begin{cases} -0.25 \\ -2 \end{cases}$ | [9] [$x^2$] [−] [4] [×] <br> [4] [×] [2] [=] [x→M] <br> [(] [9] [(−)] [+] [MR] <br> [√] [)] [÷] [2] [÷] <br> [4] [=] <br> [(] [9] [(−)] [−] [MR] <br> [√] [)] [÷] [2] [÷] <br> [4] [=] | M    49. <br><br> M    −0.25 <br><br> M    −2. |

## Calculation of time

**Example 1:** The air flight departs at 2 o'clock 9 minutes and 56 seconds (2º09'56"), and arrives at 4 o'clock 18 minutes and 23 seconds (4º18'23").
What is the travel time

| Example | Operation | Display |
|---|---|---|
| 4º18'23" − <br> 2º09'56" = <br> 2º08'27" | [4] [º'"] [1] [8] [º'"] [2] <br> [3] [º'"] [−] [2] [º'"] [0] <br> [9] [º'"] [5] [6] [º'"] [=] | 2º8'27" |

## Example 2:

The following shows the amount of time worked in three days. What was the total time?
1st day : 5 hours 46 minutes (5º46')
2nd day : 4 hours 39 minutes (4º39')
3rd day : 3 hours 55 minutes (3º55')

| Example | Operation | Display |
|---|---|---|
| 5º46' + 4º39' + <br> 3º55' = 14º20' | [5] [º'"] [4] [6] [º'"] [+] <br> [4] [º'"] [3] [9] [º'"] [+] <br> [3] [º'"] [5] [5] [º'"] [=] | 14º20'0" |

## 5. Operation Range and Accuracy

Internal digits: 14
Accuracy*: $\pm 1$ at the $10^{th}$ digits
Output Ranges : $1 \times 10^{-99}$ to $\pm 9.999999999 \times 10^{99}$

| Function | | | Input | |
|---|---|---|---|---|
| sin x | DEG | | $0 \leq |x| < 4.5 \times 10^{10}$ | |
| | RAD | | $0 \leq |x| \leq 785398163.3$ | |
| | GRAD | | $0 \leq |x| < 5 \times 10^{10}$ | |
| cos x | DEG | | $0 \leq |x| < 4.5 \times 10^{10}$ | |
| | RAD | | $0 \leq |x| \leq 785398163.3$ | |
| | GRAD | | $0 \leq |x| < 5 \times 10^{10}$ | |
| tan x | DEG | | Same as sinx except $|x| = 90(2n-1)$ | |
| | RAD | | Same as sinx except $|x| = \pi/2(2n-1)$ | |
| | GRAD | | Same as sinx except $|x| = 100(2n-1)$ | |
| $\sin^{-1}x$ $\cos^{-1}x$ | | $0 \leq |x| \leq 1$ | | |
| $\tan^{-1}x$ $\tanh x$ | | $0 \leq |x| < 1 \times 10^{100}$ | | |
| sinh x cosh x | | $0 \leq |x| \leq 230.2585092$ | | When x=0, sinh and tanh, being in some condition, will have more possibility of error, and influence accurancy. |
| $\sinh^{-1}x$ | | $0 \leq |x| < 5 \times 10^{99}$ | | |
| $\cosh^{-1}x$ | | $1 \leq x < 5 \times 10^{99}$ | | |
| $\tanh^{-1}x$ | | $0 \leq |x| \leq 9.999999999 \times 10^{-1}$ | | |
| ln x | | $0 < x < 1 \times 10^{100}$ | | |
| log x | | $0 < x < 1 \times 10^{100}$ | | |
| $10^x$ | | $-1 \times 10^{100} < x \leq 99.99999999$ | | |
| $e^x$ | | $-1 \times 10^{100} < x \leq 230.2585092$ | | |
| $\sqrt{x}$ | | $0 \leq x < 1 \times 10^{100}$ | | |
| $x^2$ | | $0 \leq |x| < 1 \times 10^{100}$ | | |
| $x^{-1}$ | | $1 \times 10^{-99} < |x| < 1 \times 10^{100}, x \neq 0$ | | |
| $\sqrt[3]{x}$ | | $0 \leq |x| < 1 \times 10^{100}$ | | |
| x! | | $0 \leq x \leq 69$ (Integer) | | |
| $x^3$ | | $0 \leq |x| \leq 2.154434689 \times 10^{33}$ | | |

| Function | Input |
|---|---|
| nPr | $0 \leqq r \leqq n \leqq 9999999999$ (r and n are integer)<br>result $< 1 \times 10^{100}$ |
| nCr | $0 \leqq r \leqq n \leqq 9999999999$ (r and n are integer)<br>result $< 1 \times 10^{100}$ |
| $x^y$ | $-1 \times 10^{100} < y \cdot \ln|x| \leqq 230.2585092$<br>x>0…The above range<br>x<0…y (integer), or $1/y$ (odd, y≠0) … The above range<br>x=0…0<y |
| $x^{1/y}$ | $-1 \times 10^{100} < 1/y \cdot \ln|x| \leqq 230.2585092$<br>x>0…The above range<br>x<0…y (odd), or $1/y$ ( integer, y≠0) … The above range<br>x=0…0<y |
| $R \rightarrow P$ | $|x|, |y| < 1 \times 10^{100}$<br>$(x^2+y^2)^{1/2} < 1 \times 10^{100}$<br>y/x same as $\tan^{-1}x$ |
| $P \rightarrow R$ | $0 \leqq r < 1 \times 10^{100}$<br>θ : same as sinx, cosx |
| °′″ | $0 \leqq |x| \leqq 999999.9999$<br>When input > 999999.9999 the result can not converted to DMS by ⬚ ⬚ |
| ◄°′″ | $0 \leqq |x| \leqq 999999"59'$ |
| DEG→RAD | $0 \leqq |x| < 1 \times 10^{100}$ |
| RAD→GRAD | $0 \leqq |x| \leqq 1.570796326 \times 10^{98}$ |
| GRAD→DEG | $0 \leqq |x| < 1 \times 10^{100}$ |

| Function | | Input |
|---|---|---|
| Complex number calculation | $(x1+y1\ i) \begin{matrix}+\\ \times\\ \div\end{matrix} (x2+y2\ i)$ | |
| | Addition Subtraction | $|x1+x2|<1{\times}10^{100}$<br>$|y1+y2|<1{\times}10^{100}$ |
| | Multiplication | $(x1x2-y1y2)<1{\times}10^{100}$<br>$(x1y2+y1x2)<1{\times}10^{100}$<br>$(x1x2), (y1y2), (x1y2), (y1x2)<1{\times}10^{100}$ |
| | Division | $\frac{x1x2+y1y2}{x2^2+y2^2}, \frac{y1x2-x1y2}{x2^2+y2^2}<1{\times}10^{100}$<br>$x2^2+y2^2, x2^2, y2^2, x1x2+y1y2, y1x2-x1y2, x1x2,$<br>$y1y2, y1x2, x1y2<1{\times}10^{100}$ |
| $\rightarrow$ DEC | | The following operation range after the conversion.<br>$0\leqq|x|\leqq9999999999$ |
| $\rightarrow$ BIN | | The following operation range after the conversion.<br>$1000000000\leqq x\leqq1111111111$<br>$0\leqq x\leqq111111111$ |
| $\rightarrow$ OCT | | The following operation range after the conversion.<br>$4000000000\leqq x\leqq7777777777$<br>$0\leqq x\leqq3777777777$ |
| $\rightarrow$ HEX | | The following operation range after the conversion.<br>$FDABF41C01\leqq x\leqq FFFFFFFFFF$<br>$0\leqq x\leqq2540BE3FF$ |
| Normal Distributions-statistic Calculation | DATA INPUT | $|x|<1{\times}10^{100}$<br>$|\Sigma x|<1{\times}10^{100}$<br>$\Sigma x^2<1{\times}10^{100}$<br>$n = \text{Integer}$<br>$|n|<1{\times}10^{100}$ |
| | $\bar{x}$ | $n\neq0$ |
| | $s$ | $n\neq1, n\neq0$<br>$0\leqq\frac{\Sigma x^2-\{(\Sigma x)^2/n\}}{n-1}<1{\times}10^{100}$ |
| | $x\sigma^n$ | $n\neq0$<br>$0\leqq\frac{\Sigma x^2-\{(\Sigma x)^2/n\}}{n}<1{\times}10^{100}$ |

\* In the case of consecutive calculations, errors are cumulative. This is also true when internal consecutive calculations are performed; for example, $(x^y)$ , $x^{1/y}$, x!, nPr, nCr, etc. In this case, the cumulative data may become large.

# BATTERY REPLACEMENT

When the display characters are dim, turn it off, and
replace the alkaline battery immediately.
Please replace the alkaline battery using the following
procedure:
1. Press $\overset{OFF}{\square}$ to power off the calculator.
2. Remove the screw that secrues the battery cover in
   place.
3. Slide the battery cover slightly and lift it.
4. Remove the old battery with a ball point pen or
   similar sharp object.
5. Load the new battery with positive "+" side facing up.
6. Replace the battery cover, tighten the screw, and
   press $\overset{ON}{\underset{CA}{\square}}$, $\overset{SHIFT}{\square}$ + $\overset{\bullet RESET}{\square}$ to initialize the calculator.
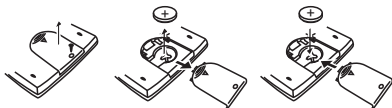


Battery Replacement

⚠ **CAUTION:** There is risk of explosion if the
battery is replaced by an incorrect type.
Dispose of used battery according to the below
instructions.

ⓘ Electromagnetic interference or electrostatic
discharge may cause the display to malfunction
or the contents of the memory to be lost or
altered. Should this occur, press $\overset{ON}{\underset{CA}{\square}}$ to restart
the calculator.

# ADVICE AND PRECAUTIONS

- This calculator contains precision components such as LSI chips and should not be used in a place subject to rapid variations in temperature, excessive humidity dirt or dust, or exposed to direct sunlight.
- The liquid crystal display panel is made of glass and should not be subjected to excessive pressure.
- When cleaning the device do not use a damp cloth or volatile liquid such as paint thinner. Instead, use only a soft, dry cloth.
- Do not under any circumstances, disassemble this device. If you believe that the calculator is not functioning properly, either bring or mail the device together with proof of purchase to a Canon Business office service representative.
- Never dispose the calculator improperly such as burning; it can create risks of personal injury or harm. You are suggested to dispose this product according to your national law.
- Replace the battery once every two years even it is not used frequently.

**Battery Caution!**
- Keep the Battery out of reach of children. If the battery is swallowed, contact a doctor immediately.
- Misuse of battery may cause leakage, explosion, damages or personal injury.
- Don't recharge or disassemble the battery, it could cause a short circuit.
- Never expose the battery to high temperatures, direct heat, or dispose by incineration.
- Never leave a dead battery in the calculator as the dead battery may leak and cause damage to the calculator.
- Continue using the calculator in the low battery condition may cause improper calculations or the stored memory may get corrupted or lost completely. Keep written records of important data all the time; and replace the battery as soon as possible.

■ When you are not sure of the current calculations and setting mode, you are recommended to initialize the calculator to default value by pressing $\boxed{\text{SHIFT}}$ + $\boxed{\text{• RESET}}$ .

## SPECIFICATIONS

| | |
|---|---|
| Power Supply | : Alkaline battery (LR54 x 1) |
| Power Consumption | : DC1.5V / 0.038mW |
| Battery Life | : Approximately 2.5 years |
| | (Based on 1 hour operation per day) |
| Auto power off | : Approx. 7 minutes |

Usable Temperature : 0° ~ 40° C  (32° F ~ 104° F)

Size: 122 (L) x 73 (W) x 12 (H) mm (with cover)
      4-51/64" x 2-7/8" x 15/32" (with cover)

Weight : 70 g (2.4 oz) with cover

\* Specifications are subject to change without notice

**For CA, USA Only**
Included battery contains perchlorate material - special
handling may apply.
See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/
for detail.