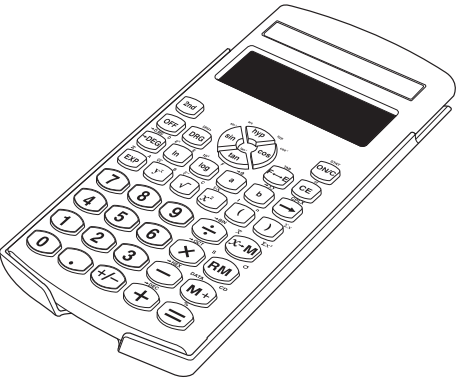# Scientific Calculator with Statistical Functions TR28201

Owner's Manual

We're here to help!
During weekday business hours, call:
1-800-270-9145

Please read before using.

SAFETY PRECAUTIONS

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

BATTERIES

- After removing the batteries from the calculator, put them in a safe place where there is no danger of them getting into the hands of small children and accidently swallowed.
- Keep batteries out of the reach of children. If accidentally swallowed, consult with a physician immediately.
- Never charge batteries, try to take batteries apart, or allow batteries to become shorted. Never expose batteries to direct heat or dispose of them by incineration.
- Misuse of batteries can cause them to leak acid that can cause damage to nearby items and creates the possibility of fire and personal injury.
- Always make sure that a battery's positive (+) and negative (–) sides are facing correctly when you load it into the calculator.
- Remove the batteries if you do not plan to use the calculator for a long time.
- Use only the type of batteries specified for this calculator in this manual.
- Do not mix old and new batteries.
- Do not mix alkaline, standard (Carbon–Zinc), or rechargeable (Nickel Cadmium) batteries.

DISPOSING OF THE CALCULATOR

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

HANDLING PRECAUTIONS

- Be sure to press the "ON/C" key before using the calculator for the first time.
- Even if the calculator is operating normally, replace the battery at least once every three years. Dead battery can leak, causing damage to and malfunction of the calculator. Never leave the dead battery in the calculator.
- The battery that comes with this unit discharges slightly during shipment and storage. Because of this, it may require replacement sooner than the normal expected battery life.
- Low battery power can cause memory contents to become corrupted or lost completely. Always keep written records of all important data.
- Avoid use and storage in areas subjected to temperature extremes. Very low temperatures can cause slow display response, total failure of the display, and shortening of battery life. Also avoid leaving the calculator in direct sunlight, near a window, near a heater or anywhere else it might become exposed to very high temperatures. Heat can cause discoloration or deformation of the calculator's case, and damage to internal circuitry.
- Avoid use and storage in areas subjected to large

---

amounts of humidity and dust. Take care never to leave the calculator where it might be splashed by water or exposed to large amounts of humidity or dust. Such elements can damage internal circuitry.
- Never drop the calculator or otherwise subject it to strong impact.
- Never twist or bend the calculator. Avoid carrying the calculator in the pocket of your trousers or other tight-fitting clothing where it might be subjected to twisting or bending.
- Never try to take the calculator apart.
- Never press the keys of the calculator with a ball-point pen or other pointed object.
- Use a soft, dry cloth to clean the exterior of the unit. If the calculator becomes very dirty, wipe it off with a cloth moistened in a weak solution of water and a mild neutral household detergent. Wring out all excess moisture before wiping the calculator. Never use thinner, benzine or other volatile agents to clean the calculator. Doing so can remove printed markings and damage the case.

LCD DISPLAY

KEYS LAYOUT
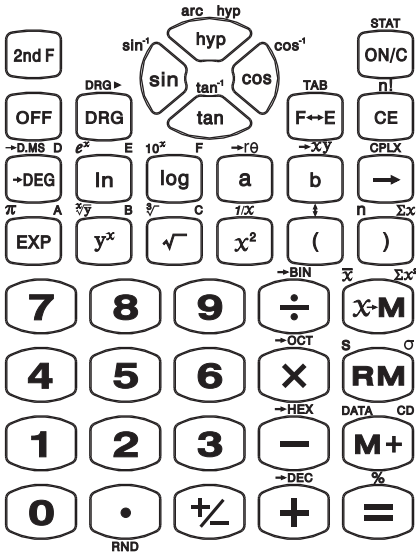
BEFORE STARTING CALCULATIONS

OPERATION MODES

When using this calculator, it is necessary to select the proper mode to meet your requirements.

CALCULATION MODES

"DEC" mode [2ndF][...]: – general calculations, including function calculations can be executed. Either "DEG", "RAD" or "GRAD" symbol appears in the LCD display (depends on which angular measurement mode is active).
"BIN" mode [2ndF][→BIN]:– binary conversion and calculations. "BIN" symbol appears in the LCD display.
"OCT" mode [2ndF][→OCT]:– octal conversion and calculations. "OCT" symbol appears in the LCD display.
"HEX" mode [2ndF][→ HEX]:– hexadecimal conversion and calculations. "HEX" symbol appears in the LCD display.
"CPLX" mode [2ndF][CPLX]:– calculations including complex numbers can be executed. "CPLX" symbol appears in the LCD display.
"SD" mode [2ndF][STAT]:– standard deviation calculation can be executed, "STAT" symbol appears in the LCD display.

ANGULAR MEASUREMENT MODES

"DEG" mode:– specify measurement in "degrees".
"DEG" symbol appears in display window.
"RAD" mode:– specify measurement in "radians".
"RAD" symbol appears in display window.
"GRA" mode:– specify measurement in "grads".
"GRAD" symbol appears in display window.
These three angular measurement modes can be used in combination with the **"DEC"** mode.

DISPLAY MODE

"TAB" mode [2ndF] [TAB]:- specify number of decimal places.

Moreover you can change the display In exponential format by pressing [F ↔E].

Mode	Operation	Display
Decimal	**[2ndF][→DEC]**	DEG, RAD or GRAD
Binary	**[2ndF][→BIN]**	BIN
Octal	**[2ndF][→OCT]**	OCT
Hexadecimal	**[2ndF][→HEX]**	HEX
Statistical	**[2ndF][STAT]**	STAT
Deg	Press **[DRG]** to cycle	DEG
Rad	through "DEG", "RAD"	RAD
Grad	and "GRAD".	GRAD
Tab	**[2ndF][TAB]** then [0]~[9]	
To reset decimal setting	**[2ndF][TAB][•]**	

ARITHMETIC OPERATIONS & PARENTHESIS CALCULATIONS

- For negative values, press [+/–] after entering the value.
- For mixed basic arithmetic operations, multiplication and division are given priority over addition and subtraction.
- Assuming that "DEC" mode ([2ndF][→DEC]) is selected.

Example	Operation	Display
23 + 4.5 −53 =−25.5	23 [+] 4.5 [−] 53 [=]	−25.5
56×(−12)÷(−2.5)=268.8	56[×]12[+/–][÷]2.5[+/–][=]	268.8
12369×7532×74103= 6.9036806×10^{12}	12369[×] 7532 [×] 74103[=]	6.9036806^{12}
(4.5×10^{75})×(−2.3× 10$^{−79}$) = −0.001035	4.5[EXP]75 [×]2.3[+/–] [EXP]79 [+/–][=]	−0.001035
(2+3)×10^2=500	[( ] 2 [+] 3[ )][×] 1 [EXP]2 [=]	500.
(1×10^5)÷7= 14285.71429	1[EXP]5 [÷] 7 [=]	14285.71429
(1×10^5)÷7−14285= 0.7142857	1[EXP]5[÷]7 [−] 14285 [=]	0.7142857
3 + 5 × 6 = 33	3 [+] 5 [×] 6 [=]	33.
7 × 8 − 4 × 5 = 36	7 [×] 8 [−] 4 [×] 5 [=]	36.
1 + 2 − 3 × 4 ÷ 5 + 6 = 6.6	1 [+] 2 [−] 3 [×] 4 [÷] 5 [+] 6 [=]	6.6
100 − (2+3) × 4 = 80	100 [−][( ] 2 [+] 3[ )] [×] 4 [=]	80.
2 + 3 × (4 + 5) = 29	2 [+] 3 [×] [( ] 4 [+] 5 [=] Closed parentheses occurring immediately before operation of the [=] key may be omitted.	29.

PERCENTAGE CALCULATIONS

Example	Operation	Display
Percentage 26% of $15.00	15 [×]26 [2ndF] [%] [=]	3.9
Premium 15% increase from $36.20	36.2[+]15 [2ndF] [%] [=]	41.63
Discount 4% discount from $47.50	47.5[−]4 [2ndF] [%] [=]	45.6
Ratio 75 is what % of 250?	75[÷]250 [2ndF] [%] [=]	30.

SPECIFYING THE NUMBER OF DECIMAL PLACES

To specify the number of decimal places (TAB), **[2ndF][TAB]** then enter a value indicating the number of decimal places (0~9).

Example	Operation	Display
To set 3 decimal places	[2ndF][TAB]3	0.000
To reset the number of decimal places.	[2ndF][TAB][•]	0.

DISPLAY IN EXPONENTIAL FORMAT

You can change the display into exponential format by pressing [F↔E].

Example	Operation	Display
2÷3 = 0.666666666	2[÷]3[=] [F↔E]	0.666666666 6.6666666$^{−01}$

MEMORY

This calculator contains a single independent memory, which is accessed by using the [X→M], [M+] and [RM]. Content of this independent memory is protected even when the power is turned OFF.

Addition results can be stored directly in memory. Results can also be totalized in memory, making it easy to calculate sums. The icon "M" will be lighted as long as "Memory" is not empty.

Example	Operation	Display	
Input 123 into memory:	123[X→M]	M	123.
	[ON/C]	M	0.
To recall the content of the memory	[RM]	M	123.
To add 25 into the memory	25[M+]	M	25.
	[ON/C]	M	0.
	[RM]	M	148.
To replace the memory content by a new number, e.g. 369	369 [X→M]	M	369.
	[ON/C]	M	0.
	[RM]	M	369.
To clear the memory	[ON/C]	M	0.
	[X→M]		0.

TRIGONOMETRIC FUNCTIONS AND INVERSE TRIGONOMETRIC FUNCTIONS

- Be sure to set the unit of angular measurement before performing trigonometric function and inverse trigonometric function calculations.
- The unit of angular measurement (degrees, radians, grads) is selected by pressing [DRG].
- Once a unit of angular measurement is set, it remains in effect until a new unit is set. Settings are not cleared when power is switched OFF.

Example	Operation	Display
sin 63°52'41" = 0.897859012	Press [DRG]to select "DEG" 63.5241[→DEG][sin]	0.897859012
cos (π/3 rad) = 0.5	Press [DRG]to select "RAD" [([2ndF][π][÷]3[)][cos]	0.5
tan (−35 grad) = −0.612800788	Press [DRG]to select "GRAD" 35[+/−][tan]	−0.612800788
2sin45°×cos65° = 0.597672477	Press [DRG]to select "DEG" 45[sin][×]2[×][(]65[cos] [=]	0.597672477
sin⁻¹ 0.5 = 30	0.5[2ndF][sin⁻¹]	30.
cos⁻¹ (√2/2) = 0.785398163 rad = π/4 rad	Press [DRG]to select "RAD" [([2][√][÷]2[)] [2ndF][cos⁻¹] [÷][2ndF][π][=]	0.785398163 0.25
tan⁻¹ 0.741 = 36.53844577° = 36°32' 18.4"	Press [DRG]to select "DEG" 0.741[2ndF][tan⁻¹] [2ndF] [→D.MS]	36.53844577 36.321840

PERFORMING HYPERBOLIC AND INVERSE HYPERBOLIC FUNCTIONS

Example	Operation	Display
sinh3.6= 18.28545536	3.6[HYP][sin]	18.28545536
cosh1.23 = 1.856761057	1.23[HYP][cos]	1.856761057
tanh2.5= 0.986614298	2.5[HYP][tan]	0.986614298
cosh1.5−sinh1.5 = 0.22313016	1.5[HYP][cos][−][(]1.5 [HYP][sin][)][=]	0.22313016
sinh⁻¹ 30 = 4.094622224	30[HYP][2ndF][sin⁻¹]	4.094622224
cosh⁻¹ (20/15) = 0.795365461	[([20[÷]15[)][HYP][2ndF] [cos⁻¹]	0.795365461
x = (tanh⁻¹ 0.88) / 4 = 0.343941914	0.88[HYP][2ndF][tan⁻¹] [÷]4[=]	0.343941914
sinh⁻¹ 2×cosh⁻¹1.5 = 1.389388923	2[HYP][2ndF][sin⁻¹][×][(][(1.5[HYP][2ndF][cos⁻¹][)][)][=]	1.389388923
sinh⁻¹ (2/3)+tanh⁻¹ (4/5) = 1.723757406	[([2[÷]3[)][HYP][2ndF] [sin⁻¹][+][([4[÷]5[)][HYP] [2ndF][tan⁻¹][=]	1.723757406

LOGARITHMIC AND EXPONENTIAL FUNCTIONS

Example	Operation	Display
log1.23 = 0.089905111	1.23[log]	0.089905111
ln90 = 4.49980967	90[ln]	4.49980967
log456÷ln456 = 0.434294481	456[log]÷[(]456[ln][)][=]	0.434294481
10^1.23 = 16.98243652	1.23[2ndF][10ˣ]	16.98243652
e^4.5 = 90.0171313	4.5[2ndF][eˣ]	90.0171313
10⁴ · e⁻⁴+1.2 · 10^2.3 = 422.5878667	4[2ndF][10ˣ][×][(]4[+/−] [2ndF][eˣ][)][+][(]1.2[×][(] 2.3[2ndF][10ˣ][)][)][=]	422.5878667
(−3)⁴ = 81	3[+/−][yˣ] 4 [=]	81.
−3⁴ = −81	[−] 3 [yˣ] 4 [=]	−81.
5.6^2.3 = 52.58143837	5.6 [yˣ] 2.3 [=]	52.58143837
³√123 = 4.973189833	123 [2ndF][³√]	4.973189833
(78−23)⁻¹² = 1.305111829×10⁻²¹	[([78[−]23[)][yˣ]12[+/−][=]	1.3051118⁻²¹
2+3×³√64−4 = 10	2[+]3[×][(]64[2ndF][³√] [)][−]4[=]	10.
2×3.4^(5+6.7) = 3306232	2[×]3.4[yˣ][([5[+]6.7[)][=]	3306232.

DEGREES, MINUTES, SECONDS CALCULATIONS

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

Example	Operation	Display
To express 2.258 degrees in deg/min/sec.	2.258[2ndF][→D.MS]	2.152880 (2°15'28.80")
To perform the calculation: 12°34'56"×3.45	12.3456[→DEG] [×]3.45[=] [2ndF][→D.MS]	12.58222222 43.40866667 43.243120 (43°24'31.20")

COORDINATE TRANSFORMATION

- This scientific calculator lets you convert between rectangular coordinates and polar coordinates, i.e., P(x, y) ↔ P(r, θ)
- With polar coordinates, θ can be calculated within a range of −180° <θ≤ 180° (Calculated range is the same with radians or grads.)

Example	Operation	Display
x=14 and y=20.7, what are r and θ°?	Press [DRG]to select "DEG" 14[a]20.7[b][2ndF][→rθ] [b] [2ndF][→D.MS]	24.98979792(r) 55.92839019(θ) 55.554220(θ)
x=7.5 and y=−10, what are r and θ rad?	Press [DRG]to select "RAD" 7.5[a]10[+/−][b] [2ndF][→rθ] [b]	12.5(r) −0.927295218(θ)
r=25 and θ= 56°, what are x and y?	Press [DRG]to select "DEG" 25[a]56[b][2ndF][→xy] [b]	13.97982259(x) 20.72593931(y)
r=4.5 and =2π/3 rad, what are x and y?	Press [DRG]to select "RAD" 2[×][2ndF][π][÷]3[=][b] 4.5[a][2ndF][→xy] [b]	−2.25(x) 3.897114317(y)

COMPLEX NUMBER CALCULATION

Press [2ndF] [CPLX] to enter the "CPLX" mode for calculations that include complex numbers.

Example	Operation	Display
(2+3i)+(4+5i)	[2ndF][CPLX] 2[a]3[b][+]4[a]5[b][=] [b]	0. 6. (real number part) 8. (imaginary number part)
Find the absolute value and the argument of (3+4i)	3[a]4[b][2ndF][→rθ] [b]	5. (absolute value) 53.13010235 (argument)

DEGREE, RADIAN, GRADIENT INTERCONVERSION

Degree, radian and gradient can be converted to each other with the use of [2ndF][DRG>].

Example	Operation	Display
Change 20 radian to degree	Press [DRG]to select "RAD" 20[2ndF][DRG>] [2ndF][DRG>]	1145.91559
10 radians+25.5 gradients The answer is expressed in degree.	Press [DRG]to select "RAD" 10[2ndF][DRG>][+]25.5 [=][2ndF][DRG>]	595.9077951

EXCHANGE FUNCTION ↕

Exchange two operands between the operator. For example [3] [÷] [6] and then press [↕] will change to [6] [÷] [3], and you will get the answer of 2.

RIGHT SHIFT FUNCTION →

To shift a displayed value digit by digit to the right, until you get to the digit you want to re-input from.

OTHER FUNCTIONS (√, x², 1/x, n!, ³√, RND)

Example	Operation	Display
√2+√5 = 3.65028154	2[√][+]5[√][=]	3.65028154
2²+3²+4²+5² = 54	2[x²][+]3[x²][+]4[x²] [+]5[x²][=]	54.
(−3)² = 9	3[+/−][x²]	9.
1/(1/3−1/4) = 12	[([3[2ndF][1/X][−]4 [2ndF][1/X][)][2ndF][1/X]	12.
8! = 40320	8[2ndF][n!]	40320.
³√(36×42×49) = 42	[([36[×]42[×]49[)] [2ndF][³√]	42.
√(1−sin²40) = 0.766044443	Press [DRG]to select "DEG" [([1[−][([40[sin][)][x²][)][)][√]	0.766044443
Random number generation (in the range of 0.000 to 0.999)	[2ndF][RND]	0.792 (random)

BINARY, OCTAL, DECIMAL, HEXADECIMAL CALCULATIONS

- General function calculations cannot be performed.
- Only integers can be handled.
- Only valid values for the particular number system can be used.

Number system	Valid values
Binary	0,1
Octal	0,1,2,3,4,5,6,7
Decimal	0,1,2,3,4,5,6,7,8,9
Hexadecimal	0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

BASIC ARITHMETIC OPERATIONS USING BINARY, OCTAL, DECIMAL, HEXADECIMAL VALUES

Example	Operation	Display
10111₂+11010₂ = 110001₂	[2ndF][→BIN] 10111[+]11010[=]	0. 110001.
B47₁₆−DF₁₆ = A68₁₆	[2ndF][→HEX] B47[−]DF[=]	0. A68.
123₈×ABC₁₆ = 37AF4₁₆ = 228084₁₀	[2ndF][→OCT] 123[2ndF][→HEX] [×]ABC[=] [2ndF][→DEC]	0. 53. 37AF4. 228084.
1F2D₁₆−100₁₀ = 7881₁₀ = 1EC9₁₆	[2ndF][→HEX] 1F2D[2ndF][→DEC] [−]100[=] [2ndF][→HEX]	0. 7981. 7881. 1EC9.
7654₈÷12₁₀ = 334.333333₁₀ = 516₈	[2ndF][→OCT] 7654[2ndF][→DEC] [÷]12[=] [2ndF][→OCT]	0. 4012. 334.3333333 516.
1234₁₀+1EF₁₆÷24₈	[2ndF][→DEC] 1234[2ndF][→HEX]	0. 4d2.
= 2352₈	[+]1EF[2ndF][→OCT] [÷]24[=]	757. 2352.
= 1258₁₀	[2ndF][→DEC]	1258.

BINARY, OCTAL, DECIMAL, HEXADECIMAL CONVERSIONS

Example	Operation	Display
How is 22₁₀ expressed in binary, octal and hexadecimal number system?	[2ndF][→DEC] 22[2ndF][→BIN] [2ndF][→OCT] [2ndF][→HEX]	0. 10110. 26. 16.

STATISTICAL CALCULATIONS

This unit can be used to make statistical calculations including standard deviation in the "STAT" mode.

STANDARD DEVIATION

In the "STAT" mode, calculations including 2 types of standard deviation formulas, mean, number of data, sum of data, and sum of square can be performed.

Data Input

1. Press [2ndF] [STAT] to specify STAT mode.
2. Input data, pressing [DATA] key each time a new piece of data is entered.

Example Data: 10, 20, 30

Key operation: 10 [DATA] 20 [DATA] 30 [DATA]

Performing calculations

The following procedures are used to perform the various standard deviation calculations.

Key operation	Result
[2ndF][σ]	Population standard deviation, σ
[S]	Sample standard deviation, S
[x̄]	Mean, x̄
[2ndF][∑x²]	Sum of square of data, ∑x²
[2ndF][∑x]	Sum of data, ∑x
[n]	Number of data, n

Standard deviation and mean calculations are performed as shown below:

Population standard deviation $\sigma = \sqrt{(\sum(x_i - \bar{x})^2/n)}$ where $i = 1$ to n

Sample standard deviation $S = \sqrt{(\sum(x_i - \bar{x})^2/(n-1))}$ where $i = 1$ to n

Mean $\bar{x} = (\sum x)/n$

Example	Operation	Display
Data 55, 54, 51, 55, 53, 53, 54, 52	[2ndF] [STAT] 55[DATA]54[DATA] 51[DATA]55[DATA] 53[×]2[DATA] 54[DATA]52[DATA]	0. 2. 4. 6. 8.
What is deviation of the unbiased variance, and the mean of the above data?	[n](Number of data) [2ndF][∑x] (sum of data) [2ndF][∑x²] (Sum of square of data) [x̄] (Mean) [2ndF][σ] (Population SD) [S] (Sample SD) [S][x²](Sample variance)	8. 427. 22805. 53.375 1.316956719 1.407885953 1.982142857

REPLACING THE BATTERY

Dim figures on the display of the calculator indicate that battery power is low. Continued use of the calculator when the battery is low can result in improper operation.

Replace the battery as soon as possible when display figures become dim.

To replace the battery:-
- Remove the screws that hold the back cover in place and then remove the back cover,
- Remove the old battery,
- Wipe off the side of the new battery with a dry, soft cloth. Load it into the unit with the positive (+) side facing up.
- Replace the battery cover and secure it in place with the screws.
- Press [ON/C] to turn power on.

AUTO POWER OFF

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

SPECIFICATIONS

Power supply: 1 x LR1130 batteries
Operating temperature:
0° ~ 40°C (32°F ~ 104°F)

ONE (1) YEAR LIMITED WARRANTY