

## Statistical Calculations

Perform the steps below to start a statistical calculation.

1. Press **MENU**, select the Statistics Mode icon, and then press **≡**.
2. On the Select Type screen that appears, select a statistical calculation type.

To select this type of statistical calculation:	Press this key:
Single-variable ( $x$ )	<b>1</b> (1-Variable)
Paired-variable ( $x, y$ ), linear regression	<b>2</b> ( $y=a+bx$ )
Paired-variable ( $x, y$ ), quadratic regression	<b>3</b> ( $y=a+bx+cx^2$ )
Paired-variable ( $x, y$ ), logarithmic regression	<b>4</b> ( $y=a+b \cdot \ln(x)$ )
Paired-variable ( $x, y$ ), $e$ exponential regression	<b>▼ 1</b> ( $y=a \cdot e^{(bx)}$ )
Paired-variable ( $x, y$ ), $ab$ exponential regression	<b>▼ 2</b> ( $y=a \cdot b^x$ )
Paired-variable ( $x, y$ ), power regression	<b>▼ 3</b> ( $y=a \cdot x^b$ )
Paired-variable ( $x, y$ ), inverse regression	<b>▼ 4</b> ( $y=a+b/x$ )

- Performing any of the above key operations displays the Statistics Editor.

**Note:** When you want to change the calculation type after entering the Statistics Mode, perform the key operation **OPTN 1** (Select Type) to display the calculation type selection screen.

## Inputting Data with Statistics Editor

Statistics Editor displays one, two, or three columns: single-variable ( $x$ ), single variable and frequency ( $x$ , Freq), paired-variable ( $x, y$ ), paired-variable and frequency ( $x, y$ , Freq). The number of data rows that can be input depends on the number of columns: 160 rows for one column, 80 rows for two columns, 53 rows for three 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 Statistics setting on the setup menu.
- Pressing the **AC** key while the Statistics Editor is on the screen will display a statistical calculation screen for performing calculations based on the input data. What you need to do to return to the Statistics Editor from the statistical calculation screen depends on the calculation type you selected. Press **OPTN 3** (Data) if you selected single-variable or **OPTN 4** (Data) if you selected paired-variable.

**Ex 1:** To select logarithmic regression and input the following data: (170, 66), (173, 68), (179, 75)

**OPTN 1** (Select Type) **4** ( $y=a+b \cdot \ln(x)$ )

	$x$	$y$	
1			
2			
3			

170  $\square$  173  $\square$  179  $\square$   $\blacktriangledown$   $\blacktriangleright$   
 66  $\square$  68  $\square$  75  $\square$

	x	y
1	170	66
2	173	68
3	179	75
4		

**Important:** All data currently input in the Statistics Editor is deleted whenever you exit the Statistics Mode, switch between the single-variable and a paired-variable statistical calculation type, or change the Statistics setting on the setup menu.

**To delete a line:** In the Statistics Editor, move the cursor to the line that you want to delete and then press  $\square$ .

**To insert a line:** In the Statistics Editor, move the cursor to the location where you want to insert the line and then perform the following key operation:  $\square$   $\square$  (Editor)  $\square$  (Insert Row).

**To delete all Statistics Editor contents:** In the Statistics Editor, perform the following key operation:  $\square$   $\square$  (Editor)  $\square$  (Delete All).

## Displaying Statistical Values Based On Input Data

From the Statistics Editor:

$\square$   $\square$  (1-Variable Calc or 2-Variable Calc)

From the statistical calculation screen:

$\square$   $\square$  (1-Variable Calc or 2-Variable Calc)

$\bar{x}$	=174
$\Sigma x$	=522
$\Sigma x^2$	=90870
$\sigma^2 x$	=14
$\sigma x$	=3.741657387
$s^2 x$	=21

## Displaying Regression Calculation Results Based On Input Data (Paired-Variable Data Only)

From the Statistics Editor:

$\square$   $\square$  (Regression Calc)

From the statistical calculation screen:

$\square$   $\square$  (Regression Calc)

$y=a+b \cdot \ln(x)$	
a=	-852.1627746
b=	178.6897969
r=	0.9919863213

## Obtaining Statistical Values from Input Data

You can use the operations in this section to recall statistical values assigned to variables ( $\sigma_x$ ,  $\Sigma x^2$ , etc.) based on the data you input with the Statistics Editor. You can also use the variables in calculations. The operations in this section are performed on the statistical calculation screen that appears when you press  $\square$  while the Statistics Editor is displayed. Supported statistical variables and the keys you should press to recall them are shown below. For single-variable statistical calculations, the variables marked with an asterisk (\*) are available.

**Summation:**  $\Sigma x^*$ ,  $\Sigma x^{2*}$ ,  $\Sigma y$ ,  $\Sigma y^2$ ,  $\Sigma xy$ ,  $\Sigma x^3$ ,  $\Sigma x^2 y$ ,  $\Sigma x^4$

$\square$   $\blacktriangledown$   $\square$  (Summation)  $\square$  to  $\square$

**Number of Items:**  $n^*$  / **Mean:**  $\bar{x}^*$ ,  $\bar{y}$  / **Population Variance:**  $\sigma_x^{2*}$ ,  $\sigma_y^2$  /

**Population Standard Deviation:**  $\sigma_x^*$ ,  $\sigma_y$  / **Sample Variance:**  $s_x^{2*}$ ,  $s_y^2$  /

**Sample Standard Deviation:**  $s_x^*$ ,  $s_y$

$\square$   $\blacktriangledown$   $\square$  (Variable)  $\square$  to  $\square$ ,  $\blacktriangledown$   $\square$  to  $\blacktriangledown$   $\square$

**Minimum Value:**  $\min(x)^*$ ,  $\min(y)$  / **Maximum Value:**  $\max(x)^*$ ,  $\max(y)$

When the single-variable statistical calculation is selected:

$\square$   $\blacktriangledown$   $\square$  (Min/Max)  $\square$ ,  $\square$

When a paired-variable statistical calculation is selected:

$\square$   $\blacktriangledown$   $\square$  (Min/Max)  $\square$  to  $\square$

**First Quartile:**  $Q_1^*$  / **Median:**  $\text{Med}^*$  / **Third Quartile:**  $Q_3^*$  (For single-variable statistical calculations only)

$\square$   $\blacktriangledown$   $\square$  (Min/Max)  $\square$  to  $\square$

**Regression Coefficients:**  $a, b$  / **Correlation Coefficient:**  $r$  / **Estimated Values:**  $\hat{x}, \hat{y}$

**OPTN** **▼** **4** (Regression) **1** to **5**

**Regression Coefficients for Quadratic Regression:**  $a, b, c$  / **Estimated Values:**  $\hat{x}_1, \hat{x}_2, \hat{y}$

**OPTN** **▼** **4** (Regression) **1** to **6**

- $\hat{x}, \hat{x}_1, \hat{x}_2$  and  $\hat{y}$  are commands of the type that take an argument immediately before them.

**Ex 2:** To input the single-variable data  $x = \{1, 2, 2, 3, 3, 3, 4, 4, 5\}$ , using the Freq column to specify the number of repeats for each items  $\{x_n; \text{freq}_n\} = \{1;1, 2;2, 3;3, 4;2, 5;1\}$ , and calculate the mean.

**SHIFT** **MENU** (SETUP) **▼** **3** (Statistics) **1** (On)

**OPTN** **1** (Select Type) **1** (1-Variable)

1 **≡** 2 **≡** 3 **≡** 4 **≡** 5 **≡** **▼** **▶**  
1 **≡** 2 **≡** 3 **≡** 2 **≡**

	x	Freq
2	2	2
3	3	3
4	4	2
5	5	1

**AC** **OPTN** **▼** **2** (Variable) **1** ( $\bar{x}$ ) **≡**

3

**Ex 3:** To calculate the logarithmic regression correlation coefficients for the following paired-variable data and determine the regression formula:  $(x, y) = (20, 3150), (110, 7310), (200, 8800), (290, 9310)$ . Specify Fix 3 (three decimal places) for results.

**SHIFT** **MENU** (SETUP) **▼** **3** (Statistics) **2** (Off)

**SHIFT** **MENU** (SETUP) **3** (Number Format) **1** (Fix) **3**

**OPTN** **1** (Select Type) **4** ( $y=a+b \cdot \ln(x)$ )

20 **≡** 110 **≡** 200 **≡** 290 **≡** **▼** **▶**  
3150 **≡** 7310 **≡** 8800 **≡** 9310 **≡**

	x	y
2	110	7310
3	200	8800
4	290	9310
5		

**AC** **OPTN** **▼** **4** (Regression) **3** ( $r$ ) **≡**

0.998

**AC** **OPTN** **▼** **4** (Regression) **1** ( $a$ ) **≡**

-3857.984

**AC** **OPTN** **▼** **4** (Regression) **2** ( $b$ ) **≡**

2357.532

## 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,  $x_1$  and  $x_2$ , in the case of quadratic regression) also can be calculated for a value of  $y$  in the regression formula.

**Ex 4:** To determine the estimate value for  $y$  when  $x = 160$  in the regression formula produced by logarithmic regression of the data in Ex 3. Specify Fix 3 for the result. (Perform the following operation after completing the operations in Ex 3.)

**AC** 160 **OPTN** **▼** **4** (Regression) **5** ( $\hat{y}$ ) **≡**

8106.898

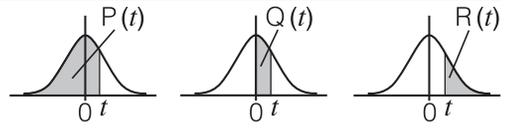
**Important:** Regression coefficient, correlation coefficient, and estimated value calculations can take considerable time when there are a large number of data items.

## Performing Normal Distribution Calculations

While single-variable statistical calculation is selected, you can perform normal distribution calculation using the functions shown below from the menu that appears when you perform the following key operation:

**OPTN** **▼** **4** (Norm Dist).

**P, Q, R:** These functions take the argument  $t$  and determine a probability of standard normal distribution as illustrated nearby.



**►t:** This function is preceded by the argument  $x$ . It calculates the standard variate for data value  $x$  using the mean value ( $\bar{x}$ ) and population standard deviation ( $\sigma_x$ ) of data input with Statistics Editor.

$$x \blacktriangleright t = \frac{x - \bar{x}}{\sigma_x}$$

**Ex 5:** For the single variable data in Ex 2, to determine the normalized variate when  $x = 2$ , and  $P(t)$  at that point.

AC 2 OPTN ▼ 4 (Norm Dist) 4 (►t) =

2►t	-0.8660254038
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OPTN ▼ 4 (Norm Dist) 1 (P) Ans ) =

P(Ans)	0.19324
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