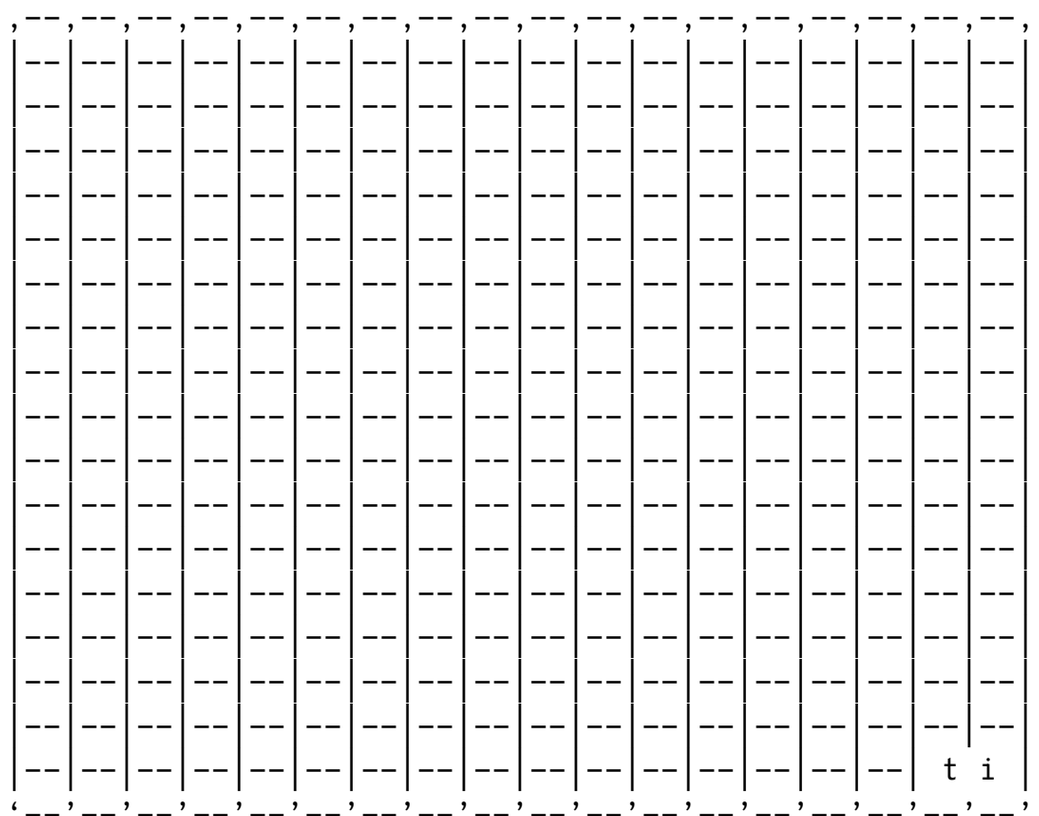
TEXAS INSTRUMENTS

TI-32

USER MANUAL



ENGLISH

Original Texas Instruments manual from Joerg Woerner (joerg@datamath.org)
at the Datamath Calculator Museum

Unofficially translated from French to English by tryt
(https://tiplanet.org/forum/memberlist.php?mode=viewprofile&u=290005)

TABLE OF KEYS

This representation of the keyboard allows quick reference to the pages describing each key.

			16 **(1/x)**	15 **($\sqrt[3]{x}$)**			23 **(STAT)**
3 **[2nd]**			15 **[x^2]**	15 **[$\sqrt{x}$]**	7 **[OFF]**		7 **[ON/C]**
22 **(HYP)**			19 **($\sin^{-1}$)**	19 **($\cos^{-1}$)**	19 **($\tan^{-1}$)**	16 **($\sqrt[x]{y}$)**	
18 **[DRG]**			19 **[sin]**	19 **[cos]**	19 **[tan]**	16 **[y^x]**	
13 **(x>A)**	**(CSR)**	23	5 **(Fix)**	17 **(10^x)**	17 **(e^x)**	21 **(>DMS)**	
13 **[A]**	**[CD]**	23	4 **[FD<>Sci]**	17 **[log]**	17 **[lnx]**	8 **[÷]**	
13 **(x>B)**	**(∑x)**	24	3 **(π)**			21 **(>DD)**	
13 **[B]**	**[n]**	23	4 **[EXP]**	10 **[(]**	10 **[)]**	8 **[x]**	
	($\sum x^2$)	24					
6 **[STO]**	**[$\dot{x}$]**	24	3 **[7]**	3 **[8]**	3 **[9]**	8 **[−]**	
	(σ)	24					
6 **[RCL]**	**[σ']**	24	3 **[4]**	3 **[5]**	3 **[6]**	8 **[+]**	
7 **[SUM]**	**[∑+]**	23	3 **[1]**	3 **[2]**	3 **[3]**	8 **[=]**	
18 **(x!)**					8 **(x<>y)**		
7 **[CE]**			3 **[0]**	3 **[.]**	3 **[+/−]**		

Note: All statistical functions are marked on the right side of the keys, and are only accessible in STAT mode.

Table of contents

I – MAIN FEATURES

This calculator provides you with many mathematical and statistical features. This manual will help you learn these features and use them effectively.

The main features are as follows:

- The various functions of the calculator help you perform arithmetic, algebraic, trigonometric and statistical calculations.

- The articulated (ten-digit) display allows you to adjust the viewing angle to avoid glare.

- A sturdy removable case protects the calculator when not in use.

- The direct algebraic entry system (from the English Algebraic Operating System – AOS™) follows the standard mathematical order of priority when performing operations, allowing simple and direct entry of the most complex problems.

- Automatic power saver (APD™) automatically turns off the calculator after about 10 minutes of non-use.

II – BASIC PRINCIPLES

1 – Turning the calculator on/off

To turn the calculator on, press the **[ON/C]** key. The display shows the current angle unit (DEG, RAD, or GRAD) and the number “0”. Adjust the tilt angle of the display to make it easier to read.

To turn the calculator off, press **[OFF]**. The display and pending operations are cleared, and STAT mode is disabled (if active).

If you do not press any key for several minutes, automatic power saver automatically turns off the calculator. Latency time may vary slightly.

2 – The display

Indicator	Meaning
M	The memory contains a value other than zero.
E	An error condition has occurred.
2F	The **[2nd]** button has been pressed. The second function of the next key pressed will be selected.
HYP	The **[HYP]** key has been pressed. If one exists, the hyperbolic function of the next key will be selected.
STAT	The calculator is in “statistics” mode.
GRAD	The angle unit is grads.
RAD	The angle unit is radians.
DEG	The angle unit is degrees.
[	An expression in parentheses has not been closed.

Note that a negative number is immediately preceded by a minus sign, as in normal writing.

3 – Second key functions

To select a second function, press **[2nd]** and then the appropriate function key. When you press **[2nd]**, the calculator displays “2F” to indicate that you are selecting a second function. The “second” function of a key is marked above the key itself.

The **statistical functions** are marked on the **right side** of the keys and are only accessible **in STAT mode**.

[2nd] is canceled when followed by a key without a second function or if **[2nd]** is pressed again.

4 – Data entry keys and display formats

[0] to **[9] – Number keys.** The number keys enter the digits 0 to 9.

[.] – Decimal point key. It enters a decimal point. The calculator uses a floating decimal point, which is automatically displayed to the right of any whole number. When entering a number, the decimal point remains to the right of the digits until the **[.]** key is pressed. The digits entered next are part of the fractional part of the number.

[2nd] (π) – Pi key. This sequence enters the value of π, exact to 11 decimal places but rounded to 10 digits (3.141592654) for display.

[+/–] – Sign change key. Pressed after a number entry or calculation, this key changes the sign of the displayed number. When pressed after the **[EXP]** key, it changes the sign of the exponent.

Entering numbers.

The display can contain a maximum of 10 digits. Any digits entered beyond that are ignored. The calculator can, however, use 11 digits. To enter a number with more than ten digits, enter it as the sum of two numbers. The display is rounded to ten digits, but the calculations are performed using 11 digits.

Example: Entering the number 123456.78955

Enter	Press	Display
	[ON/C]	0.
123456	**[+]**	123456.
.78955	**[=]**	123456.7896

The number displayed is the original number rounded to ten digits: 123456.7896.

Scientific notation

It is necessary to use scientific notation to enter a number less than ± 0.000000001 or greater than ± 9999999999. In this notation, the number is entered as a mantissa multiplied by 10 raised to a certain power (exponent), for example -3.6089×10^{-32}.

The calculator displays all numbers between $\pm 1 \times 10^{-9}$ and $\pm 9.999999999 \times 10^{9}$ in standard notation. If a calculation leads to a result outside this range, it is displayed in scientific notation. When the calculator displays a number in scientific notation, that number is normalized, with a single digit to the left of the decimal point.

[EXP] – Exponent entry key. When pressed during an entry, this key indicates that the digits entered next are part of the exponent. If the integer part of the number entered already contains more than eight digits, the **[EXP]** key has no effect. If you enter a decimal number with more than eight digits, only the first eight are displayed when you press **[EXP]**. All digits of the number are still used in the calculations.

- To enter a number in scientific notation, type the mantissa (with an integer part less than nine digits), press **[EXP]**, and enter the power of ten. The last two digits on the right of the display indicate the exponent. For example, 320000000 can be written as 3.2×10^{8}. Enter this number as 3.2 **[EXP]** 8. The display shows **3.2 08.**

- To assign a negative value to the mantissa, press the **[+/–]** key after entering at least one digit of the number, but before pressing **[EXP]**.

- To assign a negative value to the exponent, press the **[+/–]** key before, while, or after entering the exponent.

- To display a calculated value in scientific notation, press **[FD<>Sci]**. The display returns to standard notation if you press **[FD<>Sci]** again or perform a calculation.

Data in scientific notation can be entered together with data in standard notation.

Example: $3.2 \times 10^3 + 12575.321 = ?$

Enter	Press	Display
	[ON/C]	0.
3.2	**[EXP]**	3.2 00
3	**[+]**	3200.
12575.321	**[=]**	15775.321
	[FD<>Sci]	1.5775321 04
	[FD<>Sci]	15775.321

Fixed decimal point

It is possible to specify the number of digits of the fractional part of a number to display. To use this function, press **[2nd] (Fix)** n, where n is a number between 0 and 6. The calculator displays the number of decimal places corresponding to the specified number, rounding the number if necessary. Only the displayed number is rounded, not the internally stored number.

To return to floating decimal point format, press **[2nd] (Fix) [.]** or turn the calculator off and then on again.

Example:

Enter	Press	Display
	[ON/C]	0.
	[2nd] (Fix) 3	0.000
	[2nd] (Fix) [.]	0.

Rounding and precision

Each calculation generates an 11-digit result, even if the displayed result is rounded to 10 digits (in standard notation) or 8 digits of mantissa and two digits of exponent in scientific notation.

Transcendental mathematical functions require iterative processing. In most cases, the cumulative error resulting from these operations exists beyond the 10 displayed digits. Most calculations are accurate to within ± 1 unit of the last displayed digit.

Error status display

The indicator “E” is displayed when an overflow or underflow occurs, or when you enter an invalid operation. No keyboard input is accepted until you press **[ON/C]**, which cancels the error condition and all calculations in progress. You must then restart the calculation. (See appendix A “Error Conditions”.)

5 – Using the memory

The calculator has one memory which can store data. This feature allows you to keep a number in memory for repeated use or to keep a grand total of calculations. The Permanent Memory™ feature retains data even when the calculator is turned off.

The memory keys do not affect the calculations in progress, and can therefore be used at any time.

Clearing the memory

To clear only the memory, press the **[STO]** key when 0 is displayed.

Storing to the memory

By pressing the **[STO]** key, the displayed value is stored in the memory, while remaining in the display. Any previously stored value is replaced by the new value.

Recalling the memory

The **[RCL]** key brings the memory contents to the display without affecting the contents of the memory itself.

Summing to the memory

The **[SUM]** key executes and stores the algebraic sum of the displayed value and the memory contents. This key does not affect the displayed value or the calculations in progress.

Note: Additional possibilities

As you will learn later, the **[A]** and **[B]** keys can also act as permanent memories.

6 – Correcting input errors

There are several ways to correct input errors.

[CE] – Clear entry key. Pressed before an operation is entered, this key clears an incorrect number from the display without affecting the calculations in progress.

Pressed after an operator or function key is used, the **[CE]** key has no effect.

[ON/C] – Clear key. By restarting the calculation, this key is the safest correction method if you make an operation error during a calculation. Pressing **[ON/C]** clears the display, constant, and all calculations in progress. It does not affect the memory, angle unit, or values in **[A]** or **[B]**.

Note: If you use the wrong operator key and no calculation is in progress (when for example you press the first operator key of an expression), just press the correct key and continue. This procedure applies to **[+]**, **[–]**, **[x]**, **[÷]**, **[y^x]**, and **[2nd] ($^x\sqrt{y}$)**.

III – ARITHMETIC FUNCTIONS

The calculator uses direct algebraic entry. This system allows correct interpretation of key sequences, remembering certain values and operations until they are complete according to standard algebraic rules (see the second part of this chapter).

1 – Basic keys

[+] – Addition key. It tells the calculator to **add** the next value entered to the displayed number.

[–] – Subtraction key. It tells the calculator to **subtract** the next value entered from the displayed number.

[x] – Multiplication key. It tells the calculator to **multiply** the displayed number by the next value entered.

[÷] – Division key. It tells the calculator to **divide** the displayed number by the next value entered.

[=] – Equals key. It completes all previously entered operations.

(x<>y) – x exchange y key. It swaps the values of a two-variable expression. This allows you to perform a calculation even if you entered the second variable first. For example, if you want to calculate y^x and you have entered x, press **[y^x]**, enter the value for y, then press **[2nd] (x<>y)** before pressing **[=]**.

Example: 3 + ²/₅ = 3.4, and suppose that you entered ⁵/₂ instead of ²/₅

Enter	Press	Display
	[ON/C]	0.
3	**[+]**	3.
5	**[÷]**	5.
2	**[2nd] (x<>y)**	5.
	[=]	3.4

2 – Direct algebraic entry (AOS™)

The calculator follows algebraic rules that assign priorities to mathematical operators. If these rules did not exist, an expression such as 5 x 4 + 3 x 2 could be interpreted in several ways:

5 x (4 + 3) x 2 = 70
or (5 x 4) + (3 x 2) = 26
or ((5 x 4) + 3) x 2 = 46

Algebraic rules specify that multiplication must be performed before addition. The correct answer is therefore:

(5 x 4) + (3 x 2) = 26.

The mathematical operators are listed below in order of precedence.

1. Single-variable functions (trigonometrics, logarithmics, square, square root, percentage, and inverse function) are performed first.

2. Exponentiation (y^x) and roots ($\sqrt[x]{y}$) are performed next.

3. Multiplication and division are performed when all above operations are complete.

4. Addition and subtraction are performed when all above operations are complete.

5. The **[=]** key completes all operations.

The operations are performed strictly in accordance with their respective priority, as indicated in the rules above. The calculator remembers operations and data to process them in the correct order. Once familiar with the priorities of operations, you will easily solve most problems through simple and straightforward entry.

The keys located on the right of the keyboard are laid out in such a way as to remind you of the order of their respective operations:

[y^x]	Exponentiation and roots
[÷]	Division and
[x]	Multiplication
[–]	Subtraction and
[+]	Addition
[=]	Equals (completes all operations)

All single-variable functions are immediately executed on the displayed value.

Example: $(4 \div 5^2) \times 7 + 3 = 4.12$

Enter	Press	Display
	[ON/C]	
4	**[÷]**	4.
5	**[y^x]**	5.
2	**[x]**	0.16
7	**[+]**	1.12
3	**[=]**	4.12

3 – Parentheses

Some calculations require you to specify exactly how you want the calculator to evaluate the elements of an expression. For example:

$$4 \times (5 + 9) \div (7 - 4) = ?$$

To evaluate an expression like this without using parentheses, you would have to calculate 5 + 9 and 7 – 4 separately before carrying out the multiplication and the division; otherwise, it would be impossible to enter the expression past the first element.

Parentheses are used to group multiple elements of an expression into a single element. The calculator evaluates elements in parentheses separately, before processing the rest of the expression.

For example, press **[(]** 5 **[+]** 9 **[)]**. When you press the **[)]** key, the calculator immediately evaluates the element 5 + 9 and displays 14, even though you did not press **[=]**.

Parentheses must be used in an expression in the following cases:

- When you want certain elements of the expression to be evaluated independently of direct algebraic entry priorities.

- When you want to immediately see the result of a certain element of the expression.

- When you are unsure of how the calculator will interpret the expression.

There are limits to the number of operators and associated data the calculator can remember. It is possible to open up to **seven parentheses** simultaneously and have **six pending operations**. In reality, it is only in the most complex cases that you will approach these limits. If you attempt to open more than seven parentheses, or if the calculator attempts to store more than six operations, the display will indicate an error.

The example below uses four pending operations, and illustrates the order of operations the calculator follows, according to its entry system.

Example: 5 + (8 ÷ (9 − (2 ÷ 3))) = 5.96

Enter	Press	Display	Comments
	[ON/C]	0.	
5	**[+] [(]**	[	(5 +) stored
8	**[÷] [(]**	[[	(8 ÷) stored
9	**[−] [(]**	[[[	(9 −) stored
2	**[÷]**	2.	(2 ÷) stored
3	**[)]**	0.666666667	(2 ÷ 3) evaluated
	[)]	8.333333333	9 − (2 ÷ 3) evaluated
	[)]	0.96	(8 ÷ (9 − (2 ÷ 3)))
	[=]	5.96	5 + (8 ÷ (9 − (2 ÷ 3)))

Since the **[=]** key completes all operations, it could have been used instead of the three **[)]** keys. Try to repeat the problem, and press **[=]** instead of the first **[)]**.

When you press **[)]**, the expression is evaluated up to the nearest open parenthesis to the left, replacing the element with a single value. Because of this, you can manipulate the order of interpretation of an expression according to your needs. You can also check intermediate results.

4 – Calculations with a constant

The calculator simplifies repetitive calculations by storing a number and its associated operator for repeated use. The calculator can remember a commonly used sequence, such as + 3, ÷ (–17.3), or y^7, and perform it on any displayed number. After storing the constant, simply enter a number and press the **[=]** key to obtain the result.

To use a constant with **[x]**, enter m **[x]** n **[=]**. Each subsequent entry will then be multiplied by the m value.

To use a constant with **[+]**, **[–]**, or **[÷]**, proceed according to the table below:

[+] m **[=]** Adds the m value to each subsequent entry.
[–] m **[=]** Subtracts the m value from each subsequent entry.
[÷] m **[=]** Divides each subsequent entry by the m value.

To use a constant with **[y^x]** or **[2nd] ($\sqrt[x]{y}$)**, proceed according to the table below:

n **[y^x]** m **[=]** Raises each subsequent entry to the mth power.
n **[2nd] ($\sqrt[x]{y}$)** m **[=]** Calculates the mth root of each subsequent entry.

To clear a constant, clear the calculator or press any of the arithmetic keys above.

Calculations with a constant

Example 1:

$$31 + 1.8026 = 32.8026$$
$$745.797 + 1.8026 = 747.5996$$
$$-8.002 + 1.8026 = -6.1994$$
$$3.2 \times 10^{-2} + 1.8026 = 1.8346$$

Enter	Press	Display
	[ON/C]	0.
31	**[+]**	31.
1.8026	**[=]**	32.8026
745.797	**[=]**	747.5996
8.002	**[+/–] [=]**	-6.1994
3.2	**[EXP]**	3.2 00
2	**[+/–] [=]**	1.8346

Example 2: Evaluate $(3.75)^{-3.2}$, $(0.1066)^{-3.2}$, and $(0.0692)^{-3.2}$

Enter	Press	Display
	[ON/C]	0.
3.75	**[y^x]**	3.75
3.2	**[+/−] [=]**	0.014557941
.1066	**[=]**	1291.745463
.0692	**[=]**	5148.260308

5 – Uses of the [A] and [B] keys

Assigning a constant value to A and B

To assign a value to the **[A]** or **[B]** key, enter the value, then press **[2nd] (x>A)** or **[2nd] (x>B)**. To determine the current contents of one of the keys, press **[ON/C] [A]** or **[ON/C] [B]**. The calculator then displays the assigned value. Values assigned to A and B are retained in permanent memory when the calculator is turned off. These values are cleared when you switch to STAT mode.

Using A and B as multipliers

Once a value has been assigned to **[A]** or **[B]**, you can multiply by that value with a single keystroke.

By pressing **[A]** or **[B]** immediately after entering a number or completing a calculation, the calculator displays the product of the assigned value and the last number displayed.

Example: (2 x 1.234) + (3 x 1.234) = 6.17

Enter	Press	Display
	[ON/C]	0.
1.234	**[2nd] (x>A)**	1.234
2	**[A] [÷]**	2.468
3	**[A]**	3.702
	[=]	6.17

Using A and B for other calculations

When pressing **[A]** or **[B]** immediately after an operator key such as **[÷]** or **[−]**, the calculator uses the assigned value to perform the indicated operation.

Example: 2 ÷ 1.234 + 1.234 = 2.854745543

Enter	Press	Display
	[ON/C]	0.
1.234	**[2nd] (x>B)**	1.234
2	**[÷] [B] [+]**	1.620745543
	[B] [=]	2.854745543

IV – ALGEBRAIC FUNCTIONS

Single-variable functions such as x^2 are immediately executed on the displayed value.

The **[y^x]** and **[2nd] ($\sqrt[x]{y}$)** functions are not immediately executed on the displayed value: they are two-variable functions. They need a second value to perform the calculation.

Important note: The display is blank during the brief time the calculator takes to evaluate a result. Make sure the calculator has completed an operation before pressing the next key.

1 – Powers, roots, and the inverse function

[x^2] – Square key. It calculates the square of the displayed value.

Example: $4.235^2 = 17.935225$

Enter	Press	Display
4.235	**[x^2]**	17.935225

[√x] – Square root key. It calculates the square root of the displayed value. It always gives a positive result.

Example: $\sqrt{6.25} = 2.5$

Enter	Press	Display
6.25	**[√x]**	2.5

[2nd] ($\sqrt[3]{x}$) – Cube root key. It calculates the cube root of the displayed value.

Example: $\sqrt[3]{125} = 5$

Enter	Press	Display
125	**[2nd] ($\sqrt[3]{x}$)**	5.

[y^x] – Universal power key. It raises the displayed y value to the xth power. The input order is y **[y^x]** x. The y value must be positive, and both x and y can be fractional.

Example: $2.86^{-.42}$ = 0.643170721

Enter	Press	Display
2.86	**[y^x]**	2.86
.42	**[+/–]**	–0.42
	[=]	0.643170721

[2nd] ($^x\sqrt{y}$) – Universal root key. It calculates the xth root of the displayed y value. The input order is y ($^x\sqrt{y}$) x. The y value must be positive, and both x and y can be fractional.

Example: $^{3.12}\sqrt{1460}$ = 10.332744

Enter	Press	Display
1460	**[2nd] ($^x\sqrt{y}$)**	1460.
3.12	**[=]**	1033274375

[2nd] (1/x) – Inverse function key. It divides 1 by the displayed x value. x cannot be zero.

Example: $^1/_{32}$ = 0.03125

Enter	Press	Display
32	**[2nd] [1/x]**	0.03125

2 – Logarithms and antilogarithms

[lnx] – Natural logarithm key. It calculates the natural logarithm (base e) of the displayed x value. x must be positive.

Example: ln 1.2 = 0.182321557

Enter	Press	Display
1.2	**[lnx]**	0.182321557

[2nd] (e^x) – Natural antilogarithm key. It calculates the natural antilogarithm of the displayed x value. This sequence raises e to the displayed power.

Example: $e^{3.81}$ = 45.15043887

Enter	Press	Display
3.81	**[2nd] (e^x)**	45.15043887

Note that it is not necessary to press the **[=]** key since the logarithm function produces the result immediately.

[log] – Common logarithm key. It calculates the common logarithm (base 10) of the displayed x value. x must be positive.

Example: log 32.01 = 1.505285674

Enter	Press	Display
32.01	**[log]**	1.505285674

[2nd] (10^x) – Common antilogarithm key. It calculates the common antilogarithm of the displayed x value. This sequence raises 10 to the displayed power.

Example: $10^{-7.12}$ = .000000076

Enter	Press	Display
7.12	**[+/–]**	–7.12
	[2nd] (10^x)	0.000000076

The results of logarithmic functions, when displayed in standard notation and not in scientific notation, are accurate to within ± 1 unit of the last displayed digit, accounting for rounding.

3 – Factorials

The factorial **[2nd] (x!)** key calculates the factorial (x) (x–1) (x–2)… (2) (1) of the displayed integer x value, with $0 < x \leq 69$ (by definition, 0! = 1).

Example: $36! = 3.7199333 \times 10^{41}$

Enter	Press	Display
36	**[2nd] (x!)**	3.7199333 41

4 – Trigonometric functions

The trigonometric functions are sine, cosine, and tangent, and their inverses (arcsine, arccosine, and arctangent). Whether the angle is entered or calculated, it is necessary to select the appropriate angle unit to obtain the correct result.

Selecting the angle unit

Selecting the angle unit only affects trigonometric calculations. This selection is as easy to make… as it is to forget. This is a common cause of errors related to trigonometric calculations.

The **[DRG] (Degrees/Radians/Grads)** key is used to select the angle unit. The display indicates the current selection: DEG, RAD, or GRAD.

When you first turn the calculator on, the selected angle unit is degrees. Press the **[DRG]** key once to switch to radians, and a second time to switch to grads (a right angle is 100 grads).

The current selection remains active until it is changed, even if the calculator is turned off. Changing the angle unit does not perform any operation and does not affect the contents of the memory.

Trigonometric function keys

[sin] – Sine key. It calculates the sine of the displayed angle.

[2nd] ($\sin^{-1}$) – Arcsine key. It calculates the smallest angle whose sine is displayed (first or fourth quadrant, $\sin^{-1}$).

[cos] – Cosine key. It calculates the cosine of the displayed angle.

[2nd] ($\cos^{-1}$) – Arccosine key. It calculates the smallest angle whose cosine is displayed (first or second quadrant, $\cos^{-1}$).

[tan] – Tangent key. It calculates the tangent of the displayed angle.

[2nd] ($\tan^{-1}$) – Arctangent key. It calculates the smallest angle whose tangent is displayed (first or fourth quadrant, $\tan^{-1}$).

It is possible to calculate trigonometric values for angles of more than one revolution. However, in the case of radians, the rounded value of π limits precision for large angles that are multiples of π and $\pi/2$.

Example: sin 30° = 0.5 = sin 390°

Enter	**Press**	**Display**
(use **[DRG]** to select degrees)		DEG
30	**[sin]**	0.5
390	**[sin]**	0.5

The sine and cosine functions are accurate for all displayed digits (except as noted above for radians). The tangent of ±90°, ±$\pi/2$ radians or ±100 grads causes an error condition to occur, since the function is undefined at these points.

Example: [sin(.3012π)]$^{-\tan 16.2^\circ}$ = 1.062665429

Enter	Press	Display	Comments
(use **[DRG]** to select radians)			RAD
	[ON/C] [(]	[	
.3012	**[x]**	0.3012	
	[2nd] (π)	3.141592654	
	[)]	0.946247707	(.3012π)
	[sin]	0.811227138	Sin (.3012π)
	[y^x]	0.811227138	
16.2	**[DRG] [DRG]**	16.2	DEG
	[tan]	0.290526857	Tan 16.2°
	[+/–] [=]	1.062665429	Result

Because some angles have identical function values within one revolution, the angle returned by each value is limited according to the table below:

Arc function for x > 0	Quadrant of resulting angle
arcsin x ($\sin^{-1}$ x)	1st (0 to 90°, π/2, or 100 G)
arcsin –x ($\sin^{-1}$ –x)	4th (0 to –90°, –π/2, or –100 G)
arccos x ($\cos^{-1}$ x)	1st (0 to 90°, π/2, or 100 G)
arccos –x ($\cos^{-1}$ –x)	2nd (90 to 180°, π/2 to π, or 100 to 200 G)
arctan x ($\tan^{-1}$ x)	1st (0 to 90°, π/2, or 100 G)
arctan –x ($\tan^{-1}$ –x)	4th (0 to –90°, –π/2, or –100 G)

For example, arcsin 0.5 always returns an angle of 30°, although sin 150° and sin 390° are also 0.5.

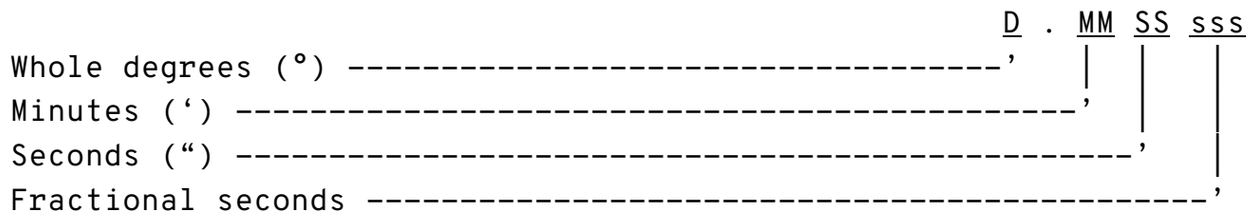
Example: $\sin^{-1}$ 0.712 = 45.39787468 degrees
0.792342387 radians
50.44208298 grads

Enter	Press	Display
(use **[DRG]** to select degrees)		DEG
.712	**[2nd] ($\sin^{-1}$)**	45.39787468
(use **[DRG]** to select radians)		RAD
.712	**[2nd] ($\sin^{-1}$)**	0.792342387
(use **[DRG]** to select grads)		GRAD
.712	**[2nd] ($\sin^{-1}$)**	50.44208298

Conversion between degree formats

An angle measured in degrees, minutes, and seconds (DMS) must be converted to decimal degrees (DD) before being used in calculations.

• The digit positions in **DMS format** are as follows:



• The digit positions in **decimal format** are as follows:

[2nd] (>DD) converts the displayed value from degrees, minutes, and seconds to decimal degrees. Enter the angle as D.MMSSsss (use zeros to place the digits in the correct positions) and press **[2nd] (>DD)**.

[2nd] (>DMS) converts the displayed value from decimal degrees to degrees, minutes, and seconds.

Example: Convert 30.27’18” from degrees/minutes/seconds format to decimal degree format, then perform the inverse conversion.

Enter	Press	Display	Comments
30.2718	**[2nd] (>DD)**	30.455	Decimal degree format
	[2nd] (>DMS)	30.2718	DMS format: 30 degrees 27 minutes 18 seconds

5 – Hyperbolic functions

To solve problems involving **hyperbolic functions**, use the sequence **[2nd] (HYP)**, as shown below:

hyperbolic sine (sinh)……**[2nd] (HYP) [sin]**
hyperbolic cosine (cosh)……**[2nd] (HYP) [cos]**
hyperbolic tangent (tanh)……**[2nd] (HYP) [tan]**

Example: tanh 2.99 = 0.994955105

Enter	Press	Display
2.99	**[2nd] (HYP) [tan]**	0.994955105

To solve problems involving **inverse hyperbolic functions**, use the sequence **[2nd] (HYP)**, as shown below:

hyperbolic arcsine ($\sinh^{-1}$)……**[2nd] (HYP) [2nd] ($\sin^{-1}$)**
hyperbolic arccosine ($\cosh^{-1}$)……**[2nd] (HYP) [2nd] ($\cos^{-1}$)**
hyperbolic arctangent ($\tanh^{-1}$)……**[2nd] (HYP) [2nd] ($\tan^{-1}$)**

Example: $\sinh^{-1}$ 86.213 = 5.150001793

Enter	Press	Display
86.213	**[2nd] (HYP)**	HYP
	[2nd] ($\sin^{-1}$)	5.150001793

V – STATISTICAL FUNCTIONS

In many cases, you are required to make decisions based on a data set. This data may consist of survey results, sales figures, game statistics, etc. The calculator's statistical keys allow you to analyze these data sets.

All statistical functions are marked on the right side of the keys, and are only accessible in STAT mode.

1 – Switching to STAT mode

The **[2nd] (STAT)** sequence puts the calculator in STAT mode. Switching to this mode clears the memory, all calculations in progress, the fixed decimal specification, and the contents of the A and B multipliers. Pressing **[2nd] (STAT)** in STAT mode exits the mode.

In STAT mode, the following operations cannot be used:

• **[STO]**, **[RCL]**, and **[SUM]**.

• Operations using the permanent multipliers A and B.

2 – Entering and deleting data

[2nd] (CSR) – Clear statistical registers key. It clears the statistical registers. Always use this sequence before starting statistical calculations.

[Σ+] – Data entry key. It is used to enter a data point x_i for mean, variance, and standard deviation calculations. When you enter a value and press **[Σ+]**, the current total number of data points (n) is displayed.

[CD] – Delete data point key. It deletes a data point x_i. When a data point has been deleted, the new number n of data points is displayed.

[n] – Display number of data points key. It displays the number of data points n that have been entered.

3 – Statistical calculation keys

After entering the data, various keys are used to calculate the mean, variance, standard deviation, and other statistical values.

[ẋ] – Mean key. It calculates the mean of the data set.

[2nd] (∑x) – Sum key. It calculates the sum of the data set.

[2nd] ($\sum x^2$) – Sum of squares key. It calculates the sum of the squares of each data point.

[σ'] – Sample standard deviation key. It calculates the standard deviation using n–1 evaluation (for sample data).

[2nd] (σ) – Population standard deviation key. It calculates the standard deviation using n evaluation (for population data).

[σ'] (x^2) – Sample variance key. It calculates the variance using n–1 evaluation (for sample data).

[2nd] (σ) [x^2] – Population variance key. It calculates the variance using n evaluation (for population data).

Note: A population consists of a full data set. A sample consists of a subset of the population. The difference between the sample and population standard deviations tends to become insignificant for samples of 30 or more randomly selected points.

FREQUENCY PROCESSING FOR REPETITIVE DATA POINTS:

X [x] f [∑+] to enter "f" times the data point "X"
X [x] f' [CD] to delete "f'" times the data point "X"

Example: 7,5,5,5

Press	Read	Comments
[2nd] [STAT]		
[7] [∑+]	1.	
5 [x] 10 [∑+]	11.	Enter 10 as frequency instead of 3
5 [x] 7 [CD]	4.	Correct the frequency
[ẋ]	5.5	Calculate the mean of the data set

Example: Analyze the following exam scores: 96, 81, 87, 74, and 92, considering that the five students concerned are part of a sample of a larger class. Then analyze the data considering that they represent the entire class

Enter	Press	Display	Comments
	[ON/C]	0.	
	[2nd] (STAT)	0.	Select STAT mode
	[2nd] (CSR)	0.	Clear statistical registers
96	**[Σ+]**	1.	First entry
81	**[Σ+]**	2.	Second entry
97	**[Σ+]**	3.	Third entry (incorrect)
97	**[CD]**	2.	Delete third entry
87	**[Σ+]**	3.	Third entry (correct)
74	**[Σ+]**	4.	Fourth entry
92	**[Σ+]**	5.	Fifth entry
	[$\dot{x}$]	86.	Mean (class)
	[σ']	8.746427842	Sample standard deviation
	[x^2]	76.5	Sample variance
	[2nd] (σ)	7.823042886	Population standard deviation
	[x^2]	61.2	Population variance

APPENDICES

A – Error conditions

General error conditions

1. Calculating a value (including in the case of a memory sum) greater than ± 9.999999999 x 10^{99}.

2. Dividing by zero.

3. Calculating **[log]**, **[lnx]**, or **[1/x]** of zero.

4. Calculating **[log]**, **[lnx]**, or **[√x]** of a negative number.

5. Using **[y^x]** to raise zero to the zeroth power or using **[2nd] ($\sqrt[x]{}$y)** to calculate the zeroth root of a number.

6. Calculating the power or root of a negative number.

7. Calculating the tangent of 90°, 270°, $\pi/2$ radians, 100 grads, 300 grads, and their rotational multiples.

8. Multiplying numbers with negative exponents when the sum of their exponents (before normalization) exceeds –99.

9. Attempting more than six pending operations or opening more than seven parentheses.

10. Attempting a fifth pending operation while in statistics mode (STAT is displayed).

11. Calculating **[2nd] (x!)** of a fractional number or a number greater than 69.

12. Calculating **[2nd] ($\sin^{-1}$)** or **[2nd] ($\cos^{-1}$)** of a number whose absolute value is greater than 1.

Statistics mode error conditions

1. Calculating a sample standard deviation (using n−1 evaluation) of a single data point.

2. Entering a data point x where $x \geq 1 \times 10^{50}$.

3. Entering a data set (x_i) where $\sum(x_i)^2$ exceeds the lower or upper limits of the calculator.

4. Clearing the last remaining data point (n = 1) with **[CD]**.

B – In case of difficulty

1. If numbers will not appear on the display, check if the batteries are discharged or incorrectly installed.

2. Check the manual to make sure calculations have been correctly performed.

3. Press the **[OFF]** and **[ON]** keys and restart the calculation.

C – Replacing the batteries

The calculator uses two batteries of one of the following types:

For up to 1000 hours of operation:

Panasonic LR−44
Ray−O−Vac RW−82
Union Carbide (Eveready) A−76
or equivalents

For up to 2500 hours of operation:

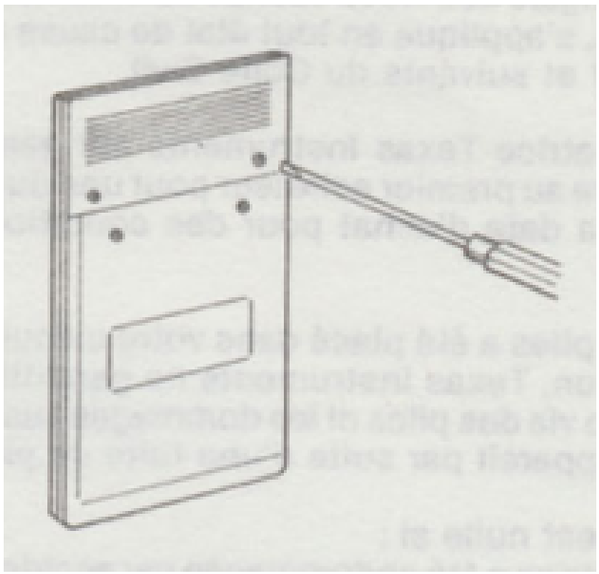
Duracell 10L14 or D357
Union Carbide (Eveready) 357
Panasonic WL−14
Ray−O−Vac RW−42.
Toshiba G−13
or equivalents

Note: If the batteries are removed or discharged, the calculator can no longer retain data.

To replace the batteries:

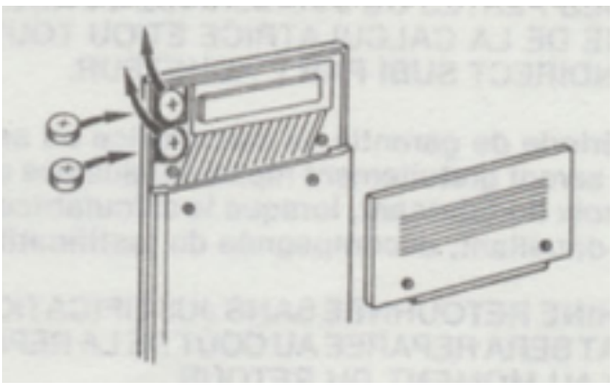
1. Turn the calculator off.

2. Using a small Phillips-head screwdriver, remove the two screws at the top of the calculator.



3. Remove the battery compartment cover.

4. Remove the old batteries and install the new ones. Avoid contact with exposed circuitry to protect the calculator from damage.



5. Reinstall the battery compartment cover.

6. Reinstall the two screws to hold the cover in place.

CAUTION: Discard discharged batteries. Do not burn them or leave them within the reach of children

D - Two-year warranty

!! PLEASE NOTE THAT THIS IS AN UNOFFICIAL TRANSLATION AND MAY NOT !!
!! ACCURATELY REPRESENT THE INTENDED LEGAL WARRANTY INFORMATION !!

Please contact your Texas Instruments dealer for warranty claims.

The legal guarantee against latent defects or defects in the goods sold applies in any case under the terms of articles 1641 and following of the Civil Code.

This Texas Instruments calculator is warranted for parts and labor to the original purchaser for a period of two years from the date of purchase under normal use conditions.

If a set of batteries has been placed in your calculator for demonstration purposes, Texas Instruments does not warrant the quality or life of the batteries or any damage that may be caused to the unit as a result of battery leakage in general.

The warranty is void if:
1. The calculator has been damaged by accident or misuse, negligence, improper repair, or any other condition not originating from the repair parts, strips or their assembly;
2. The serial number has been changed or removed.

TEXAS INSTRUMENTS CANNOT BE HELD RESPONSIBLE FOR LOSSES DUE TO CALCULATOR FAILURE AND/OR ANY OTHER INDIRECT DAMAGE SUFFERED BY THE BUYER.

During the warranty period, the calculator or its defective parts will be repaired, adjusted and/or replaced free of charge at the manufacturer's option, when the calculator has been returned to the retailer, together with proof of purchase.

ANY MACHINE RETURNED WITHOUT PROOF OF THE DATE OF PURCHASE WILL BE REPAIRED AT THE REPAIR COST IN EFFECT AT THE TIME OF RETURN.

In the event of replacement by a new calculator, the latter will retain the continuation of the contractual guarantee initially granted to the purchased model. This contractual guarantee shall in no case be less than 90 days.