User manual CASIO FX-85ES PLUS
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fx-82ES PLUS
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fx-350ES PLUS

User's Guide

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CASIO®

Manual abstract:

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Important Information

· The displays and illustrations (such as key markings) shown in this User's Guide are for illustrative purposes only, and may differ somewhat from the actual items they represent. · The contents of this manual are subject to change without notice.

· In no event shall CASIO Computer Co., Ltd. be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of the purchase or use of this product and items that come with it. Moreover, CASIO Computer Co., Ltd. shall not be liable for any claim of any kind whatsoever by any other party arising out of the use of this product and the items that come with it. · Be sure to keep all user documentation handy for future reference.

Sample Operations Sample operations in this manual are indicated by a icon. Unless specifically stated, all sample operations assume that the calculator is in its initial default setup. Use the procedure under "Initializing the Calculator" to return the calculator to its initial default setup. For information about the , , , and marks that are shown in the sample operations, see "Configuring the Calculator Setup".

Initializing the Calculator Perform the following procedure when you want to initialize the calculator and return the calculation mode and setup to their initial default settings. Note that this operation also clears all data currently in calculator memory. (CLR) (All) (Yes)

Safety Precautions Battery · Keep batteries out of the reach of small children. · Use only the type of battery specified for this calculator in this manual.

Handling Precautions · Even if the calculator is operating normally, replace the battery at least once every three years (LR44 (GPA76)), two years (R03 (UM-4)), or one year (LR03 (AM4)). A dead battery can leak, causing damage to and malfunction of the calculator. Never leave a dead battery in the calculator. Do not try using the calculator while the battery is completely dead (fx-85ES PLUS). · The battery that comes with the calculator discharges slightly during shipment and storage. Because of this, it may require replacement sooner than the normal expected battery life. · Do not use an oxyride battery* or any other type of nickel-based primary battery with this product. Incompatibility between such batteries and product specifications can result in shorter battery life and product malfunction. · Avoid use and storage of the calculator in areas subjected to temperature extremes, and large amounts of humidity and dust. E-2 · Do not subject the calculator to excessive impact, pressure, or bending.

· Never try to take the calculator apart. · Use a soft, dry cloth to clean the exterior of the calculator. · Whenever discarding the calculator or batteries, be sure to do so in accordance with the laws and regulations in your particular area. * Company and product names used in this manual may be registered trademarks or trademarks of their respective owners.

Removing the Hard Case Before using the calculator, slide its hard case downwards to remove it, and then affix the hard case to the back of the calculator as shown in the illustration nearby.

Turning Power On and Off Press Press to turn on the calculator. (OFF) to turn off the calculator. Auto Power Off Your calculator will turn off automatically if you do not perform any operation for about 10 minutes. If this happens, press the key to turn the calculator back on.

Adjusting Display Contrast Display the CONTRAST screen by performing the following key operation: fx-82/85/350ES PLUS: (SETUP) (CONT), fx-95ES PLUS: (SETUP) (CONT). Next, use and to adjust contrast. After the setting is the way you want, press . Important: If adjusting display contrast does not improve display readability, it probably means that battery power is low. Replace the battery.

Key Markings Pressing the or key followed by a second key performs the alternate function of the second key. The alternate function is indicated by the text printed above the key. The following shows what the different colors of the alternate function key text mean. If key marking text is this color: Yellow Red It means this: Press and then the key to access the applicable function. Press and then the key to input the applicable variable, constant, or symbol. Alternate function s Keycap function sin1 D E-3

Reading the Display The display of the calculator shows expressions you input, calculation results, and various indicators.

Input expression Math Indicators Math Calculation result · If a indicator appears on the right side of the calculation result, it means the displayed calculation result continues to the right. Use and to scroll the calculation result display. · If a indicator appears on the right side of the input expression, it means the displayed calculation continues to the right. Use and to scroll the input expression display. Note that if you want to scroll the input expression while both the and indicators are displayed, you will need to press first and then use and to scroll. Display indicators This indicator: Means this: The keypad has been shifted by pressing the key. The keypad will unshift and this indicator will disappear when you press a key. The alpha input mode has been entered by pressing the key. The alpha input mode will be exited and this indicator will disappear when you press a key. There is a value stored in independent memory. The calculator is standing by for input of a variable name to assign a value to the variable. This indicator appears after you press (STO). The calculator is standing by for input of a variable name to recall the variable's value. This indicator appears after you press . The calculator is in the STAT Mode. The default angle unit is degrees. The default angle unit is radians. The default angle unit is grads. FIX SCI Math A fixed number of decimal places is in effect. A fixed number of significant digits is in effect.

Natural Display is selected as the display format. S A M STO RCL STAT Calculation history memory data is available and can be replayed, or there is more data above/below the current screen.

The display currently shows an intermediate result of a Disp multi-statement calculation. Important: For some type of calculation that takes a long time to execute, the display may show only the above indicators (without any value) while it performs the calculation internally. E-4 Using Menus Some of the calculator's operations are performed using menus. Pressing or , for example, will display a menu of applicable functions. The following are the operations you should use to navigate between menus. · You can select a menu item by pressing the number key that corresponds to the number to its left on the menu screen. · The indicator in the upper right corner of a menu means there is another menu below the current one. The indicator means another menu above.

Use and to switch between menus. · To close a menu without selecting anything, press . Specifying the Calculation Mode When you want to perform this type of operation: General calculations Statistical and regression calculations Equation solution (fx-95ES PLUS only) Generation of a number table based on an expression Inequality solution (fx-95ES PLUS only) Ratio calculations (fx-95ES PLUS only) Perform this key operation: (COMP) (STAT) (EQN) fx-82/85/350ES PLUS: (TABLE) fx-95ES PLUS: (TABLE) (INEQ) (RATIO) Note: The initial default calculation mode is the COMP Mode. Configuring the Calculator Setup First perform the following key operation to display the setup menu: (SETUP). Next, use and and the number keys to configure the settings you want. Underlined (___) settings are initial defaults. MthIO LineIO Specifies the display format. Natural Display (MthIO) causes fractions, irrational numbers, and other expressions to be displayed as they are written on paper. MthIO: Selects MathO or LineO. MathO displays input and calculation results using the same format as they are written on paper.

LineO displays input the same way as MathO, but calculation results are displayed in linear format. Linear Display (LineIO) causes fractions and other expressions to be displayed in a single line. Note: · The calculator switches to Linear Display automatically whenever you enter the STAT Mode. · In this manual, the symbol next to a sample operation indicates Natural Display (MathO), while the symbol indicates Linear Display. E-5 C Deg Rad Gra Specifies degrees, radians or grads as the angle unit for value input and calculation result display.

Note: In this manual, the symbol next to a sample operation indicates degrees, while the symbol indicates radians. Fix Sci Norm Specifies the number of digits for display of a calculation result. Fix: The value you specify (from 0 to 9) controls the number of decimal places for displayed calculation results. Calculation results are rounded off to the specified digit before being displayed. Example: $100 \div 7 = 14$.

286 (Fix 3) 14.29 (Fix 2) Sci: The value you specify (from 1 to 10) controls the number of significant digits for displayed calculation results. Calculation results are rounded off to the specified digit before being displayed. Example: $1 \div 7 = 1.4286$ 101 (Sci 5) 1.429 101 (Sci 4) Norm: Selecting one of the two available settings (Norm 1, Norm 2) determines the range in which results will be displayed in non-exponential format. Outside the specified range, results are displayed using exponential format. Norm 1: 102 |x|, |x| 1010 Norm 2: 109 |x|, |x| 1010 Example: $1 \div 200 = 5$ 103 (Norm 1) 0.005 (Norm 2) ab/c d/c Specifies either mixed fraction (ab/c) or improper fraction (d/c) for display of fractions in calculation results. r Specifies either fx-95ES PLUS: CMPLX a+bi ; rectangular coordinates (a+bi) or polar coordinates (r) for EQN Mode solutions.

fx-82/85/350ES PLUS: STAT ON ; OFF fx-95ES PLUS: STAT ON ; OFF Specifies whether or not to display a FREQ (frequency) column in the STAT Mode Stat Editor. fx-82/85/350ES PLUS: Disp Dot ; C Important: · Certain types of expressions can cause the height of a calculation formula to be greater than one display line. The maximum allowable height of a calculation formula is two display screens (31 dots 2). Further input will become impossible if the height of the calculation you are inputting exceeds the allowable limit. · Nesting of functions and parentheses is allowed. Further input will become impossible if you nest too many functions and/or parentheses. If this happens, divide the calculation into multiple pamal values in a calculation while Linear Display is selected will cause the result to be displayed as a decimal value. · Fractions in calculation results are displayed after being reduced to their lowest terms. To switch a calculation result between improper fraction and mixed fraction form: Perform the following key operation: ( ) To switch a calculation result between fraction and decimal form: Press . Percent Calculations Inputting a value and pressing a percent.

150 20% = 30 (%) causes the input value to become 150 20 (%) 30 75 2875 2625 Calculate what percentage of 880 is 660. (75%) 660 880 Increase 2500 by 15%. (2875) 2500 2500 Discount 3500 by 25%. (2625) 3500 3500 (%) 15 (%) 25 (%) C E-10 Degree, Minute, Second (Sexagesimal) Calculations Performing an addition or subtraction operation between sexagesimal values, or a multiplication or division operation between a sexagesimal value and a decimal value will cause the result to be displayed as a sexagesimal value. You also can convert between sexagesimal and decimal.

@@@@@@@@@@@@@@@You can scroll through calculation history contents using and . @@@@@@To divide the result of 3 4 by 30 3 (Continuing) 4 30 123 + 456 = 579 789 579 = 210 (Continuing) 123 456 789 Variables (A, B, C, D, E, F, X, Y) Your calculator has eight preset variables named A, B, C, D, E, F, X, and Y. You can assign values to variables and also use the variables in calculations. @@@@@@@@@@@@@· Pressing (FACT) or . · Pressing any of the following keys: or .

@@@@Trying to do so will cause a math error (Math ERROR). @@@@: is displayed as 3.141592654, but internal calculations. internal calculations. sin, cos, tan, sin-1, cos-1, tan-1 : Trigonometric functions. Specify the angle unit before performing calculations. See 1. sinh, cosh, tanh, sinh-1, cosh-1, tanh-1 : Hyperbolic functions. Input a function from the menu that appears when you press . The angle unit setting does not affect calculations.

See 2 . °, r, g : These functions specify the angle unit. ° specifies degrees, r radians, and g grads. @@See 3. , : Exponential functions. @@See 4. key to input logab as log (a, b). Base log : Logarithmic function. @@@In this case, you must input a value for the base. See 5 .

ln : Natural logarithm to base e. @@@@See 7 . @@If you input 2 , for example, the final will be ignored. To 2 2 , input 2 , press the key, and then press ( ). @@See 8.

@@@@@@Coordinates (Rec) Coordinates (Pol) x2, x3, x , x ! : Factorial function.

See 9. Abs : Absolute value function. @@See 10 . Ran# : Generates a 3-digit pseudo random number that is less than 1. The result is displayed as a fraction when Natural Display is selected. See 11 . RanInt# : For input of the function of the form RanInt#(a, b), which generates a random integer within the range of a to b. See 12 . C E-14 nPr, nCr : Permutation (nPr) and combination (nCr) functions. See 13 . Rnd : The argument of this function is made a decimal value and then rounded in accordance with the current number of display digits setting (Norm, Fix, or Sci). With Norm 1 or Norm 2, the argument is rounded off to 10 digits. With Fix and Sci, the argument is rounded off to the specified digit. When Fix 3 is the display digits setting, for example, the result of $10 \div 3$ is displayed as 3.

333, while the calculator maintains a value of 3.33333333333333 (15 digits) internally for calculation. In the case of Rnd($10 \div 3$) = 3.333 (with Fix 3), both the displayed value and the calculator's internal value become 3.333. Because of this a series of calculations will produce different results depending on whether Rnd is used (Rnd($10 \div 3$) 3 = 9.999) or not used ($10 \div 3$ 3 = 10.000). See 14 . Note: Using functions can slow down a calculation, which may delay display of the result.

Do not perform any subsequent operation while waiting for the calculation result to appear. To interrupt an ongoing calculation before its result appears, press . Examples 1 $\sin 30° = 0.5$ $\sin 0.5 = 30°$ 2 $\sinh 1 = 1$.

175201194 $\cosh1$ 1 = 0 3 /2 radians = 90°, 50 grads = 45° () 2 50 4 To calculate e^5 (SETUP) (DRG) (DRG) (r) (g) -1 -1 30 (sin) 0.5 (sinh) 1 (cosh-1) 1 0.5 30 1.175201194 0 90 45 2 to three significant digits (Sci 3) ( )5 ( )5 2 2 1000 2 (,) 16 2 16 (Sci) 2.97×102 2.

97×102 3 4 4 4.50×100 5 $\log_{10}1000 = \log 1000 = 3$ $\log_2 16 = 4$ 6 To calculate ln 90 (= $\log_e 90$) to three significant digits (Sci 3) (SETUP) 7 1.2 (Sci) 1.2 1 1 5 (5)5 32 ( ) 32 90 10 2 3 2 $10^3 = 1200$ $(1+1)2+2 = 16$ $(52)3 = 15625$ 5 32 = 2 1200 16 15625 2 2 E-15 To calculate ' × 3 (= 3' = 4.242640687...) to three decimal 2 2 places (Fix 3) (SETUP) (Fix) 2 3 3' 2 2 3 4.243 4.243 8 To convert rectangular coordinates (' , ') to polar coordinates 22 (Pol) (Pol) 2 2 (,) (,) 2 2 r=2,=45 r= 2 = 45 To convert polar coordinates (' , 45°) to rectangular coordinates 2 (Rec) 9 (5 + 3) ! = 40320 10 |2 7| 2 = 10 2 2 7 7 2 2 2 5 3 (,) 45 (x!) X=1, Y=1 40320 10 10 11 To obtain three random three-digit integers 1000 (Ran#) 459 48 117 (Results shown here are for illustrative purposes only.

Actual results will differ.) 12 To generate random integers in the range of 1 to 6 (RanInt) 1 (,) 6 2 6 1 (Results shown here are for illustrative purposes only. Actual results will differ.) 13 To determine the number of permutations and combinations possible when selecting four people from a group of 10 Permutations: Combinations: 10 10 (nPr) 4 (nCr) 4 5040 210 14 To perform the following calculations when Fix 3 is selected for the number of display digits: $10 \div 3$ 3 and Rnd($10 \div 3$) 3 (SETUP) (Fix) (Rnd) 10 10 3 3 3 3 10.000 9.999 E-16 Statistical Calculations (STAT) To start a statistical calculation, perform the key operation (STAT) to enter the STAT Mode and then use the screen that appears to select the type of calculation you want to perform. To select this type of statistical calculation: (Regression formula shown in parentheses) Press this key: Single-variable (X) Paired-variable (X, Y), linear regression ($y = A + Bx$) Paired-variable (X, Y), quadratic regression ($y = A + Bx + Cx^2$) Paired-variable (X, Y), logarithmic regression ($y = A + Blnx$) Paired-variable (X, Y), e exponential regression ($y = Ae^{Bx}$) Paired-variable (X, Y), ab exponential regression ($y = AB^x$) Paired-variable (X, Y), power regression ($y = Ax^B$) Paired-variable (X, Y), inverse regression ($y = A + B/x$) (1-VAR) (A+BX) (_+CX2) (ln X) (e^X) (A·B^X) (A·X^B) (1/X) Pressing any of the above keys (to) displays the Stat Editor. Note: When you want to change the calculation type after entering the STAT Mode, perform the key operation (STAT) (Type) to display the calculation type selection screen. Inputting Data Use the Stat Editor to input data. Perform the following key operation to display the Stat Editor: (STAT) (Data).

The Stat Editor provides 80 rows for data input when there is an X column only, 40 rows when there are X and FREQ columns or X and Y columns, or 26 rows when there are X, Y, and FREQ columns. Note: Use the FREQ (frequency) column to input the quantity (frequency) of identical data items. Display of the FREQ column can be turned on (displayed) or off (not displayed) using the Stat Format setting on the setup menu. 1 To select linear regression and input the following data: (170, 66), (173, 68), (179, 75) STAT (STAT) (A+BX) STAT 170 173 179 STAT 66 68 75 E-17 Important: · All data currently input in the Stat Editor is deleted whenever you exit the STAT Mode, switch between the single-variable and a pairedvariable statistical calculation type, or change the Stat Format setting on the setup menu. @@@@@@@@@@@@@@@@@@@@ · , 1, 2 and are not variables.

@@See "Calculating Estimated Values" for more information. @@fx-82/85/350ES PLUS: (SETUP) (STAT) (ON) fx-95ES PLUS: (SETUP) (STAT) (ON) C E-18 1 2 (STAT) (1-VAR) 3 4 5 1 2 3 2 (STAT) (Var) (Var) () (x) STAT (STAT) Results: Mean: 3 3 Population Standard Deviation: 1.154700538 To calculate the linear regression and logarithmic regression correlation coefficients for the following paired-variable data and determine the regression formula for the strongest correlation: (x, y) = (20, 3150), (110, 7310), (200, 8800), (290, 9310). Specify Fix 3 (three decimal places) for results. (SETUP) (STAT) (OFF) (SETUP) (STAT) (OFF) (SETUP) (Fix) STAT (STAT) (A + BX) 20 110 200 290 3150 7310 8800 9310 (STAT) (STAT) (STAT) (STAT) (STAT) (Reg) (Type) (Reg) (Reg) (Reg) (r) (In X) (r) (A) (B) fx-82/85/350ES PLUS: fx-95ES PLUS: FIX Results: Linear Regression Correlation Coefficient: 0.

923 Logarithmic Regression Correlation Coefficient: 0.998 Logarithmic Regression Formula: $y = 3857.984 + 2357.532 lnx$ Calculating Estimated Values Based on the regression formula obtained by paired-variable statistical calculation, the estimated value of y can be calculated for a given x-value. The corresponding x-value (two values, $x1$ and $x2$, in the case of quadratic regression) also can be calculated for a value of y in the regression formula. 4 To determine the estimate value for y when x = 160 in the regression formula produced by logarithmic regression of the data in 3 . Specify Fix 3 for the result. (Perform the following operation after completing the operations in 3 .) 160 (STAT) (Reg) () Result: 8106.

898 Important: Regression coefficient, correlation coefficient, and estimated value calculations can take considerable time when there are a large number of data items.

E-19 C Equation Calculations (EQN) (fx-95ES PLUS only) You can use the following procedure in the EQN Mode to solve simultaneous linear equations with two or three unknowns, quadratic equations, and cubic equations. 1. Press (EQN) to enter the EQN Mode. 2. On the menu that appears, select an equation type. To select this calculation type: Simultaneous linear equations with two unknowns Simultaneous linear equations with three unknowns Quadratic equation Cubic equation Press this key: $(anX + bnY = cn)$ $(anX + bnY + cnZ = dn)$ $(aX2 + bX + c = 0)$ $(aX3 + bX2 + cX + d = 0)$ 3. Use the Coefficient Editor that appears to input coefficient values. in step 2, and then input · To solve $2x2 + x$ $3 = 0$, for example, press 1 the following for the coefficients (a = 2, b = 1, c = 3): 2 3 . · To change a coefficient value you already have input, move the cursor to the appropriate cell, input the new value, and then press . · Pressing will clear all of the coefficients to zero.
Important: The following operations are not supported by the Coefficient Editor: , (M), (STO). Pol, Rec, and multi-statements also cannot be input with the Coefficient Editor. 4. After all the values are the way you want, press . · This will display a solution.
Each press of will display another solution. Pressing while the final solution is displayed will return to the Coefficient Editor. · You can scroll between the solutions using the and keys. · To return to the Coefficient Editor while any solution is displayed, press . Note: · Even if Natural Display is selected, the solutions of simultaneous linear equations are not displayed using any form that includes .
· Values cannot be converted to engineering notation on the solution screen. Changing the Current Equation Type Setting Press (EQN) and then select an equation type from the menu that appears. Changing the equation type causes the values of all Coefficient Editor coefficients to change to zero. EQN Mode Calculation Examples x + 2y = 3, 2x + 3y = 4 (EQN) $(anX + bnY = cn)$ 1 2 2 3 Math 3 4 (X=) 1 (Y=) 2 E-20 x y + z = 2, x + y z = 0, x + y + z = 4 (EQN) $(anX + bnY + cnZ = dn)$ 1 1 1 2 1 1 1 0 1 1 1 4 Math (X=) 1 (Y=) 2 (Z=) 3 x2 + x + 3 = 0 4 (EQN) $(aX2 + bX + c = 0)$ 1 1 3 4 2 1' + 2 2i 2 1' (X2=)   2 2i (X1=) x2 2'x + 2 = 0 2 (EQN) 1 $(aX2 + bX + c = 0)$ 2 2 2 (X=) ' 2 x3 2x2 x + 2 = 0 (EQN) 1 $(aX3 + bX2 + cX + d = 0)$ 2 1 2 (X1=) 1 (X2=) 2 (X3=) 1 Creating a Number Table from a Function (TABLE) TABLE generates a number table for x and f(x) using an input f(x) function. Perform the following steps to generate a number table. 1. Enter the TABLE Mode. · On the fx-82/85/350ES PLUS, press , on the fx-95ES PLUS, press . 2. Input a function in the format f(x), using the X variable.

· Be sure to input the X variable ((X)) when generating a number table. Any variable other than X is handled as a constant. · Pol and Rec cannot be input in the function. 3. In response to the prompts that appear, input the values you want to use, pressing after each one. For this prompt: Input this: Start? End? Input the lower limit of X (Default = 1). Input the upper limit of X (Default = 5). Note: Make sure that the End value is always greater than the Start value. E-21 Step? Input the increment step (Default = 1). Note: The Step specifies by how much the Start value should be sequentially incremented as the number table is generated.
If you specify Start = 1 and Step = 1, X sequentially will be assigned the values 1, 2, 3, 4, and so on to generate the number table until the End value is reached. · Inputting the Step value and pressing generates and displays the number table in accordance with the parameters you specified. · Pressing while the number table screen is displayed will return to the function input screen in step 2. 1 To generate a number table for the function f(x) = x2 + for the 2 range 1 x 1, incremented in steps of 0.5 fx-82/85/350ES PLUS: fx-95ES PLUS: (X) (TABLE) (TABLE) 1 2 Math Math Math 1 1 0.
5 Note: · You can use the number table screen for viewing values only. Table contents cannot be edited. · The number table generation operation causes the contents of variable X to be changed. Important: The function you input for number table generation is deleted whenever you display the setup menu in the TABLE Mode and switch between Natural Display and Linear Display. Inequality Calculations (INEQ) (fx-95ES PLUS only) You can use the following procedure to solve a quadratic inequality or cubic inequality.
1. Press (INEQ) to enter the INEQ Mode. 2. On the menu that appears, select an inequality type. To select this inequality type: Quadratic inequality Cubic inequality Press this key: $(aX2 + bX + c)$ $(aX3 + bX2 + cX + d)$ 3. On the menu that appears, use keys through to select the inequality symbol type and orientation. 4. Use the Coefficient Editor that appears to input coefficient values. · To solve $x2 + 2x$ $3 < 0$, for example, input the coefficients a = 1, b = 2, c = 3 by pressing 1 2 3 . · To change a coefficient value you already have input, move the cursor to the appropriate cell, input the new value, and then press .

· Pressing will clear all of the coefficients to zero. E-22 Note: The following operations are not supported by the Coefficient Editor: , (M), (STO). Pol, Rec, and multi-statements also cannot be input with the Coefficient Editor. 5. After all the values are the way you want, press . · This will display the solutions. · To return to the Coefficient Editor while the solutions are displayed, press . Note: Values cannot be converted to engineering notation on the solution screen. Changing the Inequality Type Press (INEQ) and then select an inequality type from the menu that appears. Changing the inequality type causes the values of all Coefficient Editor coefficients to change to zero.
INEQ Mode Calculation Examples x2 + 2 x 3 < 0 (INEQ) $(aX2 + bX + c)$ Math $(aX2 + bX + c < 0)$ Math 1 2 3 Math x2 + 2 x 3 0 (INEQ) $(aX2 + bX + c)$ $(aX2 + bX + c 0)$ 1 2 3 Math Math Note: Solutions are displayed as shown here when Linear Display is selected. 2x3 - 3 x2 0 (INEQ) $(aX3 + bX2 + cX + d)$ $(aX3 + bX2 + cX + d 0)$ 2 3 Math E-23 Math 3x3 + 3 x2 x 0 (INEQ) $(aX3 + bX2 + cX + d)$ $(aX3 + bX2 + cX + d 0)$ 3 3 1 Math Math Math Note: Solutions are displayed as shown here when Linear Display is selected. Special Solution Display · "All " appears on the solution screen when the solution of an inequality is all numbers. x2 0 (INEQ) $(aX2 + bX + c)$ $(aX2 + bX + c 0)$ 1 0 0 Math · "NOT FOUND" appears on the solution screen when no solution exists for an inequality (such as X2 < 0).

Ratio Calculations (RATIO) (fx-95ES PLUS only) The RATIO Mode lets you determine the value of X in the ratio expression a : b = X : d (or a : b = c : X) when the values of a, b, c and d are known.

The following shows the general procedure for using RATIO. 1. Press (RATIO) to enter the RATIO Mode. 2. On the menu that appears, select the (a:b=X:d) or (a:b=c:X).

3. On the Coefficient Editor screen that appears, input up to 10 digits for each of the required values (a, b, c, d). · To solve 3 : 8 = X : 12 for X, for example, press in step 1, and then input the following for the coefficients (a = 3, b = 8, d = 12): 3 8 12 . · To change a coefficient value you already have input, move the cursor to the appropriate cell, input the new value, and then press . · Pressing will clear all of the coefficients to zero. E-24 Note: The following operations are not supported by the Coefficient Editor: , (M), (STO). Pol, Rec, and multi-statements also cannot be input with the Coefficient Editor. 4. After all the values are the way you want, press . · This displays the solution (value of X).

Pressing again will return to the Coefficient Editor. Important: A Math ERROR will occur if you perform a calculation while 0 is input for a coefficient. Changing the Ratio Expression Type Re-enter the RATIO Mode and select the ratio expression type you want from the menu that appears. Changing the ratio expression type causes the values of all Coefficient Editor coefficients to change to zero. RATIO Mode Calculation Examples To calculate X in the ratio 1 : 2 = X : 10 (RATIO) Math (a:b=X:d) 1 2 10 Math To calculate X in the ratio 1 : 2 = 10 : X (RATIO) Math (a:b=c:X) 1 2 10 Math Calculation Ranges, Number of Digits, and Precision The calculation range, number of digits used for internal calculation, and calculation precision depend on the type of calculation you are performing. Calculation Range and Precision Calculation Range Number of Digits for Internal Calculation 1 1099 to 9.999999999 1099 or 0 15 digits E-25 B Precision In general, 1 at the 10th digit for a single calculation. Precision for exponential display is 1 at the least significant digit. Errors are cumulative in the case of consecutive calculations. Function Calculation Input Ranges and Precision Functions DEG sinx RAD GRA DEG cosx RAD GRA DEG tanx sin1x cos1x tan1x sinhx coshx sinh1x cosh1x tanhx tanh1x logx/lnx 10x RAD GRA 0 0 0 0 0 0 0 0 0 0 Input Range x x x x x x 9 1 9 1 109 1010 109 1010 90.

/2. 100. 157079632.7 157079632.7 Same as sinx, except when x = (2n1) Same as sinx, except when x = (2n1) Same as sinx, except when x = (2n1) 1 9. 999999999 230.2585092 1099 x x x ex x ' x2 x 1 3' x x! nPr nCr Pol(x, y) Rec(r,) B x 4.999999999 1099 1 x 4.999999999 1099 0 x 9.999999999 1099 0 x 9. 999999999 101 0 x 9.999999999 1099 9.999999999 1099 x 99.99999999 9.999999999 1099 x 230.2585092 0 x 1 10100 x 1 1050 x 1 10100 ; x 0 x 1 10100 0 x 69 (x is an integer) 0 n 1 1010, 0 r n (n, r are integers) 1 0 1 {n!/(nr)!} 1 10100 n 1 1010, 0 r n (n, r are integers) n!/r! 1 10100 or 1 n!/(nr)! 1 10100 x , y 9.999999999 1099 x2 + y2 9.999999999 1099 0 r 9.999999999 1099 : Same as sinx E-26 °' " 1 10100; 0 b, c The display seconds value is subject to an error of ±1 at the second decimal place. x 1 10100 Decimal Sexagesimal Conversions 0°0´0 x 9999999°59´59 a , b, c xy y ' x x 0: 1 10100 ylogx 100 x = 0: y 0 x 0: y = n, m (m, n are integers) 2n+1 However: 1 10100 ylog x 100 y 0: x 0, 1 10100 1/x logy 100 y = 0: x 0 y 0: x = 2n+1, 2n+1 (m 0; m, n are integers) m However: 1 10100 1/x log y 100 Total of integer, numerator, and denominator must be 10 digits or less (including division marks).

a b/c RanInt#(a, b) a b; a , b 1 1010; b a 1 1010 · Precision is basically the same as that described under "Calculation Range and Precision", above. y, ·xy, x' 3 , x!, nPr, nCr type functions require consecutive internal calculation, which can cause accumulation of errors that occur with each calculation. · Error is cumulative and tends to be large in the vicinity of a function's singular point and inflection point. · The range for calculation results that can be displayed in form when using Natural Display is |x| 106. Note, however, that internal calculation error can make it impossible to display some calculation results in form. It also can cause calculation results that should be in decimal form to appear in form. Errors The calculator will display an error message whenever an error occurs for any reason during a calculation. There are two ways to exit an error message display: Pressing or to display the location of the error, or pressing to clear the message and calculation. Displaying the Location of an Error While an error message is displayed, press or to return to the calculation screen. The cursor will be positioned at the location where the error occurred, ready for input.

Make the necessary corrections to the calculation and execute it again. When you input 14 ÷ 0 2 = by mistake instead of 14 ÷10 14 0 2 2= Math Math (or) B E-27 Math 1 Clearing the Error Message While an error message is displayed, press to return to the calculation screen. Note that this also clears the calculation that contained the error. Error Messages Math ERROR Cause: · The intermediate or final result of the calculation you are performing exceeds the allowable calculation range. · Your input exceeds the allowable input range (particularly when using functions). · The calculation you are performing contains an illegal mathematical operation (such as division by zero). Action: · Check the input values, reduce the number of digits, and try again. · When using independent memory or a variable as the argument of a function, make sure that the memory or variable value is within the allowable range for the function. @@@ · Try splitting the calculation into two or more parts. @@Action: Make necessary corrections. @@Action: Narrow the table calculation range by changing the Start, End, and Step values, and try again. Argument ERROR Cause: A non-integer argument was input for the random number function (RanInt#). Action: Input only integers for the argument. Before Assuming Malfunction of the Calculator... Perform the following steps whenever an error occurs during a calculation or when calculation results are not what you expected. If one step does not correct the problem, move on to the next step. Note that you should make separate copies of important data before performing these steps. 1.

@@@@3. If the above steps do not correct your problem, press the key. @@@@For details about initialized settings, see "Configuring the Calculator Setup".

4. Initialize all modes and settings by performing the following operation: (CLR) (Setup) (Yes). Replacing the Battery A low battery is indicated by a dim display, even if contrast is adjusted, or by failure of figures to appear on the display immediately after you turn on the calculator. If this happens, replace the battery with a new one. Important: Removing the battery will cause all of the calculator's memory contents to be deleted. 1. Press (OFF) to turn off the calculator.

· To ensure that you do not accidentally turn on power while replacing the battery, slide the hard case onto the front of the calculator (fx-85ES PLUS). 2. Remove the cover as shown in the illustration and replace the battery, taking care that its plus (+) and minus () ends are facing correctly. Screw Screw Screw fx-82/95/350ES PLUS fx-85ES PLUS 3. Replace the cover.

4. Initialize the calculator: · Do not skip the above step! (CLR) (All) (Yes) Specifications Power Requirements: fx-82/95ES PLUS: AAA-size battery R03 (UM-4) 1 fx-350ES PLUS: AAA-size battery LR03 (AM4) 1 fx-85ES PLUS: Built-in solar cell; button battery LR44 (GPA76) 1 E-29 C Approximate Battery Life: fx-82/95ES PLUS: 17,000 hours (continuous display of flashing cursor) fx-350ES PLUS: 8,700 hours (continuous operation) fx-85ES PLUS: 3 years (based on one hour of operation per day) Power Consumption: 0.0002 W (fx-82/95/350ES PLUS) Operating Temperature: 0°C to 40°C (32°F to 104°F) Dimensions: fx-82/95/350ES PLUS: 13.8 (H) 80 (W) 162 (D) mm 1 /2 (H) 31/8 (W) 63/8 (D) fx-85ES PLUS: 11.1 (H) 80 (W) 162 (D) mm 3 /8 (H) 31/8 (W) 63/8 (D) Approximate Weight: fx-82/95/350ES PLUS: 100 g (3.

5 oz) including the battery fx-85ES PLUS: 95 g (3.4 oz) including the battery Frequently Asked Questions How can I perform input and display results the same way I did on a model that does not have Natural Textbook Display? Perform the following key operation: (SETUP) (LineIO). See "Configuring the Calculator Setup" on page E-5 for more information. How can I change a fraction form result to decimal form? How can I change a fraction form result produced by a division operation to decimal form? See "Toggling Calculation Results" on page E-9 for the procedure. What is the difference between Ans memory, independent memory, and variable memory? Each of these types of memory acts like "containers" for temporary storage of a single value. Ans Memory: Stores the result of the last calculation performed. Use this memory to carry the result of one calculation on to the next. Independent Memory: Use this memory to totalize the results of multiple calculations. Variables: This memory is helpful when you need to uses the same value multiple times in one or more calculations. What is the key operation to take me from the STAT Mode or TABLE Mode to a mode where I can perform arithmetic calculations? Press (COMP).

How can I return the calculator to its initial default settings? Perform the following operation: (CLR) (Setup) (Yes) When I execute a function calculation, why do I get a calculation result that is completely different from older CASIO calculator models? With a Natural Textbook Display model, the argument of a function that uses parentheses must be followed by a closing parenthesis. Failing to press after the argument to close the parentheses may cause unwanted values or expressions to be included as part of the argument. Example: (sin 30) + 15 Older (S-VPAM) Model: Natural Textbook Display Model: Failure to press 30 30 30 15 15 15 15.5 15.5 here as shown below will result in calculation of sin 45. 0.7071067812 C E-30 Manufacturer: CASIO COMPUTER CO., LTD. 6-2, Hon-machi 1-chome Shibuya-ku, Tokyo 151-8543, Japan Responsible within the European Union: CASIO EUROPE GmbH Casio-Platz 1 22848 Norderstedt, Germany This mark applies in EU countries only. SA0904-C .