GUIDELINES LAID DOWN BY FCC RULES FOR USE OF THE UNIT IN THE U.S.A. (not applicable to other areas).

NOTICE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- · Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- . Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications to the product not expressly approved by CASIO could void the user's authority to operate the product.



CASIO ELECTRONICS CO., LTD. Unit 6, 1000 North Circular Road, London NW2 7JD, U.K.

IMPORTANT!:

Please keep your manual and all information handy for future reference.



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•			
Handling	g Pr	ecautions	. 6
Power S	upp	ly	. 8
		Replacing the Main Battery	8
		Replacing the Back-up Battery About the Auto Power Off Function	9
		About the Auto Power Off Function	. 10
		RESET Operation	. 11
Chapter	1	Getting Acquainted	13
	1-1	Kevs and Their Functions	1 **
		Display Indicators	15
		The Keyboard	15
		Key Operations	. 16
	1-2	Selecting a Mode	20
	1-3	Basic Set Up	21
		Function Menus	21
		Unit of Angular Measurement (DRG) Menu	. 22
		Display Format/Clear (DSP/CLR) Menu	. 23
		Adjusting the Display Contrast	. 25
	1-4	Adjusting the Display Contrast	25
**	1 -	Inputting Calculations	. 25
		Editing Calculations	26
		Editing Calculations Answer Function	. 27
	•	Using Multistatements	. 28
		Multiplication Operations without a Multiplication Sign	. 29
		Performing Continuous Calculations	. 29
		Using the Replay Function	30
		Built-in Function (MATH) Menu	30
		Memory	. 33
	1-5	Using Scientific Constants	. 38
	1-6	Technical Information	. 41
		Calculation Priority Sequence	. 41
		Stacks	. 42
		Value Input and Output Limitations	43
		Input Capacity	. 43
		Overflow and Errors	4.
		Exponential Display	
		Calculation Execution Display	. 4
		Whenever you are having problems	45
Chanter	2	Manual Calculations	
Anapte		Basic Calculations	
	2-1	Basic Calculations	. 40
		Arithmetic Calculations	. 40

Calculations Using Parentheses	49
Percentage Calculations	50
Percentage Calculations 2-2 Units of Angular Measurement	50
2-3 Trigonometric and Inverse Trigonometric Functions	s 51
2-4 Logarithmic and Exponential Functions	51
2-5 Hyperbolic and Inverse Hyperbolic Functions	.,, 52
2-6 Other Functions	
2-7 Coordinate Conversion	54
2-8 Permutation and Combination	
2-9 Fractions	
2-10 Engineering Notation Calculations	57
2-11 Number of Decimal Places, Number of Significant I	
Exponential Notation Calculations	58
2-12 Calculations Using Memory	59
2-12 Calculations Using Memory	59
Variable Memories of the Management of the American	59
Chapter 3 Differential, Quadratic Differential, Integration Σ Calculations	
Chapter 3 Differential, Quadratic Differential, Integration	ı, and
Σ Calculations	
3-1 Differential Calculations	62
To Perform a Differential Calculation	63
Applications of Differential Calculations	64
3-2 Quadratic Differential Calculations	65
To Perform a Quadratic Differential Calculation	65
Applications of Quadratic Differential Calculations	66
3-3 Integration Calculations	67
To Perform an Integration Calculation	68
Applications of Integration Calculation	69
3-4 Σ Calculations	70
Example Σ Calculation	71
Σ Calculation Applications Σ Calculation Precautions	71
Chapter 4 Complex Numbers	· · · 73
Gnapter - Complex Numbers	.eg
4-1 Before Beginning a Complex Number Calculation	74
4-2 Performing Complex Number Calculations	74
Arithmetic Operations Annual Arithmetic Arithmetic Arithmetic Operations Annual Arithmetic Arithmet	74
Reciprocals, Square Roots, and Squares Annual	75
Absolute Value and Argument	
Conjugate Complex Numbers	76
Extraction of Real and Imaginary Number Parts	76
4-3 Complex Number Calculation Precautions	76

1010 (\$400) and

Chapter	5	Recursion Calculations	. 77
The second	5-1	Before Beginning a Recursion Calculation	78
	5-2	Before Beginning a Recursion Calculation Performing Recursion Calculations	79
Chapter	b	BASE-N Mode Calculations	. 83
	6-1	Before Beginning a Binary, Octal, Decimal, or	
-54	,	Hexadecimal Calculation Using the BASE-N Mode	85
	6-2	Using the BASE-N Mode	86
100		BASE-N Mode Number System	86
FF	6-3	BASE-N Mode - Number System BASE-N Mode Calculations - Arithmetic Operations - Negative Values - Logical Operations - Coloral Operation	87
73		Arithmetic Operations	87
	14.7	Negative Values	87
٠٠٤		Logical Operations	87
		Statistical Calculations	
	7_1	Single Variable Statistical Calculations	<u>9</u> 0
	7-9	Calculating a 4-Test Value	93
	7-3	Paired Variable Statistical Calculations	. 96
5.44		Calculating a t-Test Value Paired Variable Statistical Calculations Linear Regression Other Regression-Calculations	96
3.5		Other Regression Calculations	.100
8.2		Longrithmic Regression	100
		Evennential Regression	102
	•	Exponential Regression Power Regression	104
43	_		
Chapter	8	Formula Storage	107
, , , , ,	8-1.	Using Formula Memory	108
ой	8-2	Comment Text	. 110
47.75	8.3	Table Function:	. 110
	8-4	Solve Function	. 112
	8-5	Storing Formulas in the Program Area	. 114
	^	Programming	44-
Chapter	9	Programming	. 117
	9-1	Before Using the Program Area	. 118
	9-2	Storing a Program	. 118
(4		To Register a Program Name	. 119
: f		To Specify the Program Execution Mode	. 120
41		Inoutting Program Contents Charles Cha	120
		Bunning a Program 100 to 120 t	. 121
J	9-3	Error Messages	. 123
₹	9-4	Counting the Number of Bytes	124
		Checking the Amount of Memory Remaining	. 124

rween type garethered a opgang on telebrahila conceder in seeintea augy.
Trible Sequential Search State 1 and
To Use Direct Search
9-6 Editing Program Area Data
The second profit of the second secon
127 Sec. To Edit Program Contents Indian April 27
9-7 Deleting Programs
To Delete a Specific Program
To Delete All Programs
9-8 Programming Commands
Program Command Menu Management 132
Variable Input Command 133
Variable Lock Command
Jump Commands
Pause Command
141 1: Prime Factor Analysis 142 2: Greatest Common Measure 144 3: Minimum Loss Matching 146
Appendix 149
Appendix A Error Message Table
Appendix B Input Ranges
Appendix C Specifications 155
of whole, and we open the first budget or shall be point it is not believed as the second of the shall be second of the second o
and an experience of the street with the street of the str
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Handling Precautions

- · Your calculator is made up of precision components. Never try to take it apart.
- . Avoid dropping your calculator and subjecting it to strong impact.
- Do not store the calculator or leave it in areas exposed to high temperatures or humidity, or large amounts of dust. When exposed to low temperatures, the calculator may require more time to display results and may even fail to operate. Correct operation will resume once the calculator is brought back to normal temperature.
- The display will go blank and keys will not operate during calculations. When you
 are operating the keyboard, be sure to watch the display to make sure that all your
 key operations are being performed correctly.
- Replace batteries once every 5 years regardless of how much the calculator is used during that period. Never leave dead batteries in the battery compartment. They can leak and damage the unit.
- Avoid using volatile liquids such as thinner or benzine to clean the unit. Wipe it with a soft, dry cloth, or with a cloth that has been dipped in a solution of water and a neutral detergent and wrung out.
- In no event will the manufacturer and its suppliers be liable to you or any other person for any damages, expenses, lost profits, lost savings or any other damages arising out of loss of data and/or formulas arising out of malfunction, repairs, or battery replacement. The user should prepare physical records of data to protect against such data loss.
- Never dispose of batteries, the liquid crystal panel; or other components by burning them.
- When the "Low battery!" message appears on the display, replace the main power supply batteries as soon as possible.
- · Be sure that the power switch is set to OFF when replacing batteries.
- If the calculator is exposed to a strong electrostatic charge, its memory contents may be damaged or the keys may stop working. In such a case, perform the All Reset operation to clear the memory and restore normal key operation.
- Note that strong vibration or impact during program execution can cause execution to stop or can damage the calculator's memory contents.
- Using the calculator near a television or radio can cause interference with TV or radio reception.
- Before assuming malfunction of the unit, be sure to carefully reread this manual and ensure that the problem is not due to insufficient battery power, programming or operational errors.

Important

Before using the unit for the first time, be sure to load the batteries that come with it (page 8 and perform the RESET operation (page 11).

Be sure to keep physical records of all important data! (\$250 to \$100 to \$100

The large memory capacity of the unit makes it possible to store large amounts of data. You should note, however, that low battery power or incorrect replacement of the batteries that power the unit can cause the data stored in memory to be corrupted or even lost entirely. Stored data can also be affected by strong electrostatic charge or strong impact.

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Power Supply

The street private private with the term of the contraction of the section Power is supplied by two CR2032 lithium batteries: One battery (the main battery) powers normal operations, while the other battery (the back-up battery) provides the power required to retain data in memory, and an impact in the factor and of large and

The following message appears whenever main battery power gets too low-

Whenever this message appears, immediately turn off the calculator and replace the main battery as soon as possible.

If you continue to use the calculator after the low battery message appears, power will turn off automatically. Pressing the we button will not turn power back on if the main battery is too low. Also remember that even if you don't use the calculator, a low main battery can cause memory contents to be lost; gas and easily

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Important

- · Normally, you should not remove both the main battery and the back-up battery from the calculator at the same time. Doing so can cause data stored in memory to become corrupted or lost entirely. If you do remove both batteries, correctly reload them and then perform the reset operation described on page 11 of this manual.
- · Replace the 'batteries at least once every five years regardless of how much you use the calculator during that time.
- · Remove both batteries from the calculator if you do not plan to use it for a long time.

A battery is loaded in the calculator at the factory for testing before shipment. Note that the service life provided by this test battery may be shorter than normal.

Replacing the Main Battery

Precautions

- . Do not remove the back-up battery while the main battery is not loaded in the
- . Be sure to turn the calculator off before replacing batteries. Leaving it on will cause data stored in memory to be lost.
- · Never try to turn the calculator on while the main battery is not loaded or when it is loaded incorrectly. Doing so will cause data stored in memory to be lost and will cause malfunction of the calculator. Should this happen, remove the main battery and reload it correctly, and then perform the RESET operation described on page 11 of this manual.
- · Replace the main battery at least once every five years to protect against damage caused by leaking battery fluid.

• To replace the main battery

- 1. Press (MIT) (OFF) to turn the calculator off. The process and the calculator off.
- 2. Slide the battery compartment cover in the direction graphs -tion indicated by the arrow and remove it.....
- 3. Remove screw @ and remove the battery holder.
- 4. Remove the old battery.
- 5. Wipe off a new battery with a dry cloth, and load it into the calculator with the positive ##2 side facing and may up (so you can see it).
- . While pressing down on the battery with the bats at some process of the state of tery holder, replace screw to secure the holder and the in place.
- 7. Replace the battery compartment cover, and then a stanpress [678] to turn on power.
- Memory contents are not lost when you replace the main battery as long as the back-up battery supplies power. the main bartery substant misre and
- · If the figures on the display appear too light and hard to see after you turn on power, adjust the contrast using the procedure described on page 25 of this manual. bir is vestiad to be often two early in the end processes

William to the mineral agreement representation of ■ Replacing the Back-up Battery The Street Brief Charles of Court Court Street Grant Court and Court Cou

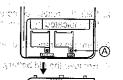
Precautions

- · Always check to make sure that the main battery is loaded and supplying power before removing the back-up battery from the calculator. If the low battery message (page 8) appears when you turn on the calculator, replace the main battery first and then replace the back-up battery, in the second expect asset to a party asset to be a second expect.
- Do not remove the main battery while the back-up battery is not loaded in the calculator. make to be so only as a partie to be entired to
- Be sure to turn the calculator off before replacing batteries.
- Though the normal life of the back-up battery is five years, you should probably replace it more often in order to make sure you do not lose valuable data stored in

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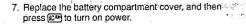


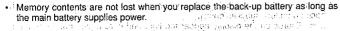




To replace the back-up battery

- 1. Press SMFI OFFIto turn the calculator off.
- 2. Slide the battery compartment cover in the direction for the partner of the condition of tion indicated by the arrow and remove it.
- 3. Remove screw @ and remove the battery holder.
- 4. Remove the old battery.
- 5. Wipe off a new battery with a dry cloth, and load it the second into the calculator with the positive "+" side facing the calculator with the calculator with the calculator with the positive "+" side facing the calculator with the calculator up (so you can see it).
- 6. While pressing down on the battery with the battery holder, replace screw @to secure the holder in place.





Warning! the State County of the second county is a substitute of the second county of the se

Improper use of batteries and leaking of battery fluid can stain and damage the calculator and other nearby items. It can also create the danger of fire or personal injury. Note the following important precautions concerning batteries.

- . Always make sure that the positive "+" side of a battery is facing up (so you can see it) when you load it into the calculator.
- · Never charge batteries, take them apart; or allow and them to become shorted. Never expose batteries to direct heat or dispose of them by burning.



Keep batteries out of the reach of small children. If accidently swallowed, consult with a physician immediately.

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■ About the Auto Power Off Function

The calculator switches power off automatically if you do not perform any key operation for about 6 minutes. To restore power, press [LDM].

■ RESET Operation

The RESET operation returns the calculator to its original default settings. Remember that the RESET operation also deletes all data stored in calculator memory. If you need the data in memory, be sure to make a written record of it before performing the RESET operation.

To reset the calculator

1. Press [IOD] [8] (RESET) and a RESET confirmation message appears on the display.

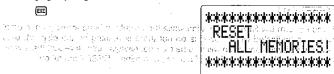
(RESET)



distriction from the control of the

2. Press to reset the calculator or to abort the RESET operation without changing anything.





- If the figures on the display appear too light or too dark after you perform the RESET operation, adjust the contrast using the procedure described on page 25 of this manual.
- · If normal operation of the calculator is impossible for some reason, you can also start the RESET operation by using a thin, pointed object to press the RESET button on the back of the calculator. This causes the RESET confirmation screen to appear, so you can press EXE to reset or EXE to abort.



Following are the original default settings that are obtained by resetting the calculator.

1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	om el cola litem e esta est	- Default Setting	ga 1999) er bud ber
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	Angle Measurement	Degrees (Deg)	
n weeds	Norm	I INDITITE	algelande/Bitseadani Taggy (BN ^{TO} Bessil)
	Number System	Decimal (Dec)	office.
	Variable Memory	Cleared	nagen i di pri
42-1	Answer Memory (Ans)	Clear	,
	Statistical Memory	Clear	
1	Expression Memory	Clear	
	Recursion Memory	Clear	
	Program Memory	Clear	
•	Input Buffer/AC Replay	Clear) မက စည်းရှိနေသည်။ စညားရှိသည်။

Important

If you perform the RESET operation while the calculator is performing an internal operation (indicated when power is on but there is nothing on the display), data being used by the operation will also be cleared. Always make sure that there is no internal operation being performed before performing a RESET operation.

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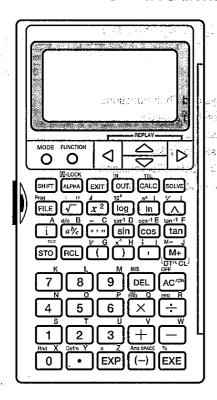
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Getting Acquainted

- Keys and Their Functions
- Selecting a Mode
- Basic Set Up
- Basic Operation -
- Using Scientific Constants
- Technical Information

This chapter gives you a general introduction to the various capabilities of the unit. It contains important information about the unit, so you should be sure to read it before starting operation.

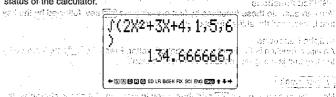
1-1 Keys and Their Functions



■ Display Indicators

Indicators appear on the display to keep you informed about the current operational status of the calculator. encilores à ballinde-

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Indicator	e en en et et et en et en et en	
S	Appears when জিলা key is pressed to indicate keys will input functions marked in orange.	
(A)	Appears when well key is pressed to indicate keys will input letters marked in red.	
D	Degrees selected as the unit of angular measurement.	
uni Bresi	'Radians selected as the unit of angular measurement, আলাল ৰজালিক	
G	Grads selected as the unit of angular measurement. Grads selected as the unit of angular measurement.	
SD	Calculator is in the SD Mode.	
LR:	Calculator is in the LR Mode.	
, BASE-N	Calculator is in the BASE-N Mode.	
FIX	Number of decimal places specification is in effect and the second	
SCI	Number of significant digits; specification is in effect. And another set	
ENG	Engineering notation is in effect. How you will be entire and up a some	
Disp	Displayed values is an intermediate result.	
+ +	Appears during display of a list to indicate data above or below the current screen.	
.+ ₂ +	Indicates data runs off left or right of the current screen.	

■ The Keyboard

But Cally Car may till a

Many of the unit's keys are used to perform more than one function. The functions marked on the keyboard are color coded to help you find the one you need quickly

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and easily:

Shifted function (orange) _____e_____Alpha function (red) Primary function ----

Primary Functions

These are the functions that are normally executed when you press the key.

Shifted Functions

You can execute these functions by first pressing the see key, followed by the key that is assigned the shifted function you want to execute.

Alpha Functions

An alpha function is the input of an alphabetic letter. Press the AMA key, followed by the key that is assigned the letter you want to input.

Alpha Lock

Normally, once you press wa and then a key to input an alphabetic character, the keyboard reverts to its primary functions immediately. If you press still and then INNI. the keyboard locks in alpha input until you press INNI again. සිය වෙනට මදින්වීම පටුමර පට වස ක් හමුමෙයේ ය. ඉදින් ලේල්ම්මර ඉමාස පුරු

MODE

Mode Key

 Press this key to display the Main Menu. You can then input a number from 1 to 8 to select a mode. See "Selecting a Mode" on page 20 for details. FUNCTION

Function Key

Press this key to display the function menu.

Cursor/Replay Keys

• Use these keys to move the cursor on the display. The restrict that the state of the state of

• After you press the Ext key following input of a calculation or value, press ■ to display the calculation from the end, or > to display it from the beginning. You can then execute the calculation again, or edit the calculation and then execute it. See page 30 for details on the Replay Function.

Shift Key

• Press this key to shift the keyboard and access the functions marked in orange. The S indicator on the display indicates that the keyboard is shifted. Pressing SHFT again unshifts the keyboard and clears the (\$) indicator from the display.

A -LOCK Alpha Kev

 Press this key to input a letter marked in red on the tkeyboard: are the are built are built of a sweet as a first

 Press this key following sure to lock the keyboard into alphabetic character input. To return to normal input, press MM again.

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11	33	
A.	В	COEF

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AJ LEJ		
	GHHIJ	
KIL		

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S	T	U.	V	W
7	TV		CDJCE	



EXIT Exit Kev

· Press this key to quit a function menu, program input display, formula storage; table function, solve function, or recursion function (23A) control you ask same.

in/Out Kev

 Use this key when performing calculations using formula storage. See Formula

Formula Storage Function/Table Key

Use this key when performing calculations using formula storage. See "Formula" Storage" on page 108 for details.

• Press sell lite to define the range (variable conditions) for one of the variables in a formula storage expression. See "Formula Storage" on page 108 for details.

SOLVE Solve Kev

· Use this key with formula storage to solve for a variable using Newton's method. See "Solve Function" on page 112 for details.

사용 여(공화된 다 어디어 나를 다녔다.)

Use this key to recall a specific file.

• In the COMP, BASE-N, SD, and LR Modes, input the following to run a program:

See "Running a Program" on page 121 for details.

Square Root/Multistatement Key to or classed locals and in the approximate approximate and in the second of the control of the

• Press this key following surf to separate formulas or commands in programmed calculations or consecutive calculations. The result of such combinations is known. as a "multistatement". For details, see page 28. Tuberty of the acquestion must be all of the reference that can be seen the

3 Square/Display Key and a contract of the square of the s Enter a value and press this key to square the value.

• Press this key following seri to display results of program calculations and consecutive calculations.

refleres 356 (1.50zer notist process in the control of a control process of and process.

General Common Logarithm/Antilogarithm Key

Press this key and then enter a value to obtain the common logarithm of the value.

• Press জিলা লিশ and then enter a value to make the value an exponent of 10:00 🖂

Right and the product and the state of the s

· Press this key and then enter a value to obtain the natural logarithm of the value.

• Press see and then enter a value to make the value an exponent of example.

• Press this key following with to enter the open bracket Entertain and Asia and account account อนักรัก ที่ร้าง อลัก ที่กับร้าง อมิดยอง ค กรไทย และที่ และ เพิโลส ติ สะครา

□ Power/Root Key

• Enter a value for x, press this key, and then enter a value for y to obtain x to the appaired by a small close order to the partial operation the

• Enter a value for x, press sum [57], and then enter a value for y to obtain the xth root of v.

• Press this key following (APM) to enter the closed bracket ...

Inaginary Number Input Key Use this key to input imaginary number unit / for a complex,number. Press this key in the BASE-N Mode to input the hexadecimal value Asubases	「「Comma/Semicolon Key and Press this key to input a comman than pactures a patient of the process of a Press this key to input a comman than pactures a patient of the pacture of the pa
● Fraction Key • Use this key when entering fractions and mixed fractions. To enter the fraction 23/45, for example, press 23 ● 45. To enter 2-3/4, press 2 ● 3 ● 4. • Press ● ● 0 display an improper fraction.	Memory Plus/Memory Minus/Data Input/Clear Key • Press this key to add the displayed value to memory. Note that when formula is displayed, results are first derived and then stored into memory. • Press this key following me to subtract the displayed value from memory.
Press this key in the BASE-N Mode to input the hexadecimal value B _s . Decimal ↔ Sexagesimal Key Press this key to enter a sexagesimal value: (degree/minute/second or hour/minute/second)	• In the SD and LR modes, press this key to input data. And the problem in the SD and LR modes, press this key following input incorrectly. **And a modes* **Comparison of the problem in the state of the stat
Example 78°45'12" → 78 ⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅⋅	Use these keys to input values from left to right. Use to input a decimal point. The your can input up to 10 digits. Additionable to the sent modified a set of the sent modified and the sent sent modified and the sent sent sent sent sent sent sent sen
Press this key in the BASE-N Mode to input the hexadecimal value Css.	these keys are accessed. Internal Rounding Internal Rounding
Press this key and then enter a value to obtain the sine of the value: Press and then enter a value to obtain the inverse sine of the value. Press this key in the BASE-N Mode to input the hexadecimal value Dis.	operation changes the internal value to the form specified for value display. Bill (陳朝) Memory Expansion Use;this key operation to expand the number of variables from the standard 280 and 190 and
• Press this key and then enter a value to obtain the cosine of the value. • Press and then enter a value to obtain the cosine of the value. • Press this key in the BASE-N Mode to input the hexadecimal value Ensign	Delete/Insert Key Press this key to delete the character at the current cursor location. Press ௵ to display the insert cursor(☑). You can insert characters or commands while the insert cursor is displayed.
Tangent Key Press this key and then enter a value to obtain the tangent of the value. Press series and then enter a value to obtain the inverse tangent of the value. Press this key in the BASE-N Mode to input the hexadecimal value Fig.	Press this key to switch power on. Press this key while power is on to clear the display. Press this key following limit to switch power off.
To Store Key Press this key and then input a letter to store a calculation result to the variable specified by the letter. Additional and additional additional and additional additi	◆ Wiscourse Arithmetic Operator/Engineering Keys Use these keys to input arithmetic operators. Press before inputting avalue to indicate that the value is negative.
Recall Key Press this key and then input a letter to recall the value assigned to the variable specified by the letter. Open Parenthesis/Cube Root Key	 The X and ⊕ keys have the following operations with the 顧 key. 國門 區 Engineering Notation Conversion Key This converts the displayed value to exponential notation in which the exponent is a positive value that is a multiple of three.
Press this key to enter an open parenthesis in a formula new of the value. Press @@ @ and then enter a value to obtain the cube root of the value.	Examples 103 = k (kilo); 106 = M (mega); 109 = G (giga) 回到 图 Engineering Notation Conversion Key This converts the displayed value to exponential notation in which the exponent is a
Close Parenthesis/Reciprocal Key: Press this key to enter a close parenthesis in a formula. Enter a value and then press	negative value that is a multiple of three. Examples $10^{-3} = m \text{ (milli)}; 10^{-6} = \mu \text{ (micro)}; 10^{-3} = n \text{ (nano)}; 10^{-12} = p \text{ (pico)}$

ing a speciment of the speciment part of the speciments.

Exponent/Pi Kev

(-)/Answer/Space Key

- Press this key when entering a negative value. Apple to the Automatic entering
- Press sen and then this key to recall the most recent calculation result obtained using the set key.
- Press APA and then this key to enter a space.

Execute/Percent Key hadden in the moneyou's a vesteral eyes a sold real in

 Press this key to obtain the result of a calculation. You can press this key following data input, or after a result is obtained to execute the calculation again using the previous result.

were the committee of the contraction and in the community of the contract

Press this key following set for percentage calculations: https://doi.org/10.100/2006/00.
 Press this key following set for percentage calculations: https://doi.org/10.100/2006/00.
 Press this key following set for percentage calculations: https://doi.org/10.100/2006/00.

1-2 Selecting a Mode

Before you perform a calculation, you should first select the appropriate mode.

- To select a mode. Specifically a served to a served
- 1. Press the MODE key to display the Main, Menu.

MODE

1.COMP 2.BASE-N 3.SD 4.LR 5.PROG 6.an 7.CONT 8.RESET

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reger and the consistency are positive and a single-

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a) Any Johann digension (Significant year Fight) in unconnected agency of the entropy and the expension on the original and the entropy of the entropy of

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2. Input the number from 1 through 8 that corresponds to the mode (you want to enter.

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The following table describes the purpose of each mode:

Mode	conformation in the manual first description of the second
COMPIU	General calculations, including function calculations
BASE-N	Binary, octal, decimal hexadecimal conversions and logical operations
SD	Single variable (standard deviation) statistical calculations
LR	Paired-variable (regression) statistical calculations
PROG	File name assignment, program input? program execution in the program area
a۰	Recursion calculations weeks to among a fireful and the first sections.
CONT	Display contrast adjustment
RESET	Reset operation as he sau entitle appearance operation

1-3 Basic Set Up

This section tells you how to perform the basic set up required by the calculator.

(16 ment upon the form the basic set up required by the calculator.)

าง อเปริกลิขายยกเลิง ขอ โดยกังได้กับสี สำโดของ การเสียงและ จากและเลิง เกาไ

A STATE President Capture of the control of

■ Function Menus

Before actually using this calculator to perform calculations, you should first specify the correct unit of angular measurement and the display format. To do this, press the with the display format and the display format.

La constitue disvisión to como banen

Example 1 Function menu in the COMP Mode

1.MATH 2.COMPLX 3.PROG 4.CONST 5.DRG 6.DSP/CLF

Example 2 Function menu in the SD/LR Mode

each show its difficulties of the condition

1.MATH 2.COMPLX 3.PROG 4.CONST 5.DRG 6.DSP/CLR 7.STAT 8.RESULTS The items that make up a function menu depend on the mode the calculator is in when you press the received key. Example function menu displays are shown the sections of this manual that describe each mode.

Following is a brief description of all the items that can appear in a function menu.

"2, COMPLX" Complex Number Calculation Menu (page 74)

For insertion of special program command

"4. CONST"....... Scientific Constant Menu (page 38) in page are already

For recall of scientific constants.

"5. DRG" Unit of Angular Measurement Menu (page 22).

"6, DSP/CLR" Display Format/Clear Menu (page 23)

For specification of the number of display digits and for switching engineering notation on and off. Also used to specify a

Victoria dall'altri da li el grandi di comencia, maggio di tetaviagi andirenti di viguroni accinosi

memory area and clear its contents.
"7. STAT" Statistical Calculation Menu (page 91)

For recall of commands used in statistical processing of data.

"8. RESULTS" Statistical Result Menu (page 91)

For display of calculation results produced by single-variable or paired-variable statistical calculations.

■ Unit of Ariquiar Measurement (DRG) Menuse 10,000 to 10,000 to 6.00

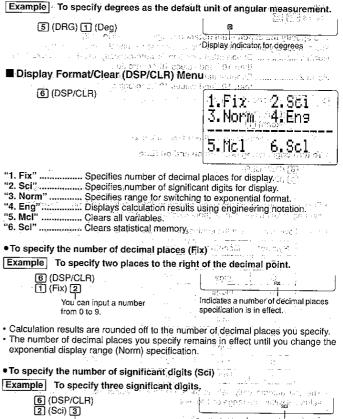
⑤ (DRG)

1.Des 2.Rad 3.Gra 4.° 5.° 6.9

"1. Deg"	Specifies degrees as the default.
"2. Rad"	Specifies radians as the default.
"3. Gra"	Specifies grads as the default.
"4. o"	Specifies degrees for a specific input value.
"5. r"	Specifies radians for a specific input value.
"6. g"	Specifies grads for a specific input value.
of Mariane 14	

• The relationship between the angular measurement units is shown below. $360^{\circ}=2\pi$ radians = 400 grads

 $90^{\circ} = \pi/2 \text{ radians} = 100 \text{ grads}$



You can input a number from 0 to 9.

Indicates a number of significant digits specification is in effect.

· Calculation results are rounded off to the number of significant digits you specify.

· Inputting 0 specifies 10 as the number of significant digits.

The number of significant digits you specify remains in effect until you change the exponential display range (Norm) specification.

 Even after you specify the number of decimal places or the number of significant digits, the calculator continues to use a 15-digit mantissa for internal calculations.

Whenever you want to round off the internal value to match your specifications; press 骊 圇
● To specify the exponential notation range (Norm 1/Norm 2)
You can specify either Norm 1 or Norm 2 as the exponential notation range.
Norm 1 Exponential notation is automatically used for values less
than 10°2 and values 10°0 or greater.
Norm 2 Exponential notation is automatically used for values less
than 10.9 and values 10.10 or greater.
Example To specify Norm 1.
⑥ (DSP/CLR) ③ (Norm) ①
You can input 1 (Norm 1) or 2 (Norm 2).
■ To turn engineering notation on and off (Eng)
(DOD/OLD)

• Each time you perform the above operation, the calculator switches between engineering notation and normal (non-engineering) notation.

க்கள் அளிகள் சமிற்றுக்கா Andicates engineering notation is on?

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• The following is a list of the engineering notation symbols and their values.

Symbol	Meaning	Unit
.sTatt.	tera	1012
G	giga	10°
.W.	mega	10 ⁶
k	kilo	103
m	milli	10-3
·с фос	micro	10−6
n	nano	10-9
· p	pico	10-12
f	femto	10-16

(Eng) Services stylerosek bat

. The unit automatically selects the engineering symbol that makes the numeric value fall within the range of 1 to 999.

To clear all variables (A through Z)

6 (DSP/CLR) 5 (Mcl) EXE

9 4 33 2 36

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on des ford englis indicato gis ta anguaga por ital oraquan en de la mangan en la dide e o crissa. 😃

Standing and a real of war rains of the last the about the . The above operation clears all standard variables (A through Z) and any other variables created by memory expansion. . Lightagra ta, with digit in some years of the light in the last the contract of the first in• To clear only statistical memories (P, Q, R, U, V, W)

6 (DSP/CLR) 6 (Scl) 🕮

สมรัสยยาลักรโล

. The above operation clears the U, V, and W variables used in the SD Mode. inclosias Covedi.

Adjusting the Display Contrast

Use the following procedure to make the figures on the display lighter or darker. รีก็เล้อย สรีรัก (การการใช้ เกาะทำ รักและเลยติก เพอเส

1. While the Main Menu (page 20) is on the display, press 7 (CONT).

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กกระสุทธเล้า ที่ mow buy และไปปลาดบาท กระชาวายา then problem on a characteristic degraped halo with arphi that arphi the arphi that .2. Use and to adjust the display contrast.

- makes figures lighter.
- makes figures darker.
- You can hold down either arrow key for repeat operation.
- 3. After setting the contrast, press wood to return to the Main Menu. Barab an Beraba a reductor i listing in

1-4 Basic Operation

The operations described here are fundamental calculations that you need to get started with the unit. Programming and statistical calculations are covered in their own separate sections.

■ Inputting Calculations

When you are ready to input a calculation, first press ac to clear-the display. Next, input your calculation formulas exactly as they are written, from left to right, and press DE to obtain a result.

Example $2(5+4) \div (4 \times 3) =$

AQ2((5)+4))+ \Box 4 \mathbf{x} 3 \Box \mathbf{x}

 $\{ e_{ij}, j \}$

The unit uses two types of functions: Type A functions and Type B functions. With Type A functions, you press the function key after you enter a value. With Type B functions, you press the function key first and then enter a value.

Type A function

Example

PRINCE OF CHARLES FRANCES Key Operation

Type B function

Squares:

Example 2 sin45° Sine:

Key Operation 2 sin 4 5

Notice of the second sections.

- · For detailed examples on all of the possible calculations available, see the section titled "Calculation Priority Sequence" on page 41. in growthy things journal will in an easy, and a chast test to
- To clear an entire calculation and start again Press the AC key to clear the error along with the entire calculation. Next, re-input the calculation from the beginning.

■ Editing Calculations

then perform one of the operations described below. After you edit the calculation, you can execute it by pressing [XE], or use I to move to the end of the calculation and input more.

• To change a step

Example To change cos60 to sin60 .cos) -6 . 0

●To delete a step : \ \mathred (m) := m feet of a condique to top a condition be ten; not be

Example To change 36 x x 2 to 36 x 2 to 36 x 2

36 X X 2

To insert a step loiseasable added by several a several section of a tribute of large and a several section.

Example To change 22 to sin22

 $2 x^2$

(4)

griver <mark>sin</mark>ger of the eru diskot has grove with the

- When you press [MIT] INS a space is indicated by the symbol "[3", The next function or value you input is inserted at the location of "£3". To abort the insert operation without inputting anything, move the cursor, press [HS] again, or press • Courte wis an our area marriage, are two place and executiffing a few = A few 20 to 100 , 100 page. benalo familia yanga nomi atto amemba a in Amara. Kalamitin ti samati da kababa
- To make corrections in the original calculation the base of the second variable

Example 14 \div 0 \times 2.3 entered by mistake for 14 \div 10 \times 2.3

ACTIA FOX 2 - 3 E

ார்க்க sPress: (▼or: ▶) நக்கம் வரகாவிரும் மா

on a s**cress: ■or. ≥**Barria al faral 150 de la fa<mark>lla dixagiónad</mark>a barriago real 20 of less double fatt seguir reviendo avir en la <mark>14.7 dixagió</mark>na barria ara

Cursor is positioned automatically at mentions adjust on the term to entire the least the location of the cause of the error.

Make necessary changes.

Execute it again.

■ Answer Function

The unit's Answer Function automatically stores the last result you calculated by pressing [55] (unless the [55] key operation results in an error). The result is stored in the answer memory.

To recall the contents of the answer memory

SHIFT AND EXE

or the entropy was a first transfer account to every boardwise.

A well of the well and leave to the state of the company of the co ことのできた。ないなどものは対象のは対象のです。のは、のは、中で、pa ●To use the contents of the answer memory in a calculation;selection acceleration

Example 123 + 456 = 579 789 - 579 = 210

AC 1 2 3 + 4 5 6 EX

123+456

់នៅខ្លួល និងមូនមា**ងលើ (នាំព**េកអំពីព្

7 8 9 - SHIFT Ans EXE

789-Ans

210

- . The largest value that the answer memory can hold is one with 15 digits for the mantissa and 2 digits for the exponent.
- · Answer memory contents are not cleared when you press the AC key or when you switch power off.
- Operation of [88], [88], [MH], [887] [MH], or [570] followed by a variable name (A to Z) automatically updates answer memory contents with the result of the operation.
- Contents of answer memory are not altered when $\mathbb{R}\mathbb{I}$ α (α = A to Z) is used to recall contents of variable memory. Also, contents of answer memory are not altered when variables are input when the variable input prompt is displayed: when of a
- · Whenever an operation produces an error, answer memory retains the last valid result produced. 그렇게 하는데 하다면 목소에 나를 되

■ Using Multistatements

Multistatements are formed by connecting a number of individual statements for sequential execution. You can use multistatements in manual calculations and in programmed calculations. There are two different ways that you can use to connect statements to form multistatements.

• Colon:(:) and by catering and a fig-

Statements that are connected with colons are executed from left to right, without stopping.

Display Result Command (⊿)

When execution reaches the end of a statement followed by a display result command, execution stops and the result up to that point appears on the display. You can resume execution by pressing the key.

To use multistatements

Example $6.9 \times 123 = 848.7$ $123 \div 3.2 = 38.4375$

> AC 1 2 3 STO A 16 9 X AMA AMA Alta ye qala

Appears on display when "A" is used

magnetic fast of the cool, performed the reality - Algoria de Domichel, poet al la fost sur sant su reviete effecte principal de decimant. Na SD 4 (3) est troche est sur mens y strochest de tractique **SX H**erroches. การโดยสานักและสุดและได้ เมื่อสาดสาราสเกาะเลาไ 280060 Permitting of the professional processor and the pro-

- · Note that the final result of a multistatement is always displayed; regardless of whether it ends with a display result command.
- You cannot construct a multistatement in which one statement directly uses the result of the previous statement.

Example 123 × 456: × 5 invalid

■ Multiplication Operations without a Multiplication Sign

You can omit the multiplication sign (x) in any of the following operations.

Before the type B functions (page 41)

Example 2sin30, 10log1.2, 2/3, 2pol(5, 12), etc.

· Before constants, variable names, value memory names

Example 2π, 2AB, 3Ans, etc.

• Before an open parenthesis in the 176 more values of the 1986 and the 1986 of the 1986 o

Example 3(5 + 6), (A + 1)(B - 1), etc. section side edition of since agentates, refer how and violating valuable compa esau nuaro anterplación entre en el presentado, carácidades en capar en una entre da como anterese de estados

and post mater beisseld out festion of the anningsiger salt was well about notice ■ Performing Continuous Calculations and the etomotor best of expense

The unit lets you use the result of one calculation as one of the arguments in the next calculation. When performing such a calculation, the contents of the Ans Memory (which contains the result of the last calculation performed) are used in the next ELIGHE MINOR OF THE BOOK OF THE PARTY OF THE calculation. nderwick in the Estain retains at the Paper in each population medical medical ratio.

Example

adiographs is regeneral. Note there there are a control of the factor o

AC 1 1 3 EXE

(Continuing)

1÷3 0.333333333

made sindays ad those of war SER Source

Ans×3

Continuous calculations can also be used with Type A functions (see page 41).

■ Using the Replay Function

The Replay Function automatically stores the last calculation performed into replay memory. You can recall the contents of the replay memory by pressing ◀or ▶. If you press ▶, the calculation appears with the cursor at the beginning. Pressing ◀ocauses the calculation to appear with the cursor at the end. You can make changes in the calculation as you wish and then execute it again.

Example To perform the following two calculations

 $4.12 \times 6.4 = 26.368$ promotions as in the control and that exists

X6 • 4 • · ·

section 1 oct 1 oc

444

4.12×<u>6</u>.4

7 • 1

ter<mark>t 2000 to</mark>nt of the factor Type 2001 to 2 department on the 6

EXE

- The maximum capacity of the replay memory is 127 bytes, A calculation remains, stored in replay memory until you perform another calculation or change modes.
- The contents of the replay memory are not cleared when you press the Ad key, so you can recall a calculation and execute it even after performing the all clear operation. Note, however, that replay memory contents are cleared whenever you change to another mode or menus appropriate and present the replay are all the present of the pr

to be mission on a but to select our be distable, and to Backers to enter a fit have His

■ Built-in Function (MATH) Menu) 1008 gairmentum (1008 gairmentum 1008 gairm

The MATH Menu can be used in the COMP, SD, LR, and a modes. It provides you with built-in scientific functions in addition to those available by pressing keys on the calculator's keyboard. Note that there is a total of four MATH Menu screens. Use the $|\nabla|$ and $|\Delta|$ keys to scroll between menus.

FUNCTION

1.MATH 2.COMPLX 3.PROG 4.GONST 5.DRG 6.DSP/CLR

The product of services of payof diley through the analysis on a second recipion COMP Mode)

T (MATH): which sees a receive a property of the construction of

• Integration, differential, Σ, probability

The first MATH menu provides tools for integrations, differentials and quadratic differentials, Σ (sigma) calculations, permutations, combinations, factorials, and random number generation.

Numerical calculations

The second MATH menu includes items for absolute value calculations, integer and fraction extraction, and conversion between rectangular and polar coordinates...

1.Abs 2.Int 3.5.Pol(6.Rec(3.1.2)

Hyperbolic calculations

The third MATH menu contains hyperbolic and inverse hyperbolic functions.

1.sinh 2.cosh 3.tanh 4.sinh-le (Midsec 5.cosh-le (tanh-le (tanh-le

5 4 5	The state of the s
"1. sinh"	Hyperbolic sine of a value
	Hyperbolic cosine of a value
"3. tanh"	Hyperbolic tangent of a value
"4. sinh-1"	Inverse hyperbolic sine of a value
"5. cosh-1"	Inverse hyperbolic cosine of a value
"6. tanh-1"	Inverse hyperbolic tangent of a value

Engineering notation

The fourth MATH Menu provides a list of symbols for input of values using engineering notation.

THE PARTY WAS TREET, NOTICE OF SHIPL

1.m 2.p 3.n 4.pab5.f 6.k 7.M 8.G 9.T

"1. m"	:: milli (105³)
"2. μ"	micro (10 ⁻⁶)
"3. n"	nano (10 ⁻⁹)
"4. p"	pico (10 ⁻¹²)
"5. f"	femto (10-15)
"6. k": "7. M"	kilo (10³)
"7. M"	mega (106)
"8. G"	giga (10°)
"9. T"	tera (10 ¹²)

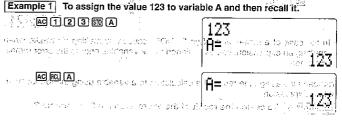
is it in passing it that a fact when the perfect in large. 🕨

■ Memory to Plat Altidates or its uplace selection and year of the following and the following of the selection of the selec

In the standard configuration, this calculator provides memory for 26 variables, which are named using alpha characters A.through Z. Values assigned to memory can have up to 15 digits for the mantissa and up to two digits for the exponent. Values assigned to variables are retained even when you turn the calculator off.

Using variables

You can store values to up to 26 different variables for instant recall when you need them.



If you input an expression in place of the value, the calculated result of the expression is assigned to the variable.

Example 2 To assign the result of 123 × 456 to variable B.

AC 123×456_

TO B

123×456

123×456

B=ote and of the second of the seco

 Once a variable is assigned a value, the variable name (alpha character) can be used in place of the value in an expression.

Tid Wild tid Transia Adj metebra i Medici (Sale)

Example 3

To multiply the value assigned to variable A in Example 1 by the value assigned to variable B in Example 2 and assign the result to variable C.

ACM AX MBT 4.5 M. BT 4.5 M. CONTRACTOR AND A CONTRACTOR A

A ROC CONTRACTOR OF THE CONTRA

. In the case of a syntax error (Syn ERROR) caused by making a mistake when inputting an expression, values assigned to the variables prior to the error remain unchanged.

You can also assign the result of a calculation to a variable using the format "Variable = Expression."

Example 4 To assign the result of the expression log 2 to variable S.

AC UPA S UPA = log 2 EXE

S=log 2

AC ROL S

и. 3010299957

Important

The following table shows how some variables are used for certain types of calculations. You should not assign other values to these variables when performing the type of calculations noted in the table.

Calculation Type	Variables Used
Differential/Quadratic Differential	F, G, H
Integration	K, L, M, N
Single-variable statistics (SD Mode)	U, V, W
Paired-variable statistics (LR Mode)	P, Q, R, U, V, W

• Independent memory

The "independent memory" lets you directly add to and subtract from variable M with a simple operation. This capability is very useful when you want to perform a series of calculations and accumulate their results for a grand total.

Example To assign the value 123 to independent memory.

AC 1 2 3 M+

column Recall the contents of the independent memory. The contents of

000

Add 25 to memory contents and subtract 12.

2 5 M+ 1 2 SHF M-

場に扱い合金の数

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- To clear the independent memory, simply assign a value of zero 0 5 M • Note that the MH and MH operations cannot be performed in the SD Mode and
- LR Mode. Ballotte zenz.

Difference between 500 M and MH, SHIFT WI-

Since independent memory is actually a variable (M), you can also assign values to it using the variable assignment operation (m), (MH) and (MI). Note, however, that (m) deletes anything currently stored in independent memory and replaces it with the newly assigned value. The independent memory operation (MH) or SMFT (MH), on the other hand, adds to or subtracts from the value that is currently stored in independentimemory. It is to suppose the property assigned to property assigned to the property assigned to the property assigned to the property assigned to the property as the prop

To use 50 M to assign the value 123 to variable M and then use m M to assign the value 456 to variable M.

AC 1 2 3 50 M

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AC RCL M

To use STO M to assign the value 123 to variable M and then use Miles to add the value 456 to independent memory (variable M).

AC 1 2 3 STO M ...

AC 4 5 6 M+

Ansie Gomenia i Dreedanie i 2

Arrays

The array capabilities of the calculator lets you use variable names that consist of an alpha character followed by a value (called an "index") inside of square brackets. The following shows some examples of array variable names.

5 2 2 3 No. 1 8 No.	and the first of the second property of the s
Value Memories	Array Memor
. A	A[0] B[-1]
8	A[1] B[0]
1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	- 50) 基本 A[2] B[1] 。

and the programs shorter and simpler programs and the programs shorter and simpler programs and the programs shorter and simpler programs and the programs are programs. and the Let Tab Edman a cubic to the state and region as the automatic receives a center that

●Expanding variable memory to be about the responsibility of the property of the control of the

You can convert memory normally assigned to program storage to variable memory. Doing so makes it possible to increase the number of variables available from the standard 26 to up to 476. Each additional variable takes up 10 bytes of memory.

 Number of variables	26	27	28) (E) (E	476
Memory remaining (bytes)	4500	4490	4480		0

[·] See page 124 for information on memory requirements for programs.

To expand variable memory

Charle do nu deter en ephanolik e The key operation sequence to expand variable memory is: SHFI Dem < number of new variables> 🚾 every it has be quest bluene dely gibre at terrario edicinic in epids

Example To expand variable memory by 10, for a total of 36 variables.

SHIFT Detm 1 0 EXE

4400 Bytes Free

2,03jabajA[26jA[26jA[2]] ### If there is not enough memory to increase the number of variables to the level you want, the above operation produces a Arg ERBOR message

You can check how much memory is available by inputting:
 Implication

 You can also include a variable memory expansion operation inside a program using the following syntax: Defm <number of new variables>.

To return variable memory to the standard configuration

The key operation sequence to return the number of available variables to the standard 26 is: 新町 Detm () [XE].

About memory names ---

You can use the additional memories you create from program memory just as you use the original 26. The names of the additional memories are Z[1], Z[2], Z[3], etc. If you increase the number of value memories by 5, you can access the original 26 memories, plus memories Z[1] through Z[5] who, CC, MMOD epic more becaused

Example To assign the value 123 to variable Z [2].

Binith colorar skalt en vit er

4480 Bytes Free

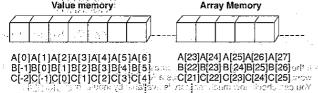
AC ALPHA Z ALPHA C 2 ALPHA C M=123E

Recall the contents of the variable.

AC (MAN) (Z) (MAN) (I) (Z) (MAN) (J) (EXE

Precautions when using arrays

grow an oldered land gas o Array variable names use alpha characters and index numbers; while standard variables use alpha characters only. You should keep in mind, however, that array variables use the same memory as standard variables. Because of this, you must be careful so that the value you assign to one variable does not replace a value already assigned to another variable. CHOLDED (CHO



	X[0]X[1]X[2]X[3]X[4]
President de controllor	Z[-2]Z[-1]Z[0]Z[-],Z[2]

1-5 Using Scientific Constants by superior smearchs with the ecologic creating merchanic three mentes of the education of mean all creating the control of the control

This calculator features 20 built-in scientific constants that you can recall any time

1. Press running to display the function menu.

2. Press 4 (CONST) to recall the first menu of scientific constants.

4 (CONST)

3. Press To change to the second menu of constants and the factor of the second menu of constants and the factor of the second menu of constants and the factor of the second menu of constants and the second menu of constants are second menu of constants and the second menu of constants and the second menu of constants are second menu of constants and the second menu of constants are second menu of constants and the second menu of constants are second menu of constants and the second menu of constants are second menu of constants and the second menu of constants are second menu of constants and the second menu of constants are second menu of constants and the second menu of constants are second menu នា 🖽 😽 នៃទោសកាចិបន្ទាំខាក់ព្យា និកែ ខេត្តពាតែ neutyr រុ Sir of haloo end, getta to $\sqrt{\frac{1}{2}}$ and domestic. The talk procedure to the very trans-

- n de de la calque en contra de la 4. While either menu is on the display, input the number that corresponds to the scientific constant you want to recall.
- a. Gravitulioni confermation la Use ■and Tto switch between the two scientific constant menus. # icrits Colors of whoch that the pro-

Table of Available Constants a 📻 55 (17) 03 (3) (17) (3) (75) (6), (3)

• Data is based on ISO Standards (1992) and CODATA Bulletin No. 63 (1986).

	taget azará	terrores to transfer to	7 to 1 to 1
Symbol	Diffusional Quantity of enough selections in	ಾ ೧೮೮ ೧ Numerical Value ಾರಿ ಪ	
mp	Proton rest mass	1.6726231∈-27	kg
F	Faraday constant	96485.309	C/mol
ao .	Bohr radius	5.29177249₅–11	m
C	Speed of light in vacuum	299792458 (a) #1714 to a c/	m/s
គ្នាសាខាន ភ	Planck constant	6.6260755⊫34	J.s
G ·	Gravitational constant	-6.67259⊧-11 · -) aanga	-Nm²/kg²
е	Elementary charge	1.60217733∈19	-c
me	Electron rest mass	9.1093897₅–31	kg
u .	Atomic mass unit. Protection	1.6605402e-27	.kg
Na	Avogadro constant	6.0221367∈+23	mol⁻¹
k	-Boltzmänn constant	1.3000030EZ3	J/IN
9 5 000	Gravitational acceleration	9.80665 (3) 3.1 (7) 9.8066 n in following consists with a	m/s²
R	Molar gas constant	8.314510 YO 6 15	
E0 .	Permittivity of vacuum	8.854187818€=12	;F/m
μο	Permeability of vacuum	1.256637061=-06	H/m
μΒ	Bohr magneton	9.2740154∈–24	-A·m²
ħ	Converted Planck constant	1.05457266≟-349√5 dgirl von	
mn:	Neutron rest mass	1.6749286 _E -27 ⁽³⁾ (20) [] []	kg
R∞	Rydberg constant	10973731.53	m-1
σ	Stefan-Boltzmann constant	5.67051₅-08	W/(m²⋅k⁴)

- · Values shown in the table are produced when the calculator is set to Norm 1. · Scientific constants cannot be used in the BASE-N Mode.

 Speed of light in vacuum (c) and memberous school gasho of 1 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2	9. Permiturity of vacuum (a) A capacitor is created by two sheets of copper with a surface area of 700cm² spaced 2mm apart. What is the capacitance of the capacitor when it is inserted into oil with a relative conductance value of 5? [INCOME] (CONST) 14 (a) 5 5 700 MBB 15494828682 09 10. Permeability of vacuum (µa)
[MITTER 4] (CONST) 5] (h) (★) [MITTER 4] (CONST) 4] (c)	If two long conductors are placed 1.1 meters apart in a vacuum, what is the force for every two meters when current of 2A and 3A are applied to each conductor in
solidi → 5 ⊕ 7 tarrisen similarga i jarosab ari, oo a 3.9728949222-19	or every two meters when construction opposite directions? Opposite directions Op
What is the attractive force between two people weighing 60kg and 80kg who are standing 70cm apart?	÷ 1.1 ₪ 2.181818182ε06
FINCHM 4 (CONST) 6 (G) ★ 60 ★ 80 ★ 0.7 ★ EM 6.536414694£-07	
4. Elementary charge (e), Electron rest mass (me) What is the power and acceleration on electrons when 200V are applied to pare	1-6 Technical Information
allel electrodes spaced 3cm apart? □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□	This section provides information on the internal workings of the unit.
⊕ (me) (me) (me) (me) (me) (me) (me) (me)	■ Calculation Priority Sequences political address grown in layoutime that or 7
5. Atomic mass unit (u) If the mass of a hydrogen atom is 1.00783 amu and the mass of its electrons is 1/1800 of that, what is the mass of the nucleus of the hydrogen atom?	This calculator employs true algebraic logic to calculate the parts of a formula in the following order: (f) Coordinate transformation, ritest
[1.00783	Pol (x, y) , Rec (r, θ) , $t($) Differentials, quadratic differentials, integrations, Σ calculations $\frac{dldx}{dt}$, $\frac{d^2ldx}{dt}$, $\frac{d}{dt}$, Σ ② Type A functions
6. Avogadro constant (Na) What is the mass of a single molecule of water? 18 → □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	With these functions, the value is entered and then the function key is pressed. $x^2, x^{-1}, x^{-1}, y^{-1}$ ENG symbols
7. Boitzmann constant (k) zonce 2 zonski fernski propinting	(A'), (A') (A') (A') (A') (A') (A') (A') (A')
What is the average translational motion energy of a single molecule of ideal gas at 0°C?	$a^{n}l_{k}$ $a^{$
3 ⊕ 2 ★ (CONST) ▼ 1 (k) ★ 273 E8 5.65379451ε-21	recursions; scientific constants
8. Gravitational acceleration (g) If a small stone dropped into a point takes 1.5 seconds to hit the surface of the water, how high above the water was the stone dropped? 7. The surface of the water was the stone dropped?	2π, 5A, πR, 2mp, etc. ⑤ Type B functions With these functions, the function key is pressed and then the value is entered. , ¾, log, ln, e*, 10°, sin, cos, lan, sin¹, cos¹, tan¹, sin¹, cosh, tanh, sinh¹,
	cosh-1, tanh-1, (-), (following in BASE-N Mode only) d, h, b, o, Neg, Not The Abbreviated multiplication format in front of Type B functions
m) a reversed in the sound depends of the	2√3 , A log2, etc.
c i beiaro cotumbno cum tont 5 p. m., 16p. vyn n per	Permutation, combination of four particles of the second sec
Malice is paramente de l'incressor de desperante de la caractera de la companya de la companya de la companya d Caractera de la caractera de la	The state of the s

(9) x,÷ (name of the company of the company

② or, xor, xnor BASE-N Mode only

 When functions with the same priority are used in series, execution is performed from right to left.

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 $e^{\epsilon} \ln \sqrt{120} \rightarrow e^{\epsilon} \{\ln(\sqrt{120})\}$

Otherwise, execution is from left to right. SONYTON THE FIG. THEN SEED FOR THE CONTROL OF THE SONE SECTION OF SECTION OF THE CONTROL OF THE

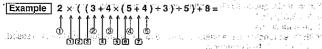
*Anything contained within parentheses receives highest priority, and seems as

Example $2 + 3 \times (\log \sin 2\pi^2 + 6.8) = 22.07101691$ (angle unit = Rad) [전 : [**()**] 하다 바다 (요. .요.) 본 [[[[[[] 전 하나 ()]

Table of the Seriesco Company of the research for length free leaving before

■ Stacks

The unit employs memory blocks, called stacks, for storage of low priority values and commands. There is a 10-level numeric value stack, a 26-level command stack, and a 10-level program subroutine stack. If you execute a formula so complex it exceeds the amount of stack space available, an error message appears on the display (Stk ERROR during calculations).



Numeric Value Stack

Command Stack



Rock to find put to meeting

7.

 Calculations are performed according to the priority sequence described on page 41. Once a calculation is executed, it is cleared from the stack.

■ Value Input and Output Limitations av pheroperation of the cap are north >

The allowable range for both input and output values is 10 digits for the mantissa and 2 digits for the exponent. Internally, however, the unit performs calculations using 15 digits for the mantissa and 2 digits for the exponent. 2 digits and nearly

Example 3 × 10^s ÷ 7 - 42857 =



្សីក្រឿ÷្តីពីពភល ២០១៣ រយៈ ទៅទំទ 3ε5÷7−42851

<u>er et inscriteritetet ker i bed</u> dieporatiwe while en afraf musaone sestapi meu • Calculation results that are greater than 1010 (10 billion) or less than 1022 (0.01) are automatically displayed in exponential form.

 Values are stored in memory with 15 digits for the mantissa and 2 digits for the exponent.

world in Night Or out on 19th an old to site ages at the uson the celebrate famous param. Imput Capacity's sensition of a characteristic and instruction of mit and be soon as a

This unit has a 127-byte area for execution of calculations. Each time you press a numeric key or arithmetic operation key, one byte of memory is used. The second Though such operations as [SIF] [27] require two key operations, they actually comprise only one function, and therefore, only one byte.

A calculation can consist of up to 127 bytes. Whenever you input the 121st byte of any calculation, the cursor changes from "__" to " ■ " on the display to let you know that you are running out of memory. If you still need to input more, you should divide your calculation into two or more parts.

Note

 As you input numeric values or commands, they appear flush left on the display. Calculation results, on the other hand, are displayed flush right.

■ Overflow and Errors

Exceeding a specified input or calculation range, or attempting an illegal input causes an error message to appear on the display. Further operation of the calculator is impossible while an error message is displayed. The following events cause an error message to appear on the display.

. When any result, whether intermediate or final, or any value in memory exceeds ±9.9999999999 × 1099 (Ma ERROR)

 When an attempt is made to perform a function calculation that exceeds the input range (Ma ERROR) (see page 152)

 When an illegal operation is attempted during statistical calculations (Ma ERROR) For example, attempting to obtain \bar{x} or xon without data input.

 When the capacity of the numeric value stack or command stack is exceeded (Stk ERROR) if to spice 01 at a play body by a body model to a parallel soft. For example, entering 25 successive ①, followed by 2.田 3 図 4團 in b, 2. bos

· When an attempt is made to perform a calculation using an illegal formula (Syn ERROR)

For example, 5 X X 3 EXE

• When an illegal memory-specification is made (Mem ERROR), are real

· When an illegal command or function argument is used (Arg ERROR) For example, input of a value other than 0 to 9 for Fix or Scr during program

Note
Other errors can occur during program execution. See page 150 for details. Most of the calculator's keys are inoperative while an error message is displayed. You can resume operation using the following procedure

The series have Search exposition and concluded B1. What growers in bond closed should

Press the @ key to clear the error and return to normal operation.

■ Exponential Display

During normal calculation, the unit is capable of displaying up to 10 digits. Values that exceed this limit, however, are automatically displayed in exponential format. You can choose between 2 different types of exponential display formats,

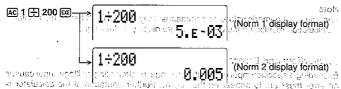
Norm 1: $10^{-2}(0.01) > 1 \times 1, 1 \times 10^{10}$. The main rate are trained as the property of th

Norm 2::10-9(0,00000001), ≥ lx l/ lx l,> 10.00 (2::10 de secondition o multi-righter)

To specify the exponential notation range, first perform the following key operation: FUNCTION 6 (DSP/CLR) 3 (Norm)

Next, press [1] to specify Norm 1 or [2] to specify Norm 2 (page 24).

The current exponential notation range is not indicated by any symbol on the display. You can check which range (Norm 1 or Norm 2) is in effect by performing the following operation.



(All of the examples in this manual show calculation results using Norm 40) to open

syndry say result in defending the end of such as you allow the control syndry syndry syndry is

 When an attempt is men of the principal action calculation that or conds the industries represented. - (SID) serie (1881 (SIOPAE Mill) semin For example, adequating to epitian a convision of data has yo

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- validade edd for resigna or soreann.

How to interpret exponential format

 $1.2_{\text{E}}+12$ indicates that the result is equivalent to 1.2×10^{12} . This means that you should move the decimal point in 1.2 twelve places to the right, since the exponent is positive. This results in the value 1.200.000.000.000.

1.2_E−03 indicates that the result is equivalent to 1.2 × 10⁻³. This means that you should move the decimal point in 1.2 three places to the left, since the exponent is negative. This results in the value 0.0012.

■ Calculation Execution Display

When the calculator is busy-executing a long, complex calculation or program, a black box (a) flashes in the upper right corner of the display. This black box indicates that the calculator is performing an internal operation.

■ Whenever you are having problems...

Whenever your calculations start producing results that are not within expectations, perform the following procedure to get back to standard settings.

- 1. Press MODE 11 to enter the COMP Mode.
- 2. Press FUNCTION [5] (DRG) to display the Unit of Angular Measurement Menu, and then press 1 (Deg) to select degrees.
- 3. Press (NACTION) [6] (DSP/CLR) to display the Display Format/Clear Menu and then press (3) (Norm) 1 to select the Norm 1.
- 4. Perform your calculation.

If you still experience problems, recheck the content of your calculation, and make sure you are using the correct mode for the type of calculation you are performing.

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dis ou suit amportance espainant, reclined the construction required that use is a second of the construction of the construct inguitation gains, duy notice for the legace factor and control or pure particular.

4. Periora your est dance.



Manual Calculations

- -- 2-1 Basic Galculations --

2-2 Units of Angular Measurement

Trigonometric and Inverse Trigonometric Functions 2-3

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Logarithmic and Exponential Functions and the (\$1 - - 65

Hyperbolic and Inverse Hyperbolic Functions THEOLOGY RESERVE SAUTE

2-6 Other Functions

Coordinate Conversion

Permutation and Combination

2-9 Fractions

2-10 Engineering Notation Calculations

2-11 Number of Decimal Places, Number of Significant Digits Exponential Notation

2-12 Calculations Using Memory appears (1985) 1985

Chapter **Manual Calculations**

Manual calculations are those that you input manually, as on the simplest of calculators. They are to be distinguished from programmed calculations. This chapter provides various examples to help you become familiar with the manual calculation capabilities of the unit.

2-1 Basic Calculations

■ Arithmetic Calculations

- Enter arithmetic calculations as they are written, from left to right.
- Use the (-) key to input the minus sign before a negative value.
- Calculations are performed internally with a 15-digit mantissa. The display is rounded to a 10-digit mantissa before it is displayed.

Example	Operation	Display
LABITIPLE		
23 + 4.5 - 53 = -25.5 85000 3 10% 2500 5700	internitation 23 ∰ 4.5 ∰ 53 ₪ 23 ∰ 4.5 ∰ 53 ₪ Diginitation control	= 25.5 - 25.5 - 25.5 - 25.5 โ
56 × (−12) ÷ (−2.5) = 268.8 ito f	-56 X ⊕ 12 ⊕ ⊕ 2.5 छ	matagad 4- 268.8
200 Roma No. 12369 × 7532 × 74103 =	ndi sega 19880A ni biqis ⊃i 12369 X 7532 X	adrogen 3-8
6.903680613 × 1012	74103 🕮	6.903680613 _E +12
(6903680613000)	ta Convenies	androod 7-4
	nelir jú <u>l, með Lh</u> s a <u>d</u> i	
$(4.5 \times 10^{75}) \times (-2.3 \times 10^{-79})$	4.5 @ 75 X 🖂 2.3 @	-1.035E- 03
$= -1.035 \times 10^{-3}$		
(-0.001035)	อยสมอัส "จงสะเปิด ผู้ที่เ	€00995Ū Ū(Norm 1)
	edif <u>lacose Flancos C</u> ita	Erdingto (4.3
$(2+3) \times 10^2 = 500$	(2 1 3 D X 1 □ 2 □ 2	a.noak∃ 500

■ C 2 → 3 D @ 2 does not produce the correct result. Be C 1980 200 A S fine sure to enter this calculation as shown.

• For mixed arithmetic calculations, multiplication and division are given priority over addition and subtraction.

Example		` <u>.</u>	Operation	Display
$3+5\times 6=33$: =	57-4	3∰5ⴟ6	33
$7 \times 8 - 4 \times 5 = 36$			7×8-4×5	36
$1 + 2 - 3 \times 4 + 5 + 6 =$	6.6	1 🕀 2 🖃	3 🗙 4 🕂 5 🕂 6 🖭	6.6

المراجعين الفراك بإرادات

■ Calculations Using Parentheses

Example Example	Operation)	Display
$100 - (2 + 3) \times 4 = 80$	100一(2十3)文4區	
2+3×(4+5) = 29 • The final closed parenthes tion of the (key) may be	es (immediately before opera- omitted, no matter how many	ne vrae in "tillto til - cæ∂i 29
are required.	· [발] 4조기 : : : : : : : : : : : : : : : : : : :	Terrer (1945) - 1945 - 1945 Terrer (1945) - 1945
 A multiplication sign immed 	【7 一 2 】 【 8 1 5 賦 iately before an open parenthe-	65
· - ·sis may be omitted.		
10 - { 2 + 7 × (3 + 6) } = -55 • In this manual, the multiplic	ation sign is always shown.	
$\frac{2 \times 3 + 4}{5} = (2 \times 3 + 4) + 5 = 2$	## 15 (12 × 3 ⊕ 4) ⊕ 5 	este tas in la silicina. Circinata investi in 2 ,
$\frac{6}{4\times5}=0.3$	6⊕(14 X 5)	0.3
• The above is identical to 6.	- · · ·	San
35 C 1 F 3 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	VET PLEASE NO. 11	

■ Percentage Calculations

Example	Operation	Display
Percentage 26% of \$15.00	15 🗶 26 🗺 %	3.9
• Premium		and the second
15% increase from \$36.20	36.2 🗙 15 आ日% 🕂	41.63
Discount-		
4% discount from \$47.50	47.50 X 4 SHF1 % —	45.6
• Ratio	me show in gar	militari (fiz. 1907) (A.
75 is what % of 250?	75 🛨 250 🖽 🣆	30(%)
• Rate of change	1.7 3.5 144	98 - 1 TC
141 is an increase of what % from 120?	141 — 120 MIT %	5 - 16 17.5(%)
240 is a decrease of what % from 300?	240 🖃 300 জিল %	-20(%)

2-2 Units of Angular Measurement

- See page 22 for full details on specifying the unit of angular measurement.
- Once you specify a unit of angular measurement, it remains in effect until you specify a different one. The specification is retained even if you switch power off.
 The following calculations cannot be performed in the BASE-N Mode.

2-3 Trigonometric and Inverse Trigonometric Functions

- Be sure to set the unit of angular measurement before performing trigonometric function and inverse trigonometric function calculations.
- ■The following calculations cannot be performed in the BASE-N Mode.

 The following calculations cannot be performed in the BASE-N Mode.

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 The following cannot be performed in the BASE-N Mode.

 The following ca

Example	Operation	Display
sin 63°52'41" = 0.897859012	FUNCTION 5 (DRG) 1 (Deg)	F 32.15 (4) (1)
	sin 63 👀 52 👀 41 👀 🕮	0.897859012
$\cos(\frac{\pi}{3}\text{rad}) = 0.5$	- FUNCTION 5 (DRG) (2 (Rad)	
######################################	© (# 7 + 3) E	. 1841 - 1850 1, 2 015
tan(-35gra) = - 0.6128007881	[1001006] (DRG) (33 (Gra)	ku i se rvolici e 11 m
11.18%	[15] 15 Emi (→ 35 Emi	- 0.6128007881
2:sin 45%×.cos 65°	FUNCTION [5] (DRG) [1] (Deg)	to the state of the state
= 0.5976724775	2 💢 sin 45 💢 🚥 65 🕮	0.5976724775
Toy Mak	can be omitted.com	AN 1 - 12/22 F. J. J.

2-4 Logarithmic and Exponential Functions

• The following calculations cannot be performed in the BASE-N Mode.

Example	Operation -	Display
log 1.23 (log ₁₀ 1.23) = 8.990511144 × 10 ⁻²	log 1.23 Ext	0.08990511144
In90 (log ₂ 90) = 4.49980967	In 90 EXE	4.49980967
10 ^{1,23} = 16.98243652 (To obtain the antilogarithn	জিল টি ³ 1.23 আ n of common logarithm 1.23)	16.98243652
e ^{4.5} = 90.0171313 (To obtain the antilogarithm	SHE (27 4.5 EXE n of natural logarithm 4.5)	90.0171313
10 ⁴ ·e ⁻⁴ + 1.2·10 ^{2·3} = 422.5878667	97 (1.2 X) 987 (3.3 (3.5 (4.2 X) 987 (3.3 (3.2 X) 987 (422.5878667
$(-3)^4 = (-3) \times (-3) \times (-3) \times (-3) = 81$		81

FUNCTION (5) (DRG) (5) (r) [XE]

4774.20181

Example		Opera	ition	.D	isplay
-34=-(3×3×3×3>	<3)=-81		(-) 3 ∧ 4 EÆ	l '	
5.6 ^{2.3} = 52.58143837).)	5.6 ▲ 2.3 ஊ		52.58143837
⁷ /123 (= 123 ¹ / ₇)				e i bed	
	3647795	7	SNFT ₹ 723 EXE	***	1.988647795

2-5 Hyperbolic and Inverse Hyperbolic Functions

Example

200 16.33

• The following calculations cannot be performed in the BASE-N Mode.

sinh 3.6=18.28545536	[MATH] (MATH) ▼▼	18.28545536
$\cosh^{-1}\left(\frac{20}{15}\right) = 0.7953654612$		0.7953654612
Determine the value of x when tanh	4x = 0.88:	oladia edil
$x = \frac{\tanh^{-1}0.88}{4} = 0.3439419141$	[NETAS] (MATH) ▼▼ 6 (tanh=1) 0.88 🕂 4 🖾	and the second second Vision

Operation

Display

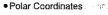
2-6 Other Functions

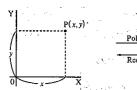
• The following calculations cannot be performed in the BASEN Mode. and the same and the

Example	Operation	Display
2+,5=3.65028154	√ 2⊕√5	3.65028154
$(-3)^2 = (-3) \times (-3) = 9$	(103)2100	9
$-3^2 = -(3 \times 3) = -9$	- 3 <i>x</i> be	-9
$2^2 + 3^2 + 4^2 + 5^2 = 54$	2æ+3æ+ 4æ+5æ®	54
$\frac{1}{\frac{1}{3} - \frac{1}{4}} = 12$	(3 947 27 — 4 947 27 D 947 27 DB	12 12 12 14 14 14 14 14 14 14 14 14 14 14 14 14
8!(= 1 × 2·×·3·×··×·8)>- × -a = 40320	5 8 [55500] 1 (MATH) (5 (x)) 5점 - 소급한 등 학교 (часей, прастиче ж, 40320 в шестрацеў (к. сент
$3\sqrt{-27} = -3$	90 91 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	12 in 12 in interest = 3 - 3
What is the absolute value of the common logarithm of $\frac{3}{4}$?	OHO YOMAN . HARA AND INTE	n nagawaran On lang la ka
$ \log \frac{3}{4} = 0.1249387366$		0.1249387366
What is the integer part of -3.5?	(MATH) ▼ 2 (Int) → 3.5	-3
What is the decimal part of – 3.5?	ENCTOM 1 (MATH) ▼ 3 (Frac) ← 3.5 回	- 0.5
What is the nearest integer not exceeding – 3.5?	FUICTION 1 (MATH) ▼ 4 (Intg) (— 3.5 DE	-4

2-7 Coordinate Conversion

Rectangular Coordinates







to begin harden and a con-

THE PRINCIPLE OF SECURITION

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• Calculation results are assigned to variables I and J.

Ī		ı	J
	Pol	r	θ
	Rec	х	у

- With polar coordinates, θ can be calculated and displayed within a range of -180%< $\theta \le 180$ ° (radians and grads have same range).
- The following calculations cannot be performed in the BASE-N Mode.

12 section 1 307.

Example		Operation	Display
To calculate r and θ ^o $x = 14$ and $y = 20.7$	when	FUNCTION [5] (DRG) [1] (Deg) FUNCTION [1] (MATH) ▼	r haspida i mersam
er war had	i in a single En aller	⑤ (Pol () 14 7 20.7) 國 (Continuing) 硼 J 國 國門而	$\theta = 55.92839019$

2-8 Permutation and Combination

Permutation		
"Pra	_n!	
112 / -	$=\frac{n!}{(n-r)!}$	

The second control of
$$\bullet$$
 Combination
$$nCr = \frac{n!}{r!(n-r)!}$$

The following calculations cannot be performed in the BASE-N Mode.

Example ೧೯೮೫ ರ ೯೭೭೯	Operation	Display
To calculate the possible	m +2-23	
number of different access	IO FORTON 1 (MATH)	to employed the train
ments using 4 items selected from among of 10 items.	7 (nPr) 4 EE	
P4 = 5040 (1.75 PE) Sec. 188		(대) (유) : 발한 9
	O FORTO (MATH)	Company Services
tions of 4 items that can be selected from among 10 items.	8 (nCr) 4 EE	210 (1986)
10C4 = 210	,	

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2-9 Fractions

 Fractional values are displayed with the integer first, followed by the numerator and then the denominator:

នក់ខ្លាំរកស៊ី បំណុចស្នាក់កែក។

•The following calculations cannot be performed in the BASE-N Mode.

Example	Operation	Display
$\frac{2}{5} + 3\frac{1}{4} = 3\frac{13}{20} = 3.65$	2碑5升3础1碶4瓯 (Conversion to decimal) 磉	3_13_ 20 3.65
• Fractions can be convert versa.	ed to decimal values and vice	er dee voorge die soo Noorgeste en die voorge Oorgeste en die voorges
$3\frac{456}{78} = 8\frac{11}{13}$ (Reduced)	3 6 456 6 78 6	8_ 11_ 13
come reduced fractions wh	(Continuing) 細 個 actions that can be reduced be- ien you press a calculation com- convert the value to an improper	115 . 13
$\frac{1}{2578} + \frac{1}{4572}$ $= 6.066202547 \times 10^{-4}$	1 @ 2578 十 1 @ 4572 ஊ	6.066202547_E- 04 (Norm 1)
numerator, denominator an	characters, including integer, d deliminator marks exceeds 10, atically displayed in decimal for-	
$\frac{1}{2} \times 0.5 = 0.25$	1 融 2 🗙 🖸 5 🖼	0.25
 Calculations containing be calculated in decimal form. 	oth fractions and decimals are at.	
$\frac{1}{\frac{1}{3} + \frac{1}{4}} = 1 \frac{5}{7}$	1碘(1碘3+1∞4)∞	7 - 5 - 7
	within the numerator or denomi- g the numerator or denominator	

2-10 Engineering Notation Calculations

Input engineering symbols using the Engineering Notation Menu from the MATH Menu, as described on page 32.

Perform the following operation to change a displayed value to the corresponding Engineering Notation.

FUNCTION 6 (DSP/CLR) 4 (Eng)

Each time you perform this operation, the display changes between Engineering Notation and standard (non-engineering) notation.

- •The unit automatically selects the Engineering Notation that makes the numeric value fall within the range of 1 to 999.
- •The following calculations cannot be performed in the BASE-N Mode.

Exar	nple 💮 💮	o. Paja (Operation	s Uminia	Grade Display
999k (kilo) + 25	k (kilo) 024M (mega)	999 [FUNCTION]	(DSP/CLR) 1) (MATH) [25 [FURCTION] 1		9 0 8 (3) (3) (5) (2) (758)
. C 89) (8. 5.1) (8.7.5 y y t (8.7.5 y y t	. जिल्हा a.c	(DSP/CLR)	6 (k) 🕮	1.024M 1024000
9 ÷ 10 = 0.9 = 9	Oom (milli)	FUNCTION 6	(DSP/CLR) 9		ter chisa erê i sîgê Davenar 900.m
(Converts unit, by s	the displayed valu hifting the decima	e to the next point three	higher engin	eering e right.),	
(Converts and, can unit, by s	the displayed value hifting the decima	e to the next	lower engine places to the	SHIFT ERG Pering The left.)	0.0009k
200.64년 2007.64년 -	11 <u>7</u> , o.7				0.9 900.m 900000.μ 900.m

2-11 Number of Decimal Places, Number of Significant Digits, Exponential Notation

- See page 23 for details on specifying the number of decimal places.
 See page 23 for details on specifying the number of significant digits.
 See page 24 for details on specifying the exponential notation.

Example	Operation 🖓 🚓 🚓	கர் ந Display
100 + 6 = 16.66666666	100 € 6 🖼	ાઈ ∋લું હ 16.6666667
(4 decimal places) FUNCTION (6) (DSP/CLR) (1) (Fix) (4)	16.6667
-011 50 11 (Cancels specification		
(5 significant digits) [WC0066 (DSP/CLR) 22 (Sa) 5	1.6667E+01
) (Norm) (1)	
 Displayed values are round 	ded off to the place you specify.	: 1x∃i
The Artest		
200 ÷ 7 × 14 = 400	200 🛨 7 🗶 14 🕮	400
(3 decimal places) FUKTON 6 (DSP/CLR) 1 (Fix) 3	400.000
(Calculation continues us	ing display capacity of 10 digits)	F. 2. 5
	200 🕂 7 🖭	28.571
	X	Ans×_
	14 🕮	400.000
If the same calculation is number of digits:	performed using the specified	n -000 = 00
number of digits.	200 🕂 7 🕮	
(The value stored internally i	s cut off to the number of decimal	er ett av store
places you specify.)		
17000	(SHFT) [Red)	28.571
	and the second s	
# \$	14 🕮	399.994
(Cancels specification)	[FUNCTION 66 (DSP/CLR) [3] (Norm) [1]	399.994

2-12 Calculations Using Memory

■ Independent Memory

Values can be directly added to or subtracted from memory. You can view the result of each individual calculation and accumulate a grand total in the memory.

Example	Operation	Display	
23 + 9 = 32	23 ⊕ 9 M	32	
53 - 6 = 47	53 <u>—</u> 6 M→	47	
$-)$ 45 \times 2 = 90	45 🔀 2 SHEFI MI-	90	
99 ÷ 3 = 33	99 ⋺ 3 🕪	33	
(Total) 22	(M) (M)	22	
 Use \$\overline{\text{M}} \text{ in or store first variety contents. Note that of \$\overline{\text{DE}}\$. 	alue. This clears any previous at IIII and IIIII III III III III III III III III		
$7 + 7 + 7 + (2 \times 3) + (2 \times 3)$	750 M M+ M+ 2 X 3 M+ M+		
$+(2 \times 3) - (2 \times 3) = 33$	Mil Saft Milac) M	33	

■ Variable Memories

The 26 variable memories can be used for storage of data, constants and any other numeric values.

Example	Operation	Display	
<u>193.2</u> ÷ 23 = 8.4	193.2 50 A → 23 50	8.4	
<u>193.2</u> ÷ 28 = 6.9	MQ A → 28 EE	6.9	
$\frac{9 \times 6 + 3}{(7 - 2) \times 8} = 1.425$	9 🔀 6 🕂 3 📆 🖪	57	
$(7-2)\times 8$	(7-2) X8m C	40	
	MWB ÷ MW C ∞	1.425	
• The same result can be p 3 □ □ □ 7 □ 2 □ ∞	 roduced by entering (9区6任] 8 ①顯。	•	



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Differential, Quadratic Differential, Integration, and Σ Calculations

with the or the proposition of the contract of the boundary of the contract of

- 3-1 Differential Calculations
- 3-2 Quadratic Differential Calculations
- 3-3 #cintegration Calculations and whother the description of the con-
- 3-4 Σ Calculations

Differential, Quadratic Differential, Integration, and Σ Calculations

3-1 Differential Calculations

After you select (2) (d/dx) from the MATH Menu, you can input differentials using following format.

FWXTON 1 (MATH) 2
$$(d/dx) f(x)$$
 \bullet a \bullet Δx \bullet

- Point for which you want to

$$dldx(f(x), a, \Delta x) \Rightarrow \frac{d}{dx}f(a)$$

determine the derivative

The differentiation for this type of calculation is defined as:

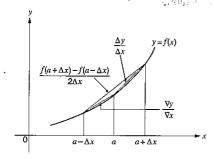
$$f'(a) = \lim_{\Delta x \to 0} \frac{f(a + \Delta x) - f(a)}{\Delta x}$$

In this definition, infinitesimal is replaced by a sufficiently small Δx , with the value in the neighborhood of f'(a) calculated as:

$$f'(a) = \frac{f(a + \Delta x) - f(a)}{\Delta x}$$

$$\frac{1}{\sqrt{1 + (1 + \Delta x)^2 + (1 + \Delta x)^2}} \frac{1}{\sqrt{1 + (1 + \Delta x)^2 + (1 + \Delta x)^2$$

In order to provide the best precision possible, this unit employs central difference to perform differential calculations. The following illustrates central difference.



The slopes of point a and point $a + \Delta x$, and of point a and point $a - \Delta x$ in function y = f(x) are as follows:

62

$$\frac{f(a + \Delta x) - f(a)}{\Delta x} = \frac{\Delta y}{\Delta x} \cdot \frac{f(a) - f(a - \Delta x)}{\Delta x} = \frac{\nabla y}{\nabla x}$$

This average, which is called the central difference, is expressed as:

$$f(a) = \frac{1}{2} \left(\frac{f(a + \Delta x) - f(a)}{\Delta x} + \frac{f(a) - f(a - \Delta x)}{\Delta x} \right)$$
 for the problem of the problem o

■ To Perform a Differential Calculation

Example To determine the derivative at point x = 3 for the function $y = x^3 + 1$ $4x^2 + x = 6$, when the increase/decrease of x is defined as $\Delta x = 1\epsilon = 5$.

Input the function f(x).

the conversion of Against the

Input point x = a for which you want to determine the derivative.

Input Δx , which is the increase/decrease of x.

- X is the only expression that can be used in the function f(x). If you use any other variable name (A through Z), that variable name is regarded as a constant, using the value currently assigned to the variable in the calculation.
- Input of Δx for the increase/decrease of x can be skipped. When you do, the unit automatically uses a value for Δx that is appropriate for the value of x = a, which you specified as the point for which you wanted to determine the derivative.
- in general, calculation precision is ±1 at the least significant digit of the result.

#Applications of Differential Calculations and the control of the

Differentials can be added, subtracted, multiplied and divided with each other.

Example
$$\frac{d}{dx}f(a) = f'(a), \frac{d}{dx}g(a) = g'(a)$$

Therefore:

$$f'(a) + g'(a)$$
, $f'(a) \times g'(a)$

· Differential results can be used in addition, subtraction, multiplication, and division, and in functions. BENDER OF THE STORY OF THE PROPERTY OF THE

Example
$$2 \times f'(a)$$
, log $(f'(a))$

• Functions can be used in any of the terms $(f(x), a, \Delta x)$ of a differential.

Example
$$\frac{d}{dx}(\sin x + \cos x, \sin 0.5)$$

• Note that you cannot use differential, integration, or Σ calculations inside of a differential calculation term.

Important The same of the second factor ago on a larger than the same page.

- · Pressing AC during calculation of a differential (while the cursor is not shown on the display) interrupts the calculation.
- . Always perform trigonometric integrations using radians (Rad Mode) as the unit of angular measurement.
- . Differential calculations use variables E through H for storage, deleting any contents that were previously stored. This also means that you cannot use these variables during differential calculations.

-	Variable		•	F	T	G	Н
İ	Data Stor	eď		a		Δx	f'(a)

In addition to the above, the value for derivative a is assigned to variable X.

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3-2 Quadratic Differential Calculations (1) (2) (2) (2)

After you select ③ (🍪 ds²) from the MATH Menu, you can input quadratic differentials using either of the two following formats.

Final boundary
$$(n = 1 \text{ to } 15)$$
Input of a value for n can be skipped.

Office this coefficient point

$$d^2/dx^2 (f(x), a, n) \Rightarrow \frac{d^2}{dx^2} f(a)$$

and white differential calculations are as possible of the Application and a soft in a

Quadratic differential calculations produce an approximate differential value using the following second order differential formula, which is based on Newton's polynomial interpretation: see an example of the priority as a second point of t

$$f''(x) = \{-f(x-2h) + 16f(x-h) - 30f(x) + 16f(x+h) - f(x+2h)\} / (12h^2)$$

In this expression, values for sufficiently small increments of x are sequentially calculated using the following formula, with the value of m being substituted as m = 1, 2; Additional combe performed man y two que much more continued.

$$h = 1/5^{m}$$

 $h = 1/5^{\circ\prime}$ The calculation is finished when the value of f''(x) based on the value of h calculated using the last value of m, and the value of f''(x) based on the value of h calculated using the current value of m are identical by the time the upper limit n is reached.

- Normally, you should not input a value for n. This automatically assigns a deref fault value of 7 for noticis recommended that you only input a value for n when required for calculation precision.
- required for calculation precision.
 Inputting a larger value for n does not necessarily produce greater precision.

■ To Perform a Quadratic Differential Calculation assessment and accompanies

To determine the quadratic differential coefficient at the point where x = 3 for the function $y = x_0^3 + 4x^2 + x - 6$. In this case, input 6 as n, which is final boundary.

a lega unid differencia quadeat e dilarget di daggazzan and X a**(x).** MATH) 3 (dPldx2) WMX / 3 + 4 WM X 22 and the total of the value of their hours drawn. Use

Input 3 as point a, which is differential coefficient point.

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the first term of the strategy of the property of the strategy of the

Additional and the state of the Control of the Contro

Input 6 as n , which is f	inal boundary.	Transmit Singram	0.2
- i 6) -ngnydib ydarbanp lugir i nco y	sy lamidis in this o	2.4dx2.(X^3±4X3;	ŧΧ
	ការ 🥂 នៅបានលើ ខ្លាំ មា	693,396⊅∑ pathe pike	ાંદા
EXE The self year of the self that	d'	2/dx2(X^3+4X2	+X .
pengula udi na seliku ku ku kati uni yari (lefanci) ki namaa	/i	6,3,6)	26

- In the function f(x), only X can be used as a variable in expressions. Other variables are treated as constants, and the value currently assigned to that variable is applied during the calculation, into an uncondition and the property of the calculation.
- Input of the closing parenthesis following the final boundary value can be omitted.
- In general, calculation precision is ±1 at the least significant digit of the result.

e or Adamençae dis a los anomotoristicos y medalitus nos acute y unclass que airit ni ■ Applications of Quadratic Differential Calculations) on prior personal de constantes of consta

Arithmetic operations can be performed using two quadratic differentials.

Example $\frac{d^2}{dx^2}f(a) = f''(a), \frac{d^2}{dx^2}g(a) = g''(a)$ for the production of the standard of the stan

f''(a) + g''(a), $f''(a) \times g''(a)$.

The result of a quadratic differential calculation can be used in a subsequent arithmetic or function calculation.

 The result of a quadratic differential calculation can be used in a subsequent arithmetic or function calculation.

 The result of a quadratic differential calculation can be used in a subsequent arithmetic or function calculation.

 The result of a quadratic differential calculation can be used in a subsequent arithmetic or function calculation.

 The result of a quadratic differential calculation can be used in a subsequent arithmetic or function calculation.

 The result of a quadratic differential calculation can be used in a subsequent arithmetic or function calculation.

Example - 2×f."(a), -log(f."(a)) -----

• Functions can be used within the terms (f(x), a, n) of a quadratic differential expression

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Note that differential, quadratic differential, integration, and Σ calculation expressions cannot be used inside of the terms of a quadratic differential expression.

Important

- Use only integers within the range of 1 to 15 for the value of final boundary n. Use of a value outside this range producesian: Ma ERROR, a mod as a local.
- You can interrupt an ongoing quadratic differential calculation by pressing the AC
- You should always specify radians (Rad) as the unit of angular measurement before performing a quadratic differential calculation using trigonometric functions.

 Variables F. G. and H. are used by the calculator during quadratic differential calculations. You can recall the values currently assigned to these variables at any time to check the details of the calculation. Also remember that you should never use these three variables for other purposes when performing quadratic differential calculations.

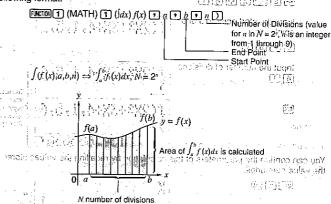
Variable-	F-	- G	-н] 	Data Cloren
Data	а	n	f"(a)		

In addition to the above, differential coefficient a is assigned to variable X after execution of a quadratic differential calculation, and a stranger of the contract of th

a drip naveral Para manifest

3-3 Integration Calculations

After you select ① (ldx) from the MATH Menu, you can input integrations using following format.



Integration calculations are performed by applying Simpson's Rule for the f(x) function you input. This method requires that the number divisions be defined as $N=2^n$, where the value of n is an integer in the range of 1 through 9. If you do not specify a value for n, the calculator automatically assigns a value in accordance with the integration being performed.

As shown in the illustration above, integration calculations are performed by calculating integral values from a through b for the function y = f(x) where $a \le x \le b$, and $f(x) \ge 0^{*}$. This in effect calculates the surface area of the shaded area in the illustration.

. If $f(\vec{x}) < 0$ where $a \le x \le b$, the surface area calculation produces negative values (surface area (x) = (x) + (x) = 0

Also note that the calculator uses the following variables to store data during integration calculations: says if the master allowed large and the control of the control o

				n the C <mark>N</mark> nov of the second and the
Data Stored	а	b	N = 2 ⁿ	$-\int_a^b f(x)\ dx$

■ To Perform an Integration Calculation

in autilion to the above, differented coefficient it is assigned to variable X each or Example To perform the integration calculation for the function $\int_{-\infty}^{5} (2x^2 +$ 3x + 4) dx

Input the function f(x).

AC FUNCTION [1] (MATH) H3 WM X H47

point of 1 (lab) 2 (mm x) 22 or one 1 (282+34+4; 273 codes are read

Input the start point and end Assessin points, year and

Input the number of divisions. 60

JC2X2±3X±4,1×5,6/i The result takes a few J(2X2+3X+4,1,5,6 seconds to appear on the display. 134.6666667

You can confirm the parameters of this calculation by recalling the values stored in the value memories.

on **(Marin) de** dise nationale di plantidi per di ber notato de la sella percebata inderget di Tributa di basio en l'accisivé di remenna di **L'**épair solla, con bodissa l'altri des di**b**er y nota where the <mark>Felico of His an interprint the real poof titlen our Kultivon de periodes war</mark> ont reperiode each eatain automobile the effort bevolunt accombance until de poor dation of a line pendicated. The second of t

terror (P. Colon solution) (Colon control activity) and control and control activity (Colon colonia) suit not control personal rate and religions some sources entransportations are middle. To a rate

• X is the only expression that can be used in the function f(x): If you use any other variable name (A through Z), that variable name is regarded as a constant, and the "value currently assigned to the variable is used in the calculation to the value

• n and parentheses may be omitted. If you omit n, the calculator automatically selects the most appropriate value.

· In general, calculation precision is ±1 at the least significant digit of the result.

Applications of Integration Calculation

· Integrals can be used in addition, subtraction, multiplication and division.

Example
$$\int_a^b f(x) dx + \int_c^d g(x) dx$$

 Integration results can be used in addition; subtraction, multiplication and division. in functions.

To the temporal $\int_{\mathbb{R}^n} f(x) \, dx$ and x is not the solution of the sum of the solution
• Functions can be used in any of the terms (f(x), a, b, n) of an integral.

Example $\int_{\sin 0.5}^{\cos 0.5} (\sin x + \cos x) dx$ $=\int (\sin x + \cos x, \sin 0.5, \cos 0.5, 5)$

 \bullet Note that you cannot use differential, integration, or Σ calculations inside of an integration calculation term.

Important

 Pressing Ouring calculation of an integral (while the cursor is not shown on the display) interrupts the calculation.

· Always perform trigonometric integrations using radians (Rad Mode) as the unit of

angular measurement.

· Integration calculations use variables K through N for storage, deleting any constepts that may be already stored. This also means that you cannot use these variables during integration calculations.

In addition to the above, the value that represents division beginning point a is stored in variable X following completion of the integration calculation:

This unit utilizes Simpson's rule for integration calculation. As the number of significant digits is increased, more calculation time is required. In some cases, calculation results may be erroneous even after considerable time is spent performing a calculation. In particular, when significant digits are less than 1, an ERROR (Ma ERROR) sometimes occurs.

 Integration involving certain types of functions or ranges can result in relatively large errors being generated in the values produced.

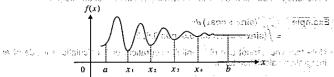
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 Note the following points to ensure correct integration values, agony included XXX (1) When cyclical functions for integration values become positive or negative for different divisions, perform the calculation for single cycles, or divide between negative and positive, and then add the results together, easing 139 lyts in

and street appropriate value. non de desemble di margora de la la la la la compania de la la la la la la compania de la compania de la compa Positive part (S) Cincilisação de anoidadiligação C

no sivio in a management
$$\int_a^b f(x)dx = \int_a^b f(x)dx + \int_a^b f(x)dx + \int_a^b f(x)dx + \int_a^b f(x)dx = \int_a^b f(x)dx + \int_a^b f(x)dx = \int_a^b f(x)dx + \int_a^b f(x)dx = \int_a^b f(x$$

(2) When minute fluctuations in integration divisions produce large fluctuations in integration values, calculate the integration divisions separately (divide the large fluctuation areas into smaller divisions), and then add the results together.



$$\int_{a}^{b} f(x)dx = \int_{a}^{x_{1}} f(x)dx + \int_{a}^{x_{2}} f(x)dx + \dots + \int_{a}^{x_{1}} f(x)dx$$

$$\lim_{x \to a} f(x)dx = \int_{a}^{x_{1}} f(x)dx + \dots + \int_{a}^{x_{2}} f(x)dx$$

$$\lim_{x \to a} f(x)dx = \int_{a}^{x_{1}} f(x)dx + \dots + \int_{a}^{x_{2}} f(x)dx$$

$$\lim_{x \to a} f(x)dx = \int_{a}^{x_{1}} f(x)dx + \dots + \int_{a}^{x_{2}} f(x)dx$$

$$\lim_{x \to a} f(x)dx = \int_{a}^{x_{1}} f(x)dx + \dots + \int_{a}^{x_{2}} f(x)dx$$

EPRORI somotores cooper

3-4 \(\subseteq \text{Calculations} \)

ntegration rapulations use a calcidea X through A in calcians, reference on every After you select $\boxed{4}$ (Σ () from the MATH Menu, you can input the following Σ calcula-Lamorte de la constante de la tion format.

all eulavieur eige above. Die value thi ENCTON 4 (MATH.) 4 (Σ () α Σ k Σ α Σ β Σ only பு அத்த நிருந்து விருந்து விரு விருந்து விருந்து விருந்து விருந்து விருந்து விருந்து விருந்த eardlauon. In panicuba, when significant rigits are jet

 Integration on alving control proces of togethers or rapides can use it is ablively. large arrors bein i generated in the eather produced. Σ calculation is the calculation of the partial sum of sequence $\{ak\}$, using the following formula.

$$S = a_{\alpha} + a_{\alpha+1} + \dots + a_{\beta} = \sum_{k=-\alpha}^{\beta} a_k$$

 \blacksquare Example Σ Calculation

Eli Zolodicilon Freceutions Example To calculate the following: 1 3 boat out and isrit erus wish!

the initial term is Otherwise, an NO -sio $\delta \mathcal{A}_{i}$ act to $\Delta \hat{\Sigma}(K_{i}^{2}\pm3K_{i}\pm5)$. It betains that the clusters Σ groups that ignores left $\delta \hat{\Sigma}$ ਤ ਨਾ L oress line ਕਿਵੇਂ ਵਰਮ

Input sequence {a_i},

AC FUNCTION (1) (MATH) (2) ((2)AMAK 2 - 3 AMAK **+5**

 $\Sigma(K^2-3K+5)$

Input variable used by sequence {ai}.

APHA K 19

 $\Sigma(K2+3K+5,K,)$

Input the initial term of sequence $\{a_i\}$ and last term of sequence $\{a_i\}$.

2060

 $\Sigma(K^2-3K+5,K,2,6)$

 $\Sigma(K^2-3K+5,K,2,6)$

You can use only one variable in the function for input sequence {ai}.

• Input integers only for the initial term of sequence {ai} and last term of sequence $\{a_k\}.$

· Closing parentheses may be omitted.

■ Σ Calculation Applications

Arithmetic operations using Σ calculation expressions

Expressions: $S_n = \stackrel{n}{\Sigma} a_k$, $T_n = \stackrel{n}{\Sigma} b_k$

Possible operations: $S_n + T_n$, $S_n - T_n$, etc.

- ullet Arithmetic and function operations using Σ calculation results 2 × S., log (S.), etc.
- Function operations using Σ calculation terms (a_i, α_i β) $\Sigma (x^2 + x, x, 2^2, 5^2 + 1)$, etc.
- \bullet Note that you cannot use differential, integration, or Σ calculations inside of a Σ calculation term.

■ Σ Calculation Precautions

(清·新) (2013)

(Carl District 1987-1993)

- Make sure that the value used as the final term β is greater than the value used as the initial term α. Otherwise, an Ma ERROR will occur.
- To interrupt an ongoing Σ calculation (indicated when the curson is not on the display), press the [Ac] key.

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Chapter

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Extraction of the lessoinary purification.

Complex Numbers

Use the fall chief procedure to disolary the Complex Number Coloulation (C.C.I. PLX).

- 4.11 Before Beginning a Complex Number Calculation
- 4-2 Performing Complex Number Calculations
- 4-3 Complex Number Calculation Precautions

"1. Abo"........ Absolute valus of a complex number no. most "2. Agg"....... Argumes of u ംനുഴേജ് ന്ന് പാണ്ട "2. Congg"....... ിവ്യവ്യേഷ്ട നേത്യിലേ വന്നുട്ട "പ്രദ്യായ"....... Resign per part nt complex number...

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Amigrado operations are the cerne as those you use for manual chiculobons (paor 18). You <mark>can</mark> bugh u se pamerhoses and themopy.

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4. To the education of the property of the

Complex Numbers Chapter

This calculator is capable of performing the following operations using complex numbers.

- Arithmetic operations (addition, subtraction, multiplication, division)
- · Calculation of the reciprocal, square root, and square of a complex number
- Calculation of the absolute value and argument of a complex number
- · Calculation of conjugate complex numbers
- Extraction of the real number part
- Extraction of the imaginary number part

4-1 Before Beginning a Complex Number Calculation

Use the following procedure to display the Complex Number Calculation (COMPLX)

FUNCTION 2 (COMPLX) ๔ฅฅ฿£icre ล**ลปกะโ**อโล Complex Number Calculation 2. Son Helper Serior Calculation Calculations Complex Number Seleculation Processings

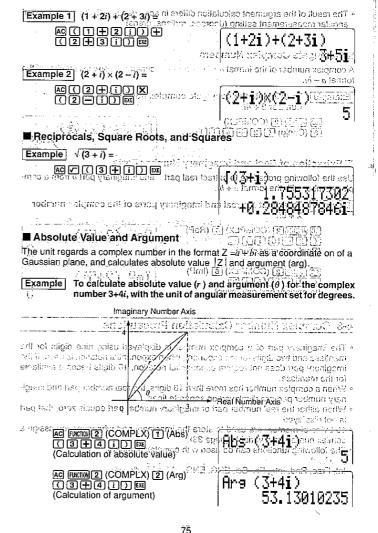
"1.	Abs"	Absolute value of a complex number
"2.	Arg"	Argument of a complex number
"3.	Conjg"	Conjugate complex number
"4.	ReP"	Real part of complex number
"5.	ImP"	Imaginary part of complex number

4-2 Performing Complex Number Calculations

The following examples show how to perform each of the complex number calculations available with this calculator.

Arithmetic Operations

Arithmetic operations are the same as those you use for manual calculations (page 48). You can even use parentheses and memory.



 The result of the argument calculation differs in accordance with the current unit of angular measurement setting (degrees, radians, grads).

■ Conjugate Complex Numbers

A complex number of the format a + bi becomes a conjugate complex number of the format a - bi.

Example To calculate the conjugate complex number for the complex number 2 + 4i.

AC FUNCTION 22 (COMPLX) 3 (Conjg) (2 + 4 i) Ex

■ Extraction of Real and Imaginary Number Parts

Use the following procedure to extract real part \ddot{a} and imaginary part b from a complex number with the format a + bi.

Example To extract the real and imaginary parts of the complex number

AC FUNCTION [2] (COMPLX) [4] (ReP) e unit regards a cora that number in the formet 2. (noitaetixe had leef) on of a

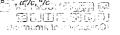
3 aucsian plana, epid duklibilitika ebsehute velina 12. hod erge nur tir horo AC FUNCTION [2] (COMPLX) [5] (ImP) ation (2 + 5 i) 🕮 terr (a) artley of

(Imaginary part extraction)

4-3 Complex Number Calculation Precautions

- . The imaginary part of a complex number is displayed using nine digits for the mantissa and two digits for the exponent, when exponential notation is used. If the imaginary part does not require exponential notation, 10 digits become available for the mantissa.
- . When a complex number has more than 16 digits, the real number part and imaginary number part are displayed on separate lines.
- . When either the real number part or imaginary number part equals zero, that part is not displayed.
- 10 bytes of memory are used to store the imaginary part whenever you assign a comlex number to a variable (page 33).
- The following functions can be used with complex numbers a policy in the complex numbers and in the complex numbers are not in the complex numbers.

Int, Frac, Rnd, Intg, Fix, Sci, ENG, ENG, o'."





Recursion Calculations that the distribution of 可包置 2015 to

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- 5-1 Before Beginning a Recursion Calculation of noisy and ve A Performing Recursion Calculations House Performing Recursion Calculations
- าสเรเก กาะโบติย์ กลังเลเลอโซ ดะไว้เมื่อได้ 600 of the falcoholf of that equipments depends on whether a type or $\mu = type$ for a falcoholf is currently salecter.

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Chapter 5 Recursion Calculations

This calculator can calculate the following two types of recursions.

- · a type recursion
- General term of sequence $\{a_i\}$, consisting of a_i and n.
- a_{n+1} type recursion Linear two-term recursion, consisting of a_{n+1}, a_n , and n.

5-1 Before Beginning a Recursion Calculation

1. Press [6] [6] (a.) to enter the Recursion Calculation Mode a "

This display appears when a_0 type recursion is currently selected. See step 3 below for information on selecting the recursion type.

- Any recursion formula you previously input will also appear on the display when you enter the Recursion Calculation Mode নতাত চত্ত্ৰী ভূল নতাল্ড এই এক
- 2. Press FUNCTION to display the function menu.
- The function menu that appears depends on whether a type or a type recursion is currently selected.

When a, type is selected

1.n 2.MATH 3.TYPE

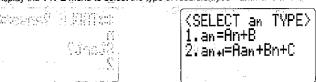
- "1. n" Inputs n.
- "2. MATH" MATH Menu (page 30)
- "3. TYPE" Specification of recursion type.

When and type is selected

1.n 2.an 3.MATH 4.TYPE

- "1. n" Inputs n.
- "2. a_n" Inputs a_n.
- "3. MATH" MATH Menu (page 30)
- "4. TYPE" Specification of recursion type.

3. Display the TYPE menuitorselect the type of recursion you want and a second of



5-2 Performing Recursion Calculations

Example 1 Input $a_n = n + 2$ and calculate values for a_n and Σa_n as variable n changes in value from 2 through 6.

- 1. Select recursion type and
 - O Stranger
- 2. Input the formula.

FUNCTION

1 (n) 🖺 2

3. Press 🖭

The table range input screen appears, showing the current table range start value.

an=_

1.n 2.MATH

|aņ=n+2_

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TABLE Range n Stant?

To cult the calculation, press <u>চ্ছিট্</u>ট This returns you to the display or step 2.

• The calculator will start from the value you specify and increment by one for each successive calculation.

• Non-tinear ϵ , ponential expressions (ox $-\kappa = 2^n - 1$). Iractional expressions (ox $-\epsilon = 1/4$), or exponentially a curvagnance ($\epsilon = 1/4$), or exponentially a curvagnance ($\epsilon = 1/4$) and one of the positional expression and the constant
4. Since we want to use a start value of 2, press 2 to change the current value.

TABLE Ranse Start?

5. Press Ex to perform the calculation. Each time you press Ex , the value of n is incremented and the corresponding results for a_i and Σa_i appear on the display

EXE		a	in=n+2
	1-63642	aartuud ka <mark>lõ</mark>	l a na ali in Allendria (1 2 0
ouses of the species.	rotens for _{dis} circ ¹ (1: 0-	है जुड़ीएकोड़क के हिंद अंदर्भ के देवाजन के	n= 4 An= ward factors7

an=n+2 n= asumicho a luca an=

an=n+2 ์<mark>Σฮัท</mark>≢ั้งอูกสมเด็กเกษา

- You can continue pressing [XII] until n = 9,999,999,999
- To quit the calculation, press [EXIT]. This returns you to the display in step 2. าง เลืองได้ที่ ดับดี (รูป การเกี่ยวกระวัตติด หูปีการเลี้ยวกระบบ แต่ยากเล้า และ และ เป็น การเลื่อน a a aT -

Note

EXE

• Non-linear exponential expressions (ex. $a_n = 2^n - 1$), fractional expressions (ex. $a_n = 2^n - 1$) (n+1)/n, irrational expressions (ex. $a_n = (n-1)$), or trigonometric expressions $(a_v = \sin 2n\pi)$ can be input into the general term of $\{a_v\}$ for generation of a numeric table.

Example 2 Input $a_{n,1} = a_n + 5$ and calculate values for a_n and $\sum a_n$ as variable \hat{n} The Committee of the Co

1. Select recursion type and.

[2]

Input the formula.

 The table range input screen appears, showing the current value for a_1 , which is the first term of sequence $\{a_i\}_{i=1}^n$

TABLE Range

2.an

ar?

an∗i=_

an+i=an+5.

[43]

4. Input the value you want to use for a..

TABLE Range

You can continue pressing (ฮีวิเกปะ 2 9.965,999,396. To quit the colculation, press [ฮีวิเว This selums you to the display m step. โสกอยายิสเปิ

if you specify a regative value for the table viert value, the sign is dramed - if you specify a decimal or fractional velocition to the table star value, on Beach - if you specify a decimal or fractional velocities to the table star value.

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 Another täble range input screen lappears, ic • Another fäble range input screen lappears; ic fabra நடிக்கு நடிக்கு என்ற இவர் is showing the current table range start value on நடிக்கு மென்ற என்ற வரும் மன than a the vising the cell by little to the properties of the content of the content of the content of "Alternation and a president president of the view on a feel seven or and the view of the seven or an adjustment to

near unarraging to the COSTA Magaziand change to the unit you make to use

- The calculator will start from the value you specify and increment by one for each successive calculation.
- Since we want to start from 1, which is the value shown on the display, we do not need to input anything to change it.

6. Press to perform the calculation. Each time you press to the value of n is incremented and the corresponding results for a_i and Σa_i appear on the display.

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n= an=	2012 die Grand
Σan=	$\mathbf{\bar{2}}$

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n=	2
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Σan=	<u> </u>

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	m=		્ર 5
)] -	. ลูก≕ ซพ cov eulev	51 A P	.∘ <u>2</u> 2
	Σan=		ьи

- You can continue pressing EXE until n = 9,999,999,999
- To quit the calculation, press EXIT. This returns you to the display in step 2.

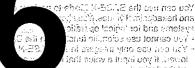
Important

- . If you specify a negative value for the table start value, the sign is dropped,
- If you specify a decimal or fractional value for the table start value, only the integer part is used.
- Specifying a relatively large table start value can cause the calculation to require considerable time to complete.
- A result that is out of the range of the calculator causes an Ma.EBRQRiodichic.
- If you change the unit of angular measurement while the result of a recursion calculation that contains trigonometric functions is on the display, the displayed result is not converted to the new unit. To recalculate using a different unit of angular measurement, go to the COMP Mode and change to the unit you want to use press [6] (a), and then perform the recursion calculation again.

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alculations S. SEWARDS tions with burney odal or nocte to convert between a



If you dilemnit to enter a value that is arralled in the number are end effective accul-BASE-N. Mode Calculations evoda privoted cut

Decimal: 0, 1, 2, 3, 4, 5, 5, 7, 8, 9

Hexadecimat: 0, 1, ∠, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F The alphabatic characters used in the hexadecinati authoritization at the land on.

6-1 Before Beginning a Binary, Octal Decimal A Oron largett

Hexadecimal Calculation (3.4.0.4.0.18 tagens / tempeus cert

residue recinium and to uppe hat antibodo, o interio antibodo principal entibodo. BASEN Mode Calculations

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	ti dians	H-QO
-	estajibi 0 r	Decimal
	256/5 A	Headenna

The following are the ealequeron renders for each of the number BASE-N Mode.

Binsty Values

Cotal Values Positivo: 0.6 v.a. 177777 / 7777

7777777777 (\$ ≥) ≥ 000 Y0000668 (AA) 155777 Positive 0 start present

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BASE-N Mode Calculations

You can use the BASE-N Mode to perform calculations with binary, octal, decimal and hexadecimal values. You should also use this mode to convert between number systems and for logical operations.

- You cannot use scientific functions in the BASE-N Mode.
- . You can use only integers in the BASE-N Mode, so fractional values are not ailowed. If you input a value that includes a decimal part, the unit automatically cuts off the decimal.
- · If you attempt to enter a value that is invalid in the number system (binary, octal, decimal, hexadecimal) you are using, the calculator displays an error message. The following shows the numerals that can be used in each number system. and the first of the communication of the property of the communication
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

. The alphabetic characters used in the hexadecimal number appear differently on the display to distinguish them from text characters.

Normal Text: A, B, O D, E(F) O V ISO 3 B DAIMIND S GROSS 11-6

- Hexadecimal Values: N, B, C, D, E, Fnotstrole Charles as Sept.

 Negative binary, octal, and hexadecimal values are produced using the two's complement of the original value. GR Using the BASE-N wode
- The following are the display capacities for each of the number systems.

 Property of the number systems.

 Property of the number systems.

Number System	Display Capacity	
Binary	16 digits	
Octal	11 digits	
Decimal	10 digits	
Hexadecimal	8 digits	

. The following are the calculation ranges for each of the number systems in the BASE-N Mode.

Binary Values

Octal Values

Decimal Values

Positive: $0 \le x \le 2147483647$ Negative: $-2147483648 \le x \le -1$

Hexadecimal Values

Positive: $0 \le x \le 7$ FFFFFFF

Negative: $800000000 \le x \le FFFFFFFF$

6-1 Before Beginning a Binary, C	octal, Decimal, or He	xadecimal
0.11.11.11.11	- Li Legaled NOT 1	"Aplilion"
Calculation	CMAA 35 comes 1	the same that

1. Enter the BASE-N Mode.

7. MODE (2) (BASE-N).

Currently selected number system

2. Display the function menderum and such autism beyolded a howest off

SO Isaino L.....

FIOX Issues.1...." tox. .5

"1. BASE-N" BASE-N Menu

"2. PROG" Program Command Menu (page 132) 38A8 13156

"3. Mcl" All memory clear (page 24)

3, Display the BASE-N Menu. (BASE-N)

To logar 1225 or The curies the delete armines system to hears "1. Dec" Specifies decimal as default

"2. Hex" Specifies hexadecimal as default

"3. Bin" Specifies binary as default

"4. Oct"...... Specifies octal as default

"6. h" Specifies hexadecimal for input value

"7. b" Specifies binary for input value "8. o" Specifies octal for input value

4. Press ▼ to change to the second BASE-N Menu.

1.Nes 2.Not 5.xor 6.xnor

B O COOR

6-2 Using tl	ne BASE-N Mo	de	A SALES	_
		boldetek lydrianálo malgyp sydmor		
"5. xor"	Logical XOR Logical XNOR	and the second		
"4. or"			Enter Pis BASE-Milliago.	
"2. Not" "3. and"			្រុះ ការរបៀបទៀប	
"1. Neg"	Negation	Maay Saalii	ogrimijoš s eie l	:-ô

■ BASE-N Mode Number System

• To convert a displayed value from one number system to another

• To input values of mixed number systems

Example To input 123% or 1010s, when the default number system is hexadecimal tholes on immediate self-degree "self-degree
AC FUNCTION (T) (BASE FUNCTION) (1) (BASE-N)	(Hèx) (mideo (Y se de seight (b) (a) (a) (b) (a) (b) (a) (b) (c) (c) (c) (c)	d123-43	"c.5"
123EE	n. ta v Juga, not fac nu cenel for iamours	Specifics podu specifics have	NONNO PER
1010	(T) (b) stack temperature (S) (sy reconstruction)	61010 2	

4 Fresk [7] to change thitte second GASE-N Manua

6-3 BASE-N Mode Calculations

Arithmetic Operations

Example 1 To calculate 101112 + 110102





<u>(리토기</u>(기 (BASE 14) [제 (리토기(기 (BASE-14 ()]) (c) [기 (기 (리토기(기 (BASE-14 ()

Example 2 To input and execute 123s × ABC1s, when the default number system is decimal or hexadecimal

AC [WITH] 1 (BASE-N) 1 (Dec)
[WITH] 1 (BASE-N) 8 (o)
1 (2 3 X)
[WITH] 1 (BASE-N) 6 (h)
A B C [X]
[WITH] 1 (BASE-N) (2 (Hex)

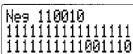
o123×hABC 228084

o123×h**ABC** 00037**AF**4

■ Negative Values

Example To calculate the negative of 1100102

AG [WETOM 1] (BASE-N) (3] (Bin) [WETOM 1] (BASE-N) (7) [1] (Neg) (1] (1] (0) (1) (0) (EE

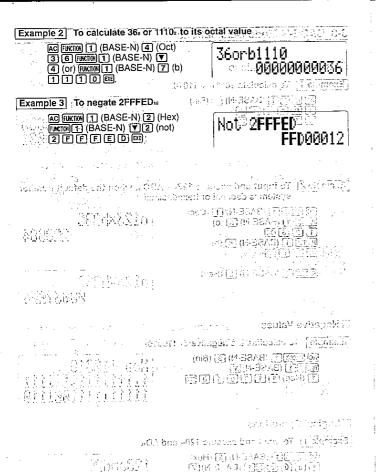


■ Logical Operations

Example 1 To input and execute 12016 and AD16

AC (UNCTION 1) (BASE-N) (2) (Hex) (1) (2) (0) (WITTON 1) (BASE-N) (V) (3) (and) (A) (D) (XI

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Single Variable Statistical Calculations

Calculating a t-Test Value

Paired Variable Statistical Calculations potentials of the control
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Chapter Statistical Calculations

This calculator can perform both single-variable statistical calculations in the SD Mode using standard deviation, and paired-variable statistical calculations in the LR Mode using regression.

7-1 Single Variable Statistical Calculations

In the SD Mode you can obtain population standard deviation, sample standard deviation, the mean of data, sum of the squares of the data, the sum of the data, and the number of data items.

To input single-variable data

1. First perform the following operation to clear statistical memory, which consists of variables U. V. and W.

FENCTION 6 (DSP/CLR) 6 (Sc!) EXE

- Always make sure you clear statistical memory before performing any statistical calculation. Calculating a r-Test Vulual
- 2. Input the data using the following syntax is that a cluster / Dome !-<data value> (DT) (= (M+))

Example To input the data 10, 20

Key operation: 10 DT 20 DT

· You can input repeated data by simply pressing [DT] again.

Example To input the data 10, 10 Key operation: 10 [DT] [DT]

· You can input multiple identical data by specifying the number of repeats.

To input the data 20, 20, 20, 20, 20 Example

Key operation: 20 SHFT 1 5 DT

Number of repeats

Deleting single-variable data

The method you use to delete data depends on whether or not you have already stored the data by pressing the Tkey.

To delete data that is not stored

If you have input data on the keyboard but have not yet stored it by pressing [DT]. simply press AC .

To delete data that is already stored

Use the following syntax to delete data that you have already stored by pressing

ে 📐 🔨 <data to be deleted> জান 🔃

To delete the data 10 and 20

Key operation: 10 SHFT (CL) 20 SHFT (CL)

 You can delete multiple identical data by specifying the number of data items:
 You can delete multiple identical data by specifying the number of data items: Example or To idelete the idata 20, 20, 20, 20, 20 pagnic now icht eiget werden in

Performing single-variable statistical calculations

Once you input the data, simple display the Single-Variable Statistics Menu and select the type of result you want to view.

- "2. xσ_a" Population standard deviation of x data
- "3. $x \sigma_{-1}$ " Sample standard deviation of x data

Commonwheath of a make a small of

- 4. \$\text{\$\tex{
- "7. t (" Use when calculating a t-test value.

You can also display a comprehensive list of results by performing the following key operation. แหละได้ ประชาสมัย สมมัย

FUNCTION (B) (RESULTS)

- · Statistical calculation results can be up to 12 digits long.
- The values for Σ², Σ¹, and n are automatically assigned to variables U, V, and W. respectively. Note that you should not use these three variables for assignment of other values when performing single-variable statistical calculations.
- Data mean and standard deviation are calculated using the following formulas.

Standard Deviation

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

Using all data from a finite population to determine the standard deviation for the population

ramen affection to reflect of Unitary Nation 19 and 40.

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

Using sample data from a population to determine the standard deviation for the $\sqrt{\frac{n-1}{n-1}}$ population เลาะเมตะ สายเกิดเหมือน เดิม เลย

Calculate statistical results for the data 55, 54, 51, 55, 53, 53, 54, 52 Example Also find the unbiased variance, and the deviation of each individual data item from the mean.

FUNCTION [B] (DSP/CLR) 6 (ScI) EXE (Clears statistical memory.)

55 DT 54 DT 51 DT 55 DT 53 DT) DT) 54 DT) 52 DT) (Data input)

n=



7-2 Calculating a t-Test Value

The mean (sample mean) and sample standard deviation can be used to obtain a r test value.

• What is the /-test?

With the *t*-test, sample mean x and sample standard deviation $x\sigma_{i-1}$ are used to judge, within a specific level of significance range, whether or not population mean uis some hypothetical value.

The t-test value is calculated using the following expression.

$$I = \frac{(\bar{x} - \mu)}{\frac{X\mathcal{O}_{r-1}}{\sqrt{n}}}$$
 $\frac{\bar{x}}{x}$: mean of x data $\frac{\bar{x}}{x}$ data $\frac{\bar{x}}{x}$: sample standard deviation of x data $\frac{\bar{x}}{x}$ in umber of data items $\frac{\bar{x}}{x}$: hypothetical population standard deviation

Example

To determine whether the population standard deviation for sample data 55, 54, 51, 55, 53, 53, 54, 52 is 53. Perform a r-test with a level of significance of 5%.

FINCTION 6 (DSP/CLR) 6 (ScI) EXE (Clears statistical memory.)

55 DT 54 DT 51 DT 55 DT 53 DT DT 54 DT 52 DT : (Data input)

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n=

FUNCTION 7 (STAT) **⑦(t()53**[]圖::: (Extraction of r-test value) t (53)en (5,0 mu) (5,4) 0.7533708035

[6] (): [1]

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The above operation produces a *t*-test value of t(53) = 0.7533708035. According to the r-distribution table below, a level of significance of 5% and a degree of freedom of 7(n-1=8-1=7) produces a two-sided *t*-test value of approximately 2.365. Since the calculated r-test value is lower than the table value, the hypothesis that population mean μ equals 53 is accepted. 71세8)(위(EE제)(STATE

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t-distribution table

 It distribution table
 The values in the top row of the table show the probability (two-sided probability) that the absolute value of t is greater than the table values for a given degree of freedom. enolistions

The following is the tomodal work of thear reduction. la vil±v to a classociation was need baltistical realization that an entitle of an interest and desirable

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Degree of Freedom	0.2) (Su) (E)	7) :::10 .05 ;0;(3	6JED 0.01
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2	1.886	2.920	70151 4 1.303 70151 41 01183 61	,rio idi
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4	1,533	2.132	2.776	4.604
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8	1.397	0/20, 10/20 (*) 20 08) 🗊	2.306	. 3:355
9	1.383	1.833	2.262	3.250
10 ^{456 - 350}		nyllosogg atz atebi.		uani n 3:16 97 *
15	n. 20/36, 20/60 1. 341	k\02 .00\02 .00\0. } a (<mark>1-753</mark> % (ຣະລົມ ດູກັນ ໃນປະກົດ 0 <u>0 :0077</u> 11 ຊອ ທູນ	2.947
20	1.325	1.725	2.086	2.845
. 25	1.316	· · · · 1.708 · · · · ·	2.060	2.787
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120	1.289	1.658	1.980	2.617
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7-3 Paired	i Variable	Statistical	Calculations

The LR Mode provides you with all the tools you need for performing regression calculations.

■ Linear Regression

The following is the formula used for linear regression.

y = A + Bx

Tο	innut	linear	regression	data

1. First perform the following operation to clear statistical memory, which consists of variables P, Q, R, U, V, and W.

(Sci) (EE)

 Always make sure you clear statistical memory before performing any statistical calculation.

2. Input the data using the following syntax:

<r data value> ๋ ● <y data value> ๎๎่∭

Example

55(4.5)

237.8

To input the data 10/20, 20/30 Key operation: 10 7 20 0 20 7 30 0

You can input repeated data by simply pressing [DT] again.

Example To input the data 10/20, 10/20 Key operation: 10 1 20 07 07

2.003

4.36.0

You can input multiple identical data by specifying the number of repeats.

To input the data 20/30, 20/30, 20/30, 20/30, 20/30 Key operation: 20 7 30 SHFT 1 5 DT

> Number of repeats Data0 ° 0. 0.1310

016.1

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Deleting liner regression data

The method you use to delete data depends on whether or not you have already stored the data by pressing the m key. 202

To delete data that is not stored eval

If you have input data on the keyboard but have not yet stored it by pressing [IT] simply press AC . 1.2:0

To delete data that is already stored.

Use the following syntax to delete data that you have already stored by pressing 008.1 120 ,,,,,,,<x data value> 1 <y data value> 細口に 1.203

Example To delete the data 10/20 and 20/30

Key operation: 10 1 20 9 7 20 9 30 9 30

You can delete multiple identical data by specifying the number of data items.

To delete the data 20/30, 20/30, 20/30, 20/30, 20/30 Key operation: 20 → 30 SMFT [7] 5 SMFT (CL)

Performing regression calculations

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1. Once you input the data, simple display the first Paired-Variable Statistics Menu and select the type of result you want to view. Hit because of an open near the box

.... (STAT). Hilbook to ratio hards

1	1.7 2.20n 3.20n-1 4.7 5.90n 6.90n-1	orj
i	3.xon-1 4.5°	Wis
	5.90n 6.90n-i	

"3. x 5-1" Sample standard deviation of x data

"4. v " Mean of v data

"6. you" Sample standard deviation of v data

Press ▼ to advance to the second Paired-Variable Statistics Menu.

3.n 5.Σy

"1, Σx^2 " Sum of squares of x data "2. Σx" Sum of x data "4. Σy2" Sum of squares of v data "5. Σy"...... Sum of y data

"6. Σxy " Sum of x data and y data

- You can return to the first Paired-Variable Statistics Menu by pressing .
- 3. Press To advance to the third Paired-Variable Statistics Menu.

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"1. A"	∴ Regression formula constant term A (1990) 2 (1990) (1991)
"2. B"	Regression formula regression coefficient B
"3. r "	Correlation coefficient r
"4. £"	Estimated value of x
	Estimated value of y ം കുട്ടുകളെ പ്രവേശം ഉദ്യാരം വിശ്യാ

- provide private in the parties of the parties of the provided private of the parties of the part You can return to the second Paired-Variable Statistics Menu by pressing .
- · You can also display a comprehensive list of results by performing the following key operation.

Sum
$$x$$
 2250

 $\Sigma x^2 =$
 100

 n =
 5

▼↓ ↑ ▲

- Statistical calculation results can be displayed up to 10 digits long: (Results are displayed using a 6-digit mantissa and a 2-digit exponent when exponential notation is in use.) O U i de erent de Noderbeidi. Di
- The values for Σx^2 , Σy , n, Σy^2 , Σy , and Σxy are automatically assigned to variables U. V, W, P, Q, and R respectively. Note that you should not use these variables for assignment of other values when performing paired-variable statistical calcula-
- Constant term A, regression coefficient B, correlation coefficient r, and estimated values for x and y are calculated using the following formulas.

$$\mathbf{A} = \frac{\mathbf{\Sigma}\mathbf{v} - \mathbf{B} \cdot \mathbf{\Sigma}\mathbf{v}}{n}$$

$$r = \frac{n \cdot \mathbf{\Sigma}\mathbf{v} - \mathbf{\Sigma}\mathbf{v} \cdot \mathbf{\Sigma}\mathbf{v}}{\sqrt{(n \cdot \mathbf{\Sigma}\mathbf{v}^2 - (\mathbf{\Sigma}\mathbf{v})^2)(n \cdot \mathbf{\Sigma}\mathbf{v}^2 - (\mathbf{\Sigma}\mathbf{v})^2)}}$$

$$r = \frac{n \cdot \mathbf{\Sigma}\mathbf{v} - \mathbf{\Sigma}\mathbf{v} \cdot \mathbf{\Sigma}\mathbf{v}}{\sqrt{(n \cdot \mathbf{\Sigma}\mathbf{v}^2 - (\mathbf{\Sigma}\mathbf{v})^2)(n \cdot \mathbf{\Sigma}\mathbf{v}^2 - (\mathbf{\Sigma}\mathbf{v})^2)}}$$

$$\mathbf{p} = \mathbf{A} \cdot \mathbf{p} \cdot \mathbf{B} \cdot \mathbf{p} \cdot \mathbf{$$

Example Perform linear regression to determine the regression formula terms and correlation coefficient for the following data. Next, use the regression formula to estimate atmospheric pressure at 18°C and ະດຽງປອດຊຸນໄດ້ ຄໍໄດ້ຄວາມກໍ່ແລງ ແລ temperature at 1000hpa.

	Temperature (°C)	
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FUNCTION (6) (DSP/CLR) 6 (Scl) Exe (Clears statistical memory.) 20 1010 同25 1011 同 30 1014 6 1 es la (Data input), esta list facilità l'indication Tempo access fersion of the composition may

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FRACTION [8] (RESULTS) ... (Statistical calculation result display) Regression 0.982607368

(Atmospheric pressure at 18°C)

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ា នាមក្សាក់សុខដែលការបែកសំរាន់ នាក់ស (Temperature at 1000hpa) ADDRESS OF A PRINCIPAL PROPERTY OF A PROPERT

■ Other Regression Calculations

The linear regression formula (y = A + Bx) can also be adjusted to allow calculation of logarithmic, exponential, and power regression.

Important

• The following sections on logarithmic, exponential, and power regression assume that you are already familiar with the basic data input and editing procedures for linear regression. If you have not already done so, go to page 96 and read the section titled "Linear Regression" state of polegorica regardence in amount of the section and the first properties and the first offer area and a second and the

threat elon local dono eader also three places of assure places tree [10] or ed ■ Logarithmic Regression and Jude tremus deposed

The following is the formula used for logarithmic regression.

 $y = A + B \ln x$

•To input logarithmic regression data

1. First perform the following operation to clear statistical memory, which consists of variables P. Q. R. U. V. and W.

FUNCTION [6] (DSP/CLR) [6] (Sci) EXE

- · Always make sure you clear statistical memory before performing any statistical calculation. in communication of the security
- 2. Input the data using the following syntax:

In <x data value> (*) <y data value> [9]

 You can input repeated data and multiple identical data using the same basic procedures as described for linear regression on page 96. Just remember to press in before inputting x data values.

Deleting logarithmic regression data

You can delete data using the same basic procedures as described for linear regression on page 96. Just remember to press [in] before inputting x data values.

Performing logarithmic regression calculations

Logarithmic regression calculations are performed in accordance with the following formulas.

- Estimated value of x = e^{yt}
- Estimated value of y = lnxŷ

If we substitute x for $\ln x$ in the logarithmic regression formula $x = A + B \ln x$, it becomes identical to the linear regression formula y = A + Bx. This means that constant term A, regression coefficient B, correlation coefficient r, and estimated values for x and v can be calculated using the same formulas as used for linear regression calculations. Note, however, that calculation results differ as shown in the following table.

Linear Regression	Logarithmic Regression
Στ Στ² Στy	Σίπχ Σ(lπx)² Σlπx·y

Example

Perform logarithmic regression to determine the regression formula terms and correlation coefficient for the following data. Next. use the regression formula to estimate values for x and y when xi =80 and vi = 73. Althought Light ReAles,

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	1.49	29 50		Plant Green men bladt sammen of the Constant lean lead to the company to the con- traction of the first flam the con-
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		118	48.9	
	1960	7.50	(4) (1) 11 (2) (2)	A HEART TO THE BOOK STORE TO STORE OF

FUNCTION [6] (DSP/CLR) 6 (Scl) EXE (Clears statistical memory.)

In 74 • 38.0 DT In 103 • 46.4 DT (Data input)

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FUNCTION [8] (RESULTS) (Statistical calculation result display)

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EXT (in 80 (\$TAT) ▼ (\$T\$) (\$ (\$) (\$) (Estimated value of \hat{y} when xi = 80) age for but halfes been followed a refle

73 (FUNCTION) [7] (STAT) (▼ ▼ 4 (x) EXE SHIFT (CAT SHIFT AND EXE (Estimated value of £ when yi = 73)

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y and the contract man parties on the extraction of the contraction of ■ Exponential Regression are the engineering and the earth of the

The following is the formula used for exponential regression.

$$y = A \cdot e^{Bx} (\ln y = \ln A + Bx)$$

• To input exponential regression data

1. First perform the following operation to clear statistical memory, which consists of variables P. Q. R. U. V. and W.

- · Always make sure you clear statistical memory before performing any statistical calculation.
- 2. Input the data using the following syntax: a company

· You can input repeated data and multiple identical data using the same basic procedures as described for linear regression on page 96. Just remember to press In before inputting y data values.

· Deleting exponential regression data

You can delete data using the same basic procedures as described for linear regression on page 96. Just remember to press [III] before inputting y data values.

● Performing exponential regression calculations (3 : 2 1)

Exponential regression calculations are performed in accordance with the following formulas.

- Constant term A = e^A
- Estimated value of x = Inv£
- Estimated value of y = e^{x9}

If we substitute y for lny and a for lnA in the exponential regression formula $y = A \cdot e^{BX}$ $(\ln y = \ln A + Bx)$, it becomes identical to the linear regression formula y = A + Bx. This means that constant term A, regression coefficient B, correlation coefficient r, and estimated values for x and y can be calculated using the same formulas as used for linear regression calculations. Note, however, that calculation results differ as shown in the following table.

į	Linear Regression	Exponential Regression	
ं	Σ _y , Σ _y ² Σχy	, Σ[nỳ + ΔΑΤ ΔΑ Σ(lny)² (5.4 Σx-lny, yr + 15.5	0 <u>640</u> N

Example

Perform exponential regression to determine the regression formula terms and correlation coefficient for the following data. Next. use the recression formula to estimate values for x and v when xi= 16 and yi = 20. A SHE AME I PROPERTY

	xi	yi	
Mill Chemica (fi	6.9 12.9	21,4 15.7	
	19.8	12.1	o Maria de Maria de Maria
	26.7	8.5	Ber 70014 이 영관 (*)
gradiens eigen	35.1	5.2	in conductor of the working of a stable of the

FUNCTION 6 (DSP/CLR) 6 (Scl) [EXE (Clears statistical memory.)

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Scl	de la se	ad t	gr.
Sept Figure	31,000		- 6

Physical section of the mortalist control of the fail of the or the control of th

(Statistical calculation result display)

Regression a = 3.417647579 b =-0.049203708 r =-0.997247351

In 20 EWEIGH 77 (STAT) ▼▼
4 (x) EXE
(Estimated value of £ when yi = 20)

ln 202 8.574868047

The following is the formula used for power regression.

$$y = A \cdot x^{B} (\ln y = \ln A + B \ln x)$$

•To input power regression data

 First perform the following operation to clear statistical memory, which consists of variables P. Q. R. U. V. and W.

- Always make sure you clear statistical memory before performing any statistical calculation.
- 2. Input the data using the following syntax:

You can input repeated data and multiple identical data using the same basic procedures as described for linear regression on page 96. Just remember to press in before inputting x data values and y data values.

Deleting power regression data

You can delete data using the same basic procedures as described for linear regression on page 96. Just remember to press (n) before inputting x data values and y data values.

Performing power regression calculations

Power regression calculations are performed in accordance with the following formulas.

- Constant term $A = e^A$
- Estimated value of $x = e^{\ln x}$
- Estimated value of $y = e^{\ln x^9}$

If we substitute y for lny, a for lnA, and x for lnX in the power regression formula $y = A \cdot x^3$ (lny = lnA + Blnx), it becomes identical to the linear regression formula y = A + Bx. This means that constant term A, regression coefficient B, correlation coefficient r, and estimated values for x and y can be calculated using the same formulas as used for linear regression calculations. Note, however, that calculation results differ as shown in the following table.

Linear Regression		Power Regression
	Σx	Σinx
	$\Sigma r^2 \approx 10^{\circ} M_{\odot}$	
	\sum_{y}	Σlny
	Σy²	$\Sigma(\ln y)^2$
	1 Σxy	Σlnx lny

Example

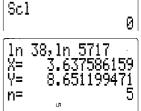
Perform power regression to determine the regression formula terms and correlation coefficient for the following data. Next, use the regression formula to estimate values for x and y when xi = 40 and yi = 1000.

- 7		
٠	xi	y <i>i</i>
	28	2410
	30	3033
	33	3895
	35	4491
	38	5717

ENCTION B (DSP/CLR)

(Sci) EXE
(Clears statistical memory.)

in 28 🕶 [in 2410 DT
in 30 🕡 in 3033 dt
in 33 📭 in 3895 in
in 35 🖸 in 4491 🕅
in 38 • in 5717 or
(Data input)



জ্জিজ(B) (RESULTS)
(Statistical calculation result display)
Regnession
ন = -1.43212442

в = 1.432124422 в = 2.771866155 r = 0.998906255

• The value for constant term A in the above display is calculated for e^{A} . Use the following key operation to calculate A for A x^{8} .

EXIT SHET) @ FUNCTION 7 (STAT) V V

ө 0.2388010685

In 40 (BUCION) (7 (STAT) ▼ ▼

(5) (5) (EE

SUPP (# SUPP AND (EE)

(Estimated value of () when xi = 40)

ln 400 8.792955696 eAns 6587.674589

ln 10002 3.008759885 eAns



Formula Storage

- 8-1 Using Formula Memory 1941
 - 8-2 Comment Text
 - 8-3 Table Function
 - 8-4 Solve Function
 - 8-5 Storing Formulas in the Program Area (\$5.50) inclined the \$2.50

Chapter O Formula Storage

You can store one formula in memory for instant recall when you need it. Then you can recall the formula at any time, plug in values, and perform calculations quickly

The following are the key operations you can use for formula storage, recall, and execution.

SHET IN Stores the formula on the display in formula memory.

............ Recalls formula memory contents. CALCI Starts a calculation operation.

8-1 Using Formula Memory

The best way to explain how to use formula memory is with the aid of a couple of actual examples.

Example 1 To store the following formula in formula memory, and then use it to perform a calculation. $Y = AX^2 + 6X - 9$

1. Input the formula.

AC SHITLERY $Y = A \times APP x^2 + 6 APA \times -9$

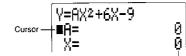
BORES A FRANCE MAD

2. Store it into formula memory.

SHIFT [IN]

3. Start the calculation operation.

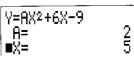
CALC

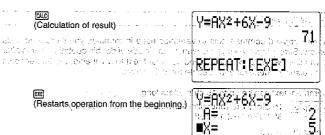


Values currently assigned to variables

- The cursor indicates the variable currently selected for input. Use ▲ and ▼ to move the cursor. The cursor also automatically moves to the next variable whenever you press EXEL.
- · If the cursor is located next to the last variable, pressing (EE) executes the calculation.

2 EXE (Value of variable A) [5] EXE (Value of variable X)





• If the calculation is taking too much time (such as when you are using a multistatement to perform a series of calculations), you can interrupt it by pressing ACI. This causes the message "Calculation Stopped" appears on the display. Press (AC) again to clear the message.

Example 2 To recall the formula $Y = AX^2 + 6X - 9$ and change it to $Y = AX^2 +$ 3X - 9. property gas back

1. Recall the formula you want to edit.

2. Move the cursor to the location where you want to make your change.

3. Make the changes you want, and then store the formula.

To delete a formula from memory, recall it and press AC SHIT IN.

Important

- . You can store only one formula in formula memory. Note that a multistatement (page 28) made up of multiple formulas is treated as a single formula.
- Storing a formula into formula memory automatically deletes anything that was previously in the formula memory.
- Formula memory can hold up to 127 bytes of data.
- . The current calculation mode (COMP, SD, LR, BASE-N) of the calculator is also stored as part of the formula data.
- . When you use an array variable inside of an formula, the value currently assigned to the variable is used when you perform a calculation using the formula.
- · A "BASE-N Mode ERROR!" occurs whenever you are in the BASE-N Mode and try to recall a formula that was stored while in another mode, or whenever you are not in the BASE-N Mode and try to recall a formula that was stored while in the BASE-N mode.

 • Formula memory contents are retained even while the calculator is turned off.

8-2 Comment Text

You can append comment text to variables used in formulas you store in formula memory. Simply input the text you want to use inside of double quotation marks after the variable name. Once you append comment text to a variable, the text appears on the display whenever you execute the calculation.

· Comment text can be up to 15 characters long.

Example To store the following formula in formula memory. S"AREA" = $3.14 \times R^2$

1. Input the formula.

ACREMIS OF AREA OF M3014XMRZ

Perform a calculation.

CALC

(Value assigned to variable R)



8-3 Table Function

The Table Function lets you assign a range of values to a single variable in a formula stored in formula memory. You can then calculate the results for the entire range of values. Example To assign values starting from 0 and incrementing by 2 to X in the

following formula (A = 2).

1. Input the formula.

SHIFT (IN)

2. Press (ALC) and then input the value for A: CALC 2 EXE

3. When the cursor is next to the variable to which you want to assign a range of values (X in our example), press [SHF] [BL]. This causes a table range start value specification screen to appear.

(SHIFT) (TBL)

4. Input the starting value you want to use for X and press [38]

TABLE Range Pitch?

5. In the next screen that appears, input a value for the pitch, which is how much the value of X will change with each execution. Next, press [EXE] to perform the first execution using the starting value.

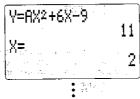
transmissional programme of the court for the company

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Pitch?

6. Continue pressing et as many times as you want.

E

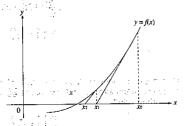


- A positive value for the pitch will cause the value of the variable to increase. A negative value will cause the value to decrease.
- A message indicating an Ma ERROR appears on the display whenever the calculation result is out of range or when the calculation result is an imaginary number.

8-4 Solve Function

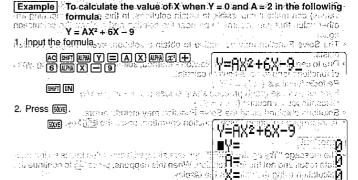
The Solve Function uses Newton's method to solve for any of the variables of a formula stored in formula memory.

Newton's Method



This method is based on the assumption that f(x) can be approximated by a linear expression within a very narrow range. It is used to approximate the roots of an equation by the methods of the calculus.

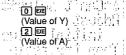
First, a starting value (predicted value) x_0 is given. Using this starting value as a base, approximate value x_1 is obtained, and then the left side and right side calculation results are compared. Next, approximate value x_1 is used as the initial value to calculate the next approximate value x_2 . This procedure is repeated until the difference between the left side and right side calculated values is less than some minute value.

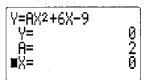


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3. Input the values for variables Y and A.

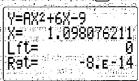




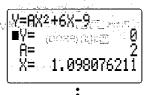
4. Move the cursor next to the variable you want to solve for, and press save

SOLY

 Lft shows the calculated left side value while Rgt shows the calculated right side value. The closer the difference between these values is zero, the greater the precision of the calculater.



ख्याः (Re-executes the calculation):



· Since the Solve Function uses Newton's Method, certain initial values (assumed values) can make it impossible to obtain solutions. In this case; try inputting another value that you assume to be near the solution and perform the calculation

The Solve Function may be unable to obtain a solution, even though a solution

exists.

• Due to certain idiosyncrasies of Newton's method, solutions for the following types of functions tend to be difficult to calculate.

Periodic functions (i.e. $y = \sin x$)

Functions whose graph produce sharp slopes (i.e. $y = e^{x}$, y = 1/x) Discontinuous functions (i.e. $y = \sqrt{x}$)

· Solutions obtained using the Solve Function may include errors.

• To interrupt an ongoing Solve Function operation, press the EXIT key.

Important

- The message "Try again: [EXE]" appears along with any value that is an intermediate result and not the final solution. When this happens, press 🖭 to continue the calculation using the value on the display.
- The message shown nearby appears whenever the calculator is unable to calculate a result. In this case, press AC or EXIT to clear the message.

Can't solve Adjust Ybacavi initial Välue. Then try again.

8-5 Storing Formulas in the Program Area

You can copy formula memory contents into the calculator's program area under a file name. This let's you store multiple formulas for recall when you need them.

Conservation in subject that their Medical of Artists of

● To store a formula in the program area or to male only one or set set in the

Example To store the following formula (which is already stored in formula memory) in the program area under the name "QUADRATIC".

 $Y = AX^2 + 6X - 9$

1. Press 1008 5 (PROG) to display the Program Menu: 100 February 100 F

1000 [5] (PROG)

Program menu

Clubby the distance by the property

2a:Press 🕦 (NEW) and then input the file name you want to use 📑 ons 🖂 ons 🖂 ons

(NEW) OULIBRICATOR

Filename?

3. Press (to register the file name.

PGM: QUADRATIC formula the <u>formattel</u> and them it is comment, as saves

Press 5, and a confirmation message appears.

This has for first every consity in pathward ago

Save formula?

- 5. Press per to store the formula and return to the Program Menu.
- To abort the save operation without saving anything, press EXT instead of EXE.

untui permi influmnoti sciti

To recall a formula from the program area

Example To recall to formula memory the formula stored in the program area under the file name "QUADRATIC".

1. While in the COMP, BASE-N, SD, or LR Mode, press FIE, or input (2) (RUN) while the Program Menu is on the display.

2 (RUN)



The above display shows multiple files are stored in the program area.

- 2. Use ▼and 🔊 to move the cursor next to the file name of the formula you want to recall.
- 3. Press [III], and a confirmation message appears on the display.



Load formula?

- 4. Press EXE to recall the formula and store it in formula memory.
- · Remember that recalling a formula and storing it in formula memory will delete anything that is already stored in the formula memory.
- To abort the recall operation without recalling anything, press [XIII] instead of [XIII]
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Programming

- -9-1 -Before Using-the-Program Area
- u 1**9-2**: / Storing a Programme of mubecate private is those of our de-2 isono me iĝo la sus sou at tobro ni labeld Error Messages
 - Counting the Number of Bytes
 - 9-5: Searching for a File Name
 - Editing Program Area Data
 - **Deleting Programs**
 - Programming Commands

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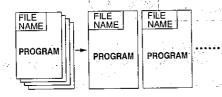
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Chapter 9 Programming

You can store often-used and complex formulas under file names in the calculator's program area. Multiple calculations can be linked to form multistatements (page 28) that perform a series of calculations. Up to 4,500 bytes of data can be stored in the program area.



9-1 Before Using the Program Area

You have to use the following procedure to enter the PROG Mode from the Main Menu in order to use the program area.

(PROG)

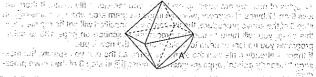


- "1. NEW" Creates a new program. "100 grimms പ്രവഴി "2, RUN" Executes a stored program (page 121). "3. EDIT" For editing of a stored program (page 125). "4. DELETE" Deletes a stored program (page 130).
- · If there is nothing stored in the program area, the message "No file" appears when you enter the PROG Mode.

9-2 Storing a Program

Example

To store a program that calculates the surface area and volume of three regular octahedrons, each with one side 7cm, 10cm, and 15cm long. Store the program under the file name "OCTAHE-DRON".



The following are the formulas for calculation of the surface area (S) and volume (V) of a regular octahedron when the length of one side (A) is known.

$$S = 2\sqrt{3}A^2$$
, $V = \frac{\sqrt{2}}{2}A^3$

To store a program, you register the program name, specify the mode to use for program execution, and the input the program itself, the unit is a most of more ell. (7)

■ To Register a Program Name

1. While the Program Menu is on the display, press 1 (NEW) to select input of a new program.

(NEW)

Filename?

recurred the Process in Maria.

2. Input the file name you want to use.

OCTAHEDRON FILENAME? College of the and base about \$1,100, and leading

- The cursor indicates upper-case alpha character input: A straight to the department of the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character input: A straight to the cursor indicates upper-case alpha character indicates upper-case alpha
- You can input up to 12 characters for a file name. Valid characters are alpha characters A through Z, space, numbers 0 through 9, decimal point, open bracket, closed bracket, and arithmetic operator symbols $(+, -, \times, +)$.
- · You can delete specific characters by moving the cursor to the character to be deleted and pressing DEL). The court of the second court as seed not been product an end of sending and an end of the court - 3. Press [XX] to register the file name and change to the menu of program execution modes.

- 17 bytes of memory are used up each time you register a file name. If there are less than 17 bytes of memory available in the program area when you press EXE in step 3 of the above procedure, the file name you specified will not be registered. In this case, you will have to use the procedure described on page 130 to delete programs you no longer need to make room for the new input.
- . If there is already a file with the same file name as the one you specify, the message "Already exists" appears when you press ex in step 3 of the above proce-
- Nothing is registered if you press without inputting a file name? 19 february
 - To abort the above procedure any time before you press on in step 3, press exit to return to the Program Menu.

io To Specify the Program Execution Mode அது பிரு அடி க காண்களி

While the Program Menu is on the display, input the value from 1 to 4 that specifies the mode the calculator should enter when executing the program you are inputting.

a a tao it ntex as ABM, (1) menu yalqara em | 1 700MP nter**2:BBSE**EN 5.Save formula

2. For the ville order to the Cast

- "1. COMP" COMP Mode "2, BASE-N" BASE-N Mode
- "3. SD" SD Mode
- "4. LR".....LR Mode
- STRANDING CORP. "5. Save formula" .. Saves formula memory contents under the specified file name.

Here we will press [1] (COMP) to specify the COMP Mode and move on to actual input of the program's contents. The state state state and anti-pit is a state of the program's contents. grech , litar not reproduce to the calcardination to hit e

the Alfacture Z, seed, no rang or any change in the deal of term by change as a break by change as a break of the change of the

■ Inputting Program Contents of the analysis and sales of the set when the contents of the set when th

Program contents are input using the same basic procedures that you use for manual calculations. The following shows how you would input the required formulas as manual calculations and as a program.

- Manual Calculation :
- 2 ★ / 3 × <Value of A> æ æ / 2 → 3 × <Value of A> △ 3 ᢁ Surface Area S Volume V
- Program

Surface Area S Volume V:

2X73XMAZE 72+3XMAA3E

If you just input the two formulas, the calculator will execute them without stopping for you to see the results. For this reason you will have to use the output command to tell the calculator to stop and show you calculated results along the way. The following table describes the output command and its close cousin, the multistatement command.

The display result command "a" causes program execution to stop while the calculation result up to the display result command or a text message is displayed. To resume program execution, press 🙉 . The final result of the program execution is displayed regardless of whether or not this command is included at the end

This is the multistatement command, which is used to connect two calculation expressions or commands. With the multistatement command, execution of the connected statements is performed without stopping.

To input program contents

2 X 7 3 X LIMA A 2 SHIT 1

2x\\3xA2 .

Ale subsy:

2×√3×A2.

Program menu 4467 Bytes Free

Running a Program

You can use any one of three different methods to run a program.

- · From the Program Menu
- · Pressing the FILE key
- Pressing SHIFT Prog
- To run a program from the Program Menu
- 1. While the Program Menu is on the display, press [2] (RUN).



Program execution mode

- .. Program execution modes are indicated as:CO (COMP) and BN (BASE-N): a √√√3
- then up to lively a total and the up mosts call to library of head from set of the cursor next to the name of the program you want to marking the cursor next to the name of the program you want to marking the cursor was the cursor next to the name of the program you want to the cursor next to the name of the cursor was
| . | | (S) | Volume(V) |
|----|-----------------------------|------------------------------|---|
| | 990, 3% 7cm 1, 39393 | 169.7409791cm ² : | 161:6917506cm ³ to |
| 24 | 10cm | 346.4101615cm² | 471,4045208cm ³ 1500,990258cm ³ |
| | 15cm 3163 | 779.4228634cm ² | = 1590,990258cm ³ |

3. Press 🖾 to run the program.

(Value of A)

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indicates that program execution is paused for display of an intermediate result.

2×√3×A² 169.7409791 √2×3×A^3 161.6917506

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condition (SS) a cologic sprission of many F2+3XA63 to the property of the spring of the spring and the spring of the spring and the spring of the s

 Pressing exagain while the final calculation result is on the display re-runs the program from the beginning.

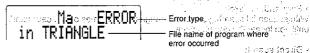
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- To run a program by pressing the FEE keyro gold from a sit yelded base soon of the While in the COMP, BASE-NeSD, on LR Mode press FEE 1000 erg sides of the
- 2. Use ▲ and ▼ to move the cursor next to the name of the program you want to
- 3. Press (to run the program.
- To run a program by pressing SHFT Program
- 1. While in the COMP, BASE-N, SD or LR Mode, press [970].
- 2. Input the file name of the program in using the following syntax.
- 3. Press [EXE] to run the program.

9-3 Error Messages

Sometimes a program you enter causes an error message to appear when you execute it. This means that there is an error that needs to be corrected. The following shows a typical error message display:



All of the possible error messages are listed in the Error Message Table on page 150. When you get an error message, look it up in the Error Message Table and take actions to correct it.

9-4 Counting the Number of Bytes

The memory of this unit can hold up to 4,500 bytes of data. Generally, one function in a program takes up one byte. Some functions, however, require two bytes each.

• 1-byte functions sin, cos, tan, log, (,), A, B, 1, 2, etc.

• 2-byte functions Lbl 1. Goto 2. etc.

You can count the bytes in a program by pressing the ◀and ▶keys. Each press of these keys causes the cursor to jump one byte.

When the number of bytes remaining drops to five or below, the cursor automatically changes from an underline to " . If you need to input more than five bytes, try to increase the amount of memory available for program storage by deleting unnecessary programs, deleting expanded memory, or by deleting unneeded function memory contents.

· Pressag [2] again availe fire interest noted and that the charles are

■ Checking the Amount of Memory Remaining

You can also display the remaining memory display by performing the following operation while the COMP, BASE-N, SD, or LR Modes are displayed.

1.5

istin

Number of bytes used perfect from a fair brief in the

Remaining memory-

9-5 Searching for a File Name

. Ship too in the

en others of the experience of a respect to the transplantation of the experience of You can use either "sequential search" or "direct search" to locate a file name:

· Sequential search

With sequential search, you scroll through the file names on the calculator's display until you locate the one you want

Direct search

With direct search, you input the first few characters of the file name and recall the names, that matched entire read with a set in well was a specie for the read not not be set in the matched and the page of the The second of the ma-

■ To Use Sequential Searcher to street depond to be of the effect of

- 1. While the Program Menu is on the display, press (3) (EDIT). See A See Was
- 2. Use A and To move the cursor next to the name of the program you want to run. 3. Press (to display the contents of the program o

Note

· You can also display a list of program area files by pressing FILE While in the COMP. BASE-N, SD, or LR Mode. In this case, however, you will not be able to view the contents of the program, all equipment formed washings, collect only and rest mad yet?

■ To Use Direct Search Library - Hawk of angra placetar to an appear to the configuration of the set to and a set to 1. While the Program Menu is on the display, press [3] (EDIT). Fig. 16 feb. nearby service so the fall is value to take a febberary

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WHIS COMP DASSING CO. JEN'T LINET.

2. Press Function to display the File Commands Menu.

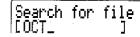
Province in the manufacture of the conditional province in the

File Commands	
14:SEARCH;ci3 substate	į
2. RENAME CAROLINA	

3. Press [1] (SEARCH).

Search	for	file
[:	7

4. Input the first few characters of the file name you want to find.



5. Press EXE to start the search.



Program [EDIT1

. The message "No file" appears on the display if there are not any file names that start with the characters you specified.

- 6. Use ▲and ▼to scroll through the list of recalled file names and move the cur-
- sor next to the file name you want.

 If there are more than four file names that start with the characters you specified. ▲ and ▼will scroil the list of names on the display.
- 7. Press to display the contents of the program.

- Note You can also use the following direct search procedure to look for a file name while in the COMP, BASE-N, SD, or LR Mode.
- 1. Input the first few characters of the file name you want to find. รางนัก รู้ โดยเดิม ของเลยเลือด สัมการ์ส วางกาท ค.ศ. 4 .W
- 2. Press FILE to perform the search and display a list of file names whose first characters match the ones you specified. In this case, however, you will not be able to view the contents of the program.

9-6 Editing Program Area Data

Use the following procedures to edit file names and program contents. ... การ ของเอการของ คาที อัก ของออจ ค.รี นั้น กา

■ To Edit a File Name

1. While the Program Menu is on the display, press 3 (EDIT), and move the cursor next to the file name you want to edit.

Program [EDIT]

2. Press record to display the File Commands Menu.

nali man dan ka

File Commands

Rename file

manipage por his section and in a rate

4. Change the file name to the one you want as a self-asia attent in a segment of order

DEL DEL DEL SARONA CONTRACTOR SONO CONTRACTOR

and areas the expect of time propagation.

- 5. Press 🕮 to store the program under its new file name.
- · If there is already a file with the same file name as the one you specify, the message "Already exists" appears when you press [3] in step 5 of the above procedure. If this happens, press ◀ or ▶ to display the new file name. Next, press AC to clear the file name and input a different one.

所引作。中的原面中的语言。

■ To Edit Program Contents

- 1. While the Program Menu is on the display, press 3 (EDIT), and move the cursor next to the file name of the program whose contents you want to edit.
- 2. Press to display the contents of the program
- 3. Make the changes you want to the contents of the file.
 - •. For details on how to edit data, see Editing Calculations on page 26, nyo boy as
- 4. After you are finished making the changes you want, press EXT EXT to store the program.

Helpful Cursor Commands

The following cursor commands can help you move around inside a program quicker and easier 4

· SHET 🔼 - LISSY OF LISSY OF STATE

This command makes the cursor jump to the beginning of the program.

This command makes the cursor jump to the end of the program.

. To edit the program named OCTAHEDRON (which in stored on page 118) so that it calculates the surface area and volume of three regular tetrahedrons, each with one side 7cm, 10cm, and 15cm long. Also change the name of the program to "TETRAHEDRON".



teris son für alle sind min ean grants die abhand ont, no enpenga intilitation de erem and f

The following are the formulas for calculation of the surface area (S) and volume (V) of a regular tetrahedron when the length of one side (A) is known

$$S = \sqrt{3}A^2, \qquad V = \frac{\sqrt{2}}{12}A^2$$

The following shows the differences between the OCTAHEDRON and the TETRA-

OCTAHEDRON

The grant of pasitions of the 2X/3X/MAZMI/-----Surface Area S **72÷3X**■AA3 Volume V

TETRAHEDRON

Surface Area S **▶ 112 X RM A ◇ 3** 3 3 at a supra of [6] 1 3 at a Volume V

As you can see, we need to delete 2 X at the beginning of the program, and to

Procedure

1. Change the name of the program.

1000 [5] (PROG) 3 (EDIT)



File Commands

[2] (RENAME) TETRAHEDRON

Rename file

Louis Care in the mention of the care in the 2. Change the contents of the program.

and with one bear a character and the

2x13xH2 4



√3×82 "⊸ J2÷3x8^3

√3×A2⊿ √2÷12ǯxA^3

√3×A2.

Program menu 4468 Bytes Free

3. Now run the program.

 Length of One Side (A)	Surface Area (S)	Volume (V)
7cm	84.87048957cm ²	40.42293766cm ³
10cm	173.2050808cm ²	117.8511302cm ³
15cm	389.7114317cm ² .	397.7475644cm ³

7 EXE (Value of A)

ur aðitskið II silenn mollgengingi kjölfsbjóli. Filigulþal**f**i

r∰o comily salged value in Wi √3xA2 50 + 30 €4 84.87048957

84.87048957 √2÷12×A^3 40.42293766

329

128

J2÷12×8^3 40.42293766 8?

1 0 EXE

J3X82 173.2050808 117.8511302

9-7 Deleting Programs

You can delete a specific program or all programs stored in the program area.

■ To Delete a Specific Program

Example To delete the program named TRIANGLE.

1. While the Program Menu is on the display, press 4 (DELETE).

4 (DELETE)

2. Press (1) (ONE PROGRAM).

1 (ONE PROGRAM)

Currently selected

3. Move the cursor next to the file name of the program you want to delete: 1990 (2) Press ex and a confirmation message appears on the display.

ggru begreid tog seem anab, as gode at the dt brouid an

PGM: TRIANGLE Delete?

4. Press EE to delete the program.

To all the light abroaut we programmed to issue their to issue their discount

• To abort the delete operation without deleting anything, press EXT instead of EXE. Ligging allowing or general to display the first findering Countries Wentle

■ To Delete All Programs :

Example To delete all the programs.

1. While the Program Menu is on the display, press 4 (DELETE).

4 (DELETE)

- ८००८ - १ (३) (५००

2. Press 2 (ALL PROGRAMS) and a confirmation message appears on the display.

(2) (ALL PROGRAMS)

3. Press 🕮 to delete all the programs. to employed this section against a live establish Notice of the Pastering of Bases



Program menu *** No file ***

നുറ_{്റു}ക്കെടു . .ഉപളിയുന് 4

To abort the delete operation without deleting anything, press exil instead of exil.

9-8 Programming Commands

A collection of powerful programming commands are also available to allow you to incorporate logical operations, conditional jumps, and other sophisticated techniques into your programs.

■ Program Command Menu

You can access most of the special programming commands from the Program Command Menu. Learny profitors (1) Let the Attuant to some existing of the condition of the

1. Use the following operation to display the first Program Command Menu.

FUNCTION (3) (PROG)

- "1 >" Conditional jump success code "2. ≠ ⇒"...... Conditional jump failure code
- "3. \sum "...... Conditional jump end code 2 Press 37 VEL PEOGLAMS Innammon command PMALEONA LLAY 70 Representation
- "5. Lbl" Label command
- "6, Dsz" Decrement command "7. Isz".......Increment command
- 2. Press Tto advance to the second Program Command Menu.

1.Pause 2.Fixm

armadeor similar Pil

"1. Pause" Pause command "2. Fixm"Variable lock command "3. { " Variable input command "4. } " Variable input command

- You can return to the first Program Command Menu by pressing [A].

aliali eta <u>ar</u> di ari elerrogana yesa (ali bir ^{ari} vili).	1) 1 (1 1 10 1 10 10 10 10 10 10 10 10 10 10 1
<u> </u>	1 <u> </u>
emiliosus prodegif ibas serenciedi ar eyib succi Sobsume eminodas no serelatur nosebu	d in 製造 Kiou alpan 東 切り いっぷり
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5 15675	ata heaviora colati il a ra ambeglio i
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such approved that we had isnotifened after non-

el magrapi) og hátil

word, brief it still time bijdener ab gerind.

"1. =" Conditional jump relational operator	jami is nova aarbawa a
"2. = " Conditional jump relational operator	
"3. > " Conditional jump relational operator	
"4. <" Conditional jump relational operator	ព័ត្តមាន សមាស្ត្រាស់ មេខាង
"5. ≥" Conditional jump relational operator	ന്ന പരഞ്ചിന് പ്രവേശന്ത്ര
"6. ≤" Conditional jump relational operator	ar four grifflers generop anti-
- Company of A fire and A service of Shaker with the before	a Grade personalización (medical)

· You can return to the second Program Command Menu by pressing Alvertices ими в быть вы эт тер двы стем на были мый дизетыны тако той иг проид

■ Variable Input Command Any value you assign to a variable in a program is normally fixed throughout the duration of the program. This means that it is normally impossible for you to assign a new value to the same variable when you use a jump command to execute the same subroutine inside a program.

In order to overcome this, you must use the variable input command to assign a different value to a variable. The variable input command unlocks a variable and lets you assign a different value to it.

To execute the variable input command inside of a program, simply enclose the variable name inside of curly braces.

Examples [-{A}: Unlocks variable A. In a stangard on bone by 18 clembre? (AB), (A) B); (A B); Unlocks variables A and B.

- *A pair of curly braces is treated as one statement, page 1 to a more inclined of
- Array variables cannot be used as variables.

■ Variable Lock Command

The Fixm variable lock command locks all variables, which means that the values currently assigned to all variable become fixed, and cannot be changed. The Fixm variable lock command can be inserted to relock variables that have been unlocked using the variable input command.

- The Fixm command is treated as one statement.
- Fixm takes priority over the Variable input command of the ratio of Separation 5.5%

■ Jump Commands

Jump commands can be used to change the flow of program execution. They can be used to cause the same expression to be executed a number of times, or to make program execution jump to another location.

The following-are the three types of jump commands that are available with this calculator.

Unconditional jump

Unconditional jump This type of jump is immediately executed, without any preconditions being checked.

Conditional jump

This type of jump sets up a certain preconditions that are tested. The jump destination is determined depending upon whether or not these conditions are satisfied.

Count jump

A control value is incremented or decremented with each pass, and the jump is executed when the control value reaches zero.

Unconditional jump

Unconditional jumps are constructed using the following two commands.

Goto n (where n = a value from 0 to 9 or a letter from A to Z))

Lbl n (where n is the same value or letter used in the corresponding Goto n) Executing the Goto n command causes program execution to immediately jump to the corresponding Lbl n. Adda An administration and an artist of a second and artist of a second and a second a second and
An unconditional jump can be used to make a program jump back to its beginning and continue to run in an endless loop. Or you can use it to make only one part of a program to repeat endlessly. The unconditional jump can also be used in combination with conditional jumps and count jumps.

Example 1 To create a program that continually calculates y = a + bx, with ors had got linew values input for xyd; and b each time! gotted a b asset yst

Note the use of the variable input command in the following program.

Example 2 To create a program that continually calculates y = a + bx, with new values input for x_0 and a = 2 and b = 5.

The following program causes values to be assigned to variables, which are then locked. When the program is executed; a value is input for x only, a least a peak of

• A Go ERROR occurs whenever a Goto n does not have a corresponding Libl \tilde{n} .

A conditional jump compares two variables or arithmetic expressions. Based on the results of the comparison, a decision is made to next jump to either the statement following ⇒ or the statement following ≥ ⇒. The following is the syntax for a conditional jump.

- Relational Operator) (R) = (S) | L | L | S | Contract of the property of the contract of the c
- Left side
- (R): Right side
- (S): Statement

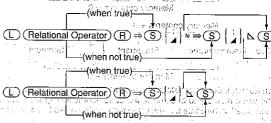
Left Side and Right Side can be variables (A through Z), constants, or variable expressions (i.e. $A \times 2$, B - C). The following are the six relational operators that can be used in a conditional jump.

L= R True when L and R are equal; false when L and R are not equal and L+R True when L and R are not equal; false when L and R are equal

L> R True when L is greater than R , false when L is less than or equal to R L< R True when L is less than R; false when L is greater than or equal to R

 $L \ge R$ True when L is greater than or equal to R; false when L is less than R L≤ RTrue when L is less than or equal to R; false when L is greater than R

The following shows how jumps are performed based upon whether or not a condition is true or false.

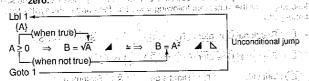


- Statements following ⇒ and ≠ ⇒ can be multistatements:
- Up to 15 conditions can be nested inside of a single conditional jump.
- A conditional jump cannot contain any newline symbols (→). If you include a newline symbol inside of a conditional jump, a Syn ERROR will occur when you run the program.

in the Schooling of the



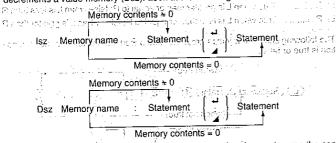
Example To input a program that calculates the square root of any input ा तुर के उन्हें Svalue zero or greater and squares any input value that is less than regionata serzero, a espeneral e que espera el nolo que municipalmento de la el trava-



When this program is executed, it first prompts for input of a value for A. If the value of A is 0 or greater, execution lumps to the statement between ⇒ and ∡. If the value of A is less than zero, execution jumps to the statement between + = and ... Finally, an unconditional jump causes execution to jump from Goto 1 to Lbl 1 to repeat the program, but not a sector sine on without their end, and the little

prints and another the security of the contract of the contrac Count Jumps

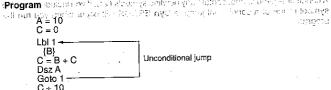
There are two count jumps: one that increments a value memory (lsz) and one that decrements a value memory (Dsz). Look at the following format:



As shown above, if the increment or decrement operation does not cause the content of the value memory to become 0, the statement following the value memory name is executed. If the content of the value memory becomes 0, the next statement is skipped.

Example To write a program that accepts input of 10 values, and then calculates the average of the values.

(Program legicini) by high shallowings pollybergon highest zero, a generation has been as



This program starts out by assigning a value of 10 to A. This is because value memory A will be used as a control variable. The next statement clears C to zero. After defining the location of label 1 (Lbl 1), the program then prompts for input of a value for B The next statement adds the value of B to value memory C, and then stores the result in C. The next three statements say: "decrement the value in A, and if it is still greater than 0, jump back to label 1; otherwise divide the contents of C by 10".

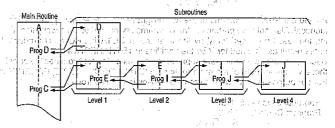
Proceed Comercial Rule

Hile Name, TO that II, but Old-

a Table 3 port law most harpware

Subroutines

Up to this point, all of the programs we have seen were contained in a single program area. You can also jump between program areas, so that the resulting execution is made up of pieces in different areas. In such a case, the central program from which other areas are jumped to is called a "main routine". The areas jumped to from the main routine are called "subroutines". - - - -



To iump to a subroutine, use Prog (input using sur Prog) followed by a program file name in double quotation. School Contents | v = VZ ∈ S + A S

Example Prog ABC — Jumps to the program stored in a file named "ABC"

gridenilot est his arcition the sign and penedia need each and After the jump to the program you specify, execution continues from the beginning of the subroutine. When end of the subroutine is reached, execution returns to the statement following the Prog command that initiated the subroutine. You can jump from one subroutine to another, a procedure that is called "nesting" You can nest up to a maximum of 10 levels, and an error will occur (Ne ERROR) if you try to nest an 11th time. If you try to jump to a program area that does not contain a program, an error message (Go ERROR) will appear on the display (1999) 157(4)

Important

· The Goto command does not jump between program areas. A Goto command jumps to the label (Lbl) located inside the same program area.

Example Create two programs, one that calculates the surface area and volume of a regular octahedron and one that calculates the surface area and volume of a regular tetrahedron. Specify that results should use only three decimal places.

lettig and American of the employee's reservable in electric control of an end of the electric

Octahedron
 File Name: OCTAHEDRON

Program Contents: Fix 3 $\overline{S} = 2 \times \sqrt{3} \times A^2$ $V = \sqrt{2 + 3 \times 4 / 3}$

Tetrahedronic seeds for consequences of the seed of t

File Name: TETRAHEDRON COMPANIES AND ASSESSMENT OF THE COMPANI Program Contents: Fix 3

 $S = \sqrt{3} \times A^2$ The street of the street $V = \sqrt{2 \div 12} \times A^3$

As you can see, the portions of the two programs underlined using a solid line are identical. Also note the portions of the programs underlined using a wavy line. Dividing the result produced for V by the final line in OCTAHEDRON will produce the same result as obtained for V by the final line in TETRAHEDRON.

Because of this, we can create separate programs called "subroutines" to calculate these values for both of the main routines (OCTAHEDRON and TETRAHEDRON). For our purposes here, we will create the following two subroutines.

Subroutine Name: S. SUB Program Contents: Fix 3

"Subroutine Name: V. SUB Indianal Article (a) The first U. His control of the first Control o

Program Contents: $V = \sqrt{2} + 3 \times A^3$

Now we can change our main routines to the following. ● Octahedron ** The electron to be a tell \notine \no

File Name: OCTAHEDRON THE WAR TREETED TO THE TOTAL TREETED TO A LIVERY

Program Contents: "Prog "S. SUB" (# 1998 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1999 | 1 gas . The state are S = Ans x 2 ⊿ contracts of the contract of the section in the en da^{me} della mode (<mark>Prograv: SUB</mark>asiliaise), la lieu la sevala i anciani e la colonia.

introdes a space com barring a program of the control of a fill start and yourse Tetrahedron in a seek in a subject of the factor of the papers of the end of the course

File Name: TETRAHEDRON Program Contents: Prog "S. SUB" ▲

ing nember a later of the Prog "Va SUB" were test again that are in the contract of self." The W. = Ans. + 14. The many relationship and the formation of the construction of the

The following is a description of each step performed when OCTAHEDRON or TET-RAHEDRON is run.

- 1. When you run either of the two main routines, execution will immediately jump to the subroutine S. SUB.
- 2. In S. SUB, the Fix 3 command specifies three decimal places.
- 3. Next, the subroutine calculates the surface area of a regular tetrahedron using the value you input for A.
- 4. Processing jumps back to the main routine.
- TETRAHEDRON uses the value calculated by S. SUB as it is.
- OCTAHEDRON multiplies the result calculated by S. SUB by 2 (S = Ans x 2) to convert it to the surface area of a regular octahedron.
- The main routine now jumps to V. SUB.
- 6. The subroutine calculates the volume of a regular octahedron.
- Processing jumps back to the main routine.
- OCTAHEDRON uses the value calculated by V. SUB as it is.
- TETRAHEDRON divides the result calculated by V. SUB by 4 (S = Ans + 4) to convert it to the volume of a regular tetrahedron.

The use of subroutines helps to save memory and makes programs easier to write.

■ Pause Command

The following is the syntax of the Pause command.

Pause n (n = and integer from 0 to 9)

The Pause command can be used to stop program execution for up to 4.5 seconds. The calculator displays the intermediate result up to that point (Ans Memory contents) while execution is paused.

The following table shows the meaning of the integers used with the Pause command.

п	0	1	2		8	9
Seconds Paused	0	0.5	1	*****	4	4.5

Pause n is treated as one statement.

Example | Write a program that starts A with a value of 1, and then continually increments the value of A, displaying each new value of A for 1.5 seconds.

> I.bl 1-4-A = A + 1Unconditional jump Pause 3 (1.5-second display) Goto 1 -

in this program A = A + 1 increments the value of A, and Pause 3 displays the new value of A for about 1.5 seconds. The Goto 1/Lbl 1 unconditional jump creates an endless loop.

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1. Prime Factor Analysis

2. Greatest Common Measure

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CASIO PROGRAM SHEET

Program for **Prime Factor Analysis**

Description

Produces prime factors of arbitrary positive integers

For $1 < m < 10^{10}$

prime numbers are produced from the lowest value first. "END" is displayed at the end of the program.

(Overview)

m is divided by 2 and by all successive odd numbers (d = 3, 5, 7, 9, 11, 13,) to check for divisibility. ...

Where d is a prime factor, $m = m \cdot \sqrt{d}$ is assumed, and division is repeated until $\sqrt{m} + 1 \le d$.

Example

 $119 = 7 \times 17$

 $\frac{1}{630} = 2 \times 3 \times 3 \times 5 \times 7$ The distriction of the section of

C. Wilherton Loss Madenan

Preparation and operation

- · Specify the mode for the program execution.
- · Store the program written on the next page.
- · Execute the program as shown below.

Step	Key operation	Display	Step	Key operation	Display
1	FUNCTION (COMP) FUNCTION (G (DSP/CLR) 5 (McI) (EXE	McI Ø	11	匯	PRIME FACTOR= 5
2	FILE	Program [RUN] ■ PRIME FACTOR:CO	12	EXE	PRIME FACTOR=
3	EXE	M?	13	EXE	END 63 <u>0</u>
4	119 🕮	PRIME FACTOR=	14	DEE	M? 7
5	EXE	PRIME FACTOR=	15	262701 🕮	PRIME FACTOR=
6	M	END 119	16	EXE	PRIME FACTOR=
7	EXE	M? 17	17	EXE	PRIME FACTOR= 17
8	630 🕮	PRIME FACTOR=	18	EXE	PRIME FACTOR=
9	EXE	PRIME FACTOR=	19	EX	PRIME FACTOR= 101
10	, EXE	PRIME FACTOR=	20	EXE	END 262701

				A T				11.5	2 34	W.	noi	an.	60	160	N	o.	1	> 140	٠٤;
Lin	e (V	/hile t isplay	he "Fi , inpu	lenam t the f	ne?" s ollowi	creer	is or	the nds.	Pro	gra	ım					4		ist	
Fil nan	P	R	्रि∃	M	įΕ	h s	F	Α:	C	T	₹O	R	EXE		(CC	MP)	10.00	ř	1
1	Lbi	Ø	; ;	{	Α	}	: :	Α	. "	M	. 10		N	:⊆	A.	14.0	Goto	2	1
	1	;	1		-	100		100	EST.V	P .	fger	1	-		1 30			1	1
2	LbI	1	:	В	, ,,	Ρ	B	1	М	Ε	:	F	Α	С	Ť	0	R	"	1
	=	2	1	Α	=	Α	÷	2	:	Α	=	1	\Rightarrow	Goto	9	:	1 7	4	1
3	Lbl	2	:	Frac	:(Α	÷	2)	=	0	; ⇒	Goto	1	1:.	Δ	; В	; =	1
	3	44	-				-				;			:	:				1
4	Lbi	3	:	С	=	$\sqrt{}$	A	+	1	į.	-	ŀ	1. 3	1	À				1
.5	LbI	4	1 - 4	В	'≥	C	⇒	Goto	8		, P	Frac	(a)	Α	÷	В	;)	; =	ı
_	0	⊨⇒	Goto	6	:	Δ.	لور					;			-	:	-		١.
6	Lbl	5		В	=	В.	1:+	2	:.	Goto	4	Ţ	lec		1	1.01		<u> </u>	[=
7	Lbl	6	:	(, A .	÷	В.)	В	orgo e	A.	~	.0	⇒	Goto	7	:	4	1
	Goto	5	4				<u>:</u>		:				:		:	;	-]
8	Lbi	7	:	В	"	Р	:Rg	al ,	М	Ε	1	F	Αt	С	T	0	¦ R	=	
	17	1	Α	= 1	Α	٠	В	:	Goto	3	Ħ	i	:						ĺ
9	LbI	8	:	Α	"	Р	R	1.	M.	E	<u> </u>	F	Α	C	i.T.:	0	l:B	≟.	-:
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10	Lbl	9	:	N	**	Ε	N:	D			Goto		10	02	10 S	12.5	iulir.	1	
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5	В	····-	<u>d</u>		1	1	:			P			1.1	Ŋ	/				
5	C		$m_i = 1$	1	_ J	+-			-:-	Q				. X				-	
Memory contents	D		<u></u>		K					R			;	٠,	1				<u>.</u>
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CASIO PROGRAM SHEET

Program for Greates	Common Measure	No. 2
Description	enngoria i enga	
ure for two integ	al division is used to determine the ers, a and b . b ! < 10^9 , positive values are taken	
$n_1 = \min$	$ \zeta([a], b) $ $ ([\tilde{a}], b) $ $ = \left[\frac{Rs - 2}{Rs - 1}\right] Rs - 1 $	
$k = 2,$ If $n_{\nu} = 0$,	3 then the greatest common measu	ire (c) will be \bar{n}_{k-1}
	[1] [2] [3] = 238 $a = 23345$ $a = 522952$ = 374 $b = 9135$ $b = 3208137$	

Preparation and operation

- Specify the mode for the program execution.
 Store the program written on the next page.
 Execute the program as shown below.

Step	Key operation	Display	Step	Key operation	Display
1	MODE 1 (COMP) FUNCTION 6 (DSP/CLR) 6 (Mcl) ES	McI 0	10	522952 🖭	B? 1015
2	FILE	Program [RUN] PRIME FACTOR:CO MEASURE :CO	11	3208137866 🕮	C 998
3	▼ EE	A? 0			1
4;	238 🖼	B? 0		L 15 11	
5	374 📼	C 34			
61	EXE	A? 102			
7	23345 🕮	B? 34			<u> </u>
8	9135 🕮	C 1015			
9	· - , EXE	A? 4060			

			3					<u></u>	eru:	es.		001	: (1)	.25.3	N	o.	10 ¹ ր 2	rs g	7
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File name	·M			s		·R						Δ'n	į. 2	วกต	J.	f's :	ျား	1 -	1
1	Lbi	1	<u>_</u>	:	:-			1		;		:	;					!	1
2	{	Α	١.,	В	}	Ļ		1	<u> o</u>	- :		:				1	:	:	1
3	Α	=	Abs	Α	[:	В	=	Abs	В	4		1	1		:	:	:	1	1
4	В	>	Α	⇒	C	=	Α	:	Α	=	В	:	В	=	С	:	<u> </u>	4	1
5	Lb!	2	Į.		:	1.		1	-				:				1	1	1
6	C	=	(-)		Int	-(-	A⁼	25	В)	×	В	-	Α)		:-	;	1
7	C	*	0	⇒	Α	: ⊒ :	٠в	:	В	=	C	:	Goto	2	Ė	Δ	1	Ī	
8	В	,,	C	"	4	Gotα	1	· !								:		1	1
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CASIO PROGRAM SHEET

- ·		 No.	-
Program for	Minimum Lana Matabina	INU.	2
	Minimum Loss Matching	i	v

Description

Calculate R_1 and R_2 which match Z_1 and Z_1 with loss minimized. $(Z_0 > Z_1)$

$$\begin{array}{c|c} R_{l} & \\ \circ - W_{l} & \circ \\ Z_{l} & \longrightarrow & R_{l} \leq_{lR_{l}} Z_{l} \end{array}$$

$$R_1 = Z_0 \sqrt{1 - \frac{Z_1}{Z_0}}$$
 $J_1 = \frac{Z_1}{\sqrt{1 - \frac{Z_1}{Z_2}}}$

Minimum loss
$$L_{inn} = 20 \log \left(\sqrt{\frac{Z_o}{Z_i}} + \sqrt{\frac{Z_o}{Z_i} - 1} \right) [dB]$$

Example

Calculate the values of R_1 , R_2 and L_{min} for $Z_2 = 500\Omega$ and $Z_1 = 200\Omega$

Preparation and operation

- · Specify the mode for the program execution:
- Store the program written on the next page.
- Execute the program as shown below.

Step	Key operation	Display	Step	Key operation	Display
1	PACTOR (COMP) (PACTOR) 6 (DSP/CLR) (MCI) EXE	McI 0			1
2	FILE	Program [RUN] PRIME FACTOR :CO MEASURE :CO LOSS :CO			
3	V ▼⊠	Z0 ? 0			
4	500 EE	Z1? 0		±1	
5	200 €	R1 = 387,2983346			
6	EXE	H2 = 258,1988897		4.4	-
7	`611	LMIN = 8.961393328			- (21 F)
				<u> </u>	3
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	,														``	o.	3	
Line	(M	hile t	he "F , inpu	ilenan It the f	ne?" s follow	creer	is or	the)	Pr	ogra	m		-					_
File name	L	0	S	s	EXE		(CO	MP)			Ţ		:	-	:	: -		:
1	Υ	. "	Z	0	11	:	Z	"	Z	1	"		!	-	†	1		-
2	Α	=	厂	(1		Z	÷	Υ	;)	:	В	=	Ϋ́	÷	ΪZ	L	
3	R	"	R	1	"	=	Υ	Α	4	1	 -	-	:		-	一	-	-
4	S	,,	R	2	"	=	Z	÷	Α	4			-		-	-		_
5	T	19	: L	M	Ι.	N	"	=	2	0	log	(7	В	+	<i>J</i> =	(В
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Appendix A Error Message Table

Message	Meaning	Countermeasure
Syn ERROR	Calculation formula contains an error. Formula in a program contains an error.	① Use ◀ or ▶ to display the point where the error was generated and correct it. ② Use ◀ or ▶ to display the point where the error was generated and then correct the program.
Ma ERROR	Calculation result exceeds calculation range. Calculation is performed outside the input range of a function. Illogical operation (division by zero, etc.)	Check the input numeric value and correct it. When using variables, check that the numeric values assigned to variables are correct.
Go ERROR	② No program stored in program	 Correctly, input a Lbl n to correspond to the Goto n, or delete the Goto n if not required. Store a program in program area Prog "file name", or delete the Prog "file name" if not required.
Ne ERROR	Nesting of subroutines by Prog "file name" exceeds 10 levels.	Ensure that Prog "file name" is not used to return from subroutines to main routine. If used, delete any unnecessary Prog "file name". Trace the subroutine jump destinations and ensure that no jumps are made back to the original program area. Ensure that returns are made correctly.
SIK ERROR	Execution of calculations that exceed the capacity of the stack for numeric values or stack for calculations. Program being run contains a conditional jump that contains more than 15 conditions.	Simplify the formulas to keep stacks within 10 levels for the numeric values and 26 levels for the calculations. Divide the formula into two or more parts.

Mem ERROR	Specified expanded memory does not ex	value 1000 list. Canadai	Use set lem to correctly expand the number of value memories.
Arg ERROR ORGEN 19 MC ORGEN 1	Ala Maf Birlana Birlana	t requires an	 ① Correct the argument. Sci n, Fix n: n = integer from 0 through 9, A through Z. Defin n: n = integer from 0 up to the number of remaining bytes. ② Keep the number of value memories you use for the operation within the number of value memories currently available. Simplify the data you are trying to store to keep it within the available memory capacity. Delete no longer needed data to make room for the new data.

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Appendix B Input Ranges

Function	Input ranges	Internal digits	Accuracy	Notes
			SCHOOL STATE OF	an i salahararah
sinx cosx	(DEG) x < 9 × 10 ⁹ °	calupor rec	As a rule,	However, for tanx: $ x = 90(2n+1)$:DEG
tanx	(DEG) x < 9 × 10 ⁹ ° (RAD) x < 5 × 10 ⁷ πrad (GRA) x < 1 × 10 ¹⁰ grad	15 digits	l+1 at the	$ x + \pi/2(2n+1)$:HAU
7 1 15 D	The State of the S	tar engine.	10th digit.	x = 100(2n+1):GRA
sin x	7 (38.19 - 10.11 (1.12) x ≤ q3n951		707	Y 114 ,
cos 1x		n	,,	
tan⁴x ∈uit.√ o	x < 1 × 10 ¹⁰⁰			
sinhx	a cey aairoaraa x ≤ 230.2585092			Note: For sinh and
coshx	se lomam sulter to	٠.,	"	tanh, when x=0, error are cumulative and
tanhx	x < 1 ×101003 (5.00)			accuracy is affected a
59 (35) (1)	5 - 5 - 5453 - 3 3 3			a certain point.
sinh:¹x	x < 5 × 10 ⁹⁹		ļ.	
$\cosh^4 x_{12}$	1≦x <5 × 10 ⁹⁹ obs	"		
tanh ⁻¹ x	$ x < 1$ $ x _{1/2}$			
logx Inx	$1 \times 10^{-99} \le x < 1 \times 10^{100}$		И	
10 <i>x</i>	$-1 \times 10^{100} < x < 100$			
e ^τ	-1 × 10 ¹⁰⁰ < x ≦230.2585092	u,	"	
√x	0 ≤ x < 1 × 10 ¹⁰⁰		п.	
x ² .	x <1 × 10 ⁵⁰	"		
$x^{-1}(1/x)$	$ x < 1 \times 10^{100}, x = 0$,,	
3√x	$ x < 1 \times 10^{100}$			
x!	$0 \le x \le 69$ (x is an integer)		н	
nPr nCr	Result < 1 × 10 ¹⁰⁰ n, r (n and r are integers) $0 \le r \le n$, $n < 1 \times 10^{10}$	n	. 11	
Pol (x, y)	$\sqrt{x^2 + y^2} < 1 \times 10^{100}$	l .		

Function	Input ranges	Internal digits	Accuracy	Notes
Rec (<i>r</i> , <i>θ</i>)	r < 1 × 10 ¹⁰⁰ (DEG) θ < 9 × 10 ⁹¹ (RAD) θ < 5 × 10 ¹⁰ grad (GRA) θ 1 × 10 ¹⁰ grad	15 digits	As a rule, accuracy is ±1 at the 10th digit.	However, for $\tan \theta$: $ \theta \neq 90(2n+1)$:DEG $ \theta \neq \pi/2(2n+1)$:RAD $ \theta \neq 100(2n+1)$:GRA
	a , b $c < 1 \times 10^{100}$ (1) (1417 (141) 1777 (141)	ntitin - Electoria Electroscopia (m	10003 1000 10003 1000
0 1 11	x < 1 × 10 ¹⁰⁰ Hexadecimal display: x ≤ 2777777.777	avillen ja	, armazana	
^ (x*)	x>0: $x>0$: $x<0$: $x<0$: $x>0$:	2000 12000	an his war is.	and provide a record
	However; -1 × 10 ¹⁰⁰ < $\frac{1}{y}$ log x < 100			•
χί ý	$\begin{array}{l} y>0: x \neq 0 \\ -1 \times 10^{100} < \frac{1}{x} \log y < 100 \\ y=0: x>0 \\ y<0: x = 2n+1, \frac{1}{n} \\ (n \neq 0, n \text{ is an integer}) \\ \text{However,} \frac{1}{\sqrt{x}} \log y < 100 \end{array}$	n	,	
a ^b lê	Results Total of integer, numerator and denominator must be within 10 digits (includes division symbols). Input Result displayed as a fraction for integer when integer; numerator and denominator are less than 1 × 1010.	•		
SD (LR)	$ x < 1 \times 10^{50}$ $ y < 1 \times 10^{50}$ $ n < 1 \times 10^{100}$ $x\sigma_n, y\sigma_n, \bar{x}, \bar{y}, A, B, r; n \neq 0$ $x\sigma_{ort}, y\sigma_{ort}, n \neq 0, 1$	н		

Function	Input Range	×
	Values after variable within following range: DEC: -2147483648 ≤ x ≤ 2147483647 BIN: 1000000000000000000000000000000000000	48"
7.51a))(1 =	0 ≤ x ≤ 011111111111111111111111111111(0, positive) OCT: 20000000000 ≤ x ≤ 3777777777 (negative)	
	0 ≤ x ≤ 17777777777 (0, positive) HEX: 80000000 ≤ x ≤ FFFFFFF (negative) 0 ≤ x ≤ 7FFFFFFF (0, positive)	

^{*} Errors may be cumulative with internal continuous calculations such as $^{(x')}$, $^{'}\sqrt{y}$, x!. $\sqrt[4]{x}$ sometimes affecting accuracy.

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Appendix C Specifications

Model: fx-4800P

Calculations (see to in secul, a to several suspension of the second difference of the

Basic calculation functions: Negative numbers; exponents; parenthetical addition, subtraction, multiplication, division (with priority sequence judgement function - true algebraic logic)

skipili a 1. s. – u čiav iku su su se i poznate prediv **Built-in scientific functions:**

Trigonometric/inverse trigonometric functions (units of angular measurement: degrees, radians, grads); hyperbolic/inverse hyperbolic functions; logarithmic/exponential functions; reciprocals; factorials; square roots; cube roots; powers; roots; squares; negative signing; exponential notation input; π; parenthetical calculations; internal rounding; random numbers; unit of angular measurement specification; fractions; decimal-sexagesimal conversion; coordinate transformation; engineering calculations; permutation; combination; number of decimal place and significant digit specification

Built-in functions:

Exponential notation range; delete, insert, answer functions; replay; memory status display; multistatements; output command

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Extraction of derivative using differential from center point

Quadratic Differentials:

Extraction of quadratic differential using second order value differential formula or It notions are not the markings of the control of the equation of the control of

Integrations: Integrations: Integration in the second of t

Using Simpson's rule

Σ Calculations: yes the state of the state of the state of the few states of the few states of the few of the

Calculation of partial sum of sequence (a) managed sections (a) the sequence (a)

COLORS BY TO STANGED A COLORS OF WALLS TO A COLORS Complex Number Calculations:

Addition, subtraction, multiplication, division; reciprocal; square root; square; absolute number/argument calculations; conjugate complex number extraction; real number part/imaginary number part extraction

Binary, Octal, Decimal, Hexadecimal Calculations:

The Court of Office Addition, subtraction, multiplication, division calculations; base specification; negative values (two's complement); logical operations

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Statistics:

Standard deviation: number of data; mean; standard deviation (two types); sum; sum of squares: t-test

Regression: number of data; mean of x; mean of y; standard deviation of x (two types); standard deviation of y (two types); sum of x; sum of y; sum of squares of x; sum of squares of y; sum of squares of x and y; constant term; regression coefficient; correlation coefficient; estimated value of x; estimated value of y

Formula Memory:

Formula storage, recall, execution; Table function; Solve function; storage of formula to program area, recall The characteristic particles of the control of the

Variables: an design and an administration of the relative many another award

26 standard (expandable to 476) a sale of the second to the place method to พิทธิ และเมละใช้สารีวิธี เลือน ได้เรื่อง ๆ และสุดมากน้ำเรื่อง 180 กระบุ x อิฟริเตล์ กระบบกลัง

Calculation Range: The Law Control of the Control o

 $\pm 1\times 10^{99}$ to $\pm 9.999999999\times 10^{99}$ and 0. Internal operations use 15-digit mantissal.

Exponential Display:

Norm 1: $10^{-2} > |x|, |x| \ge 10^{10}$ Norm 2: $10^{-9} > |x|, |x| \ge 10^{10}$ in the second MMT To the reason of the second section and the second sections and the second sections and the second sections and the second sections are second sections as the second section and the second sections are second sections as the second section section section sections are second sections as the second section section section sections are sections as the second section section section section section section section section sections are sections as the section section section section sections are sections as the section sec

Rounding:

Performed according to the number of significant digits and number of decimal places specified by user. ten in trade or most either that refer or as in the trade of the

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Programming

Programming parable of exception as the great state of the attention to training the Input, storage, recall, execution of programs in program area; editing and deletion of file names and program contents; recall by file name

Program commands:

Variable input ({}); Variable lock (Fixm); Unconditional jump (Goto, Lbl); Conditional $jump \Rightarrow + \Rightarrow A$; relational operators $\{=, +, >, <, \geq, \leq\}$; Count jump (lsz, Dsz); Subroutine (Prog) with nesting up to 10 levels; Pause (Pause)

Check function: a place describes an exact our less set in a character of a contract o

Programicheck; debugging) Annual et al. 102 raneille solle i fit duri et solle i 300 km

Program area:

4,500 bytes maximum legan tengah tugan legah didikasa tengah dan beradakan kecamatan berada
General

Display system:

16-character × 4-line liquid crystal display; 10-digit mantissa and 2-digit exponent for calculations; displays binary, octal, hexadecimal, sexagesimal, fraction values, complex numbers

Text display:

Up to 64 characters for function commands, program commands, alpha characters

Error check function:

Check for illegal calculations (using values greater than 10100), illegal jumps, etc. Indicates by error message display.

Power supply:

Main: One CR2032 lithium battery Back-up: One CR2032 lithium battery

Power consumption:

0.05W

Battery life:

Main: Approximately 900 hours (continuous display of 0.) Approximately 1 year (power off) Back-up: Approximately 2 years

Auto power off:

Power is automatically turned off approximately six minutes after last operation.

Ambient temperature range:

0°C to 40°C

Dimensions:

Closed: $15 \text{mmH} \times 81.5 \text{mmW} \times 157 \text{mm D} (\frac{5}{8} \text{"H} \times 3^{1}/4 \text{"W} \times 6^{1}/8 \text{"D})$ Open: $11 \text{mmH} \times 165 \text{mmW} \times 157 \text{mm D} \left(\frac{3}{8} \text{"H} \times 6^{1} / 2 \text{"W} \times 6^{1} / 8 \text{"D}\right)$

Weight: 133g (4.7oz) (including batteries)