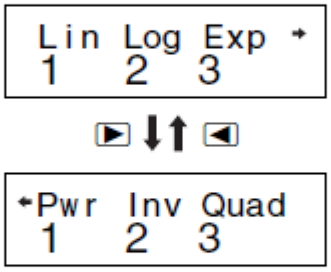
Regression Calculations REG

Use the MODE key to enter the REG Mode when you want to perform statistical calculations using regression.

REG ..... MODE 3 (fx-95MS)
MODE MODE 2 (Other Models)

- Entering the REG Mode displays screens like the ones shown below.



- Press the number key (1, 2, or 3) that corresponds to the type of regression you want to use.

1 (Lin): Linear regression
2 (Log): Logarithmic regression
3 (Exp): Exponential regression
▶ 1 (Pwr): Power regression
▶ 2 (Inv): Inverse regression
▶ 3 (Quad): Quadratic regression

- Always start data input with SHIFT CLR 1 (Scl) = to clear statistical memory.
- Input data using the key sequence shown below.
  <x-data> , <y-data> DT
- The values produced by a regression calculation depend on the values input, and results can be recalled using the key operations shown in the table below.

To recall this type of value:	Perform this key operation:
Σx^2	SHIFT S-SUM 1
Σx	SHIFT S-SUM 2
n	SHIFT S-SUM 3
Σy^2	SHIFT S-SUM ▶ 1
Σy	SHIFT S-SUM ▶ 2
Σxy	SHIFT S-SUM ▶ 3
$\bar{x}$	SHIFT S-VAR 1
$x\sigma_n$	SHIFT S-VAR 2
$x\sigma_{n-1}$	SHIFT S-VAR 3
$\bar{y}$	SHIFT S-VAR ▶ 1
$y\sigma_n$	SHIFT S-VAR ▶ 2
$y\sigma_{n-1}$	SHIFT S-VAR ▶ 3
Regression coefficient A	SHIFT S-VAR ▶ ▶ 1
Regression coefficient B	SHIFT S-VAR ▶ ▶ 2

Regression calculation other than quadratic regression	
Correlation coefficient r	SHIFT S-VAR ▶ ▶ 3
$\hat{x}$	SHIFT S-VAR ▶ ▶ ▶ 1
$\hat{y}$	SHIFT S-VAR ▶ ▶ ▶ 2

- The following table shows the key operations you should use to recall results in the case of quadratic regression.

To recall this type of value:	Perform this key operation:
Σx^3	SHIFT S-SUM ▶ ▶ 1
$\Sigma x^2 y$	SHIFT S-SUM ▶ ▶ 2
Σx^4	SHIFT S-SUM ▶ ▶ 3
Regression coefficient C	SHIFT S-VAR ▶ ▶ 3
$\hat{x}_1$	SHIFT S-VAR ▶ ▶ ▶ 1
$\hat{x}_2$	SHIFT S-VAR ▶ ▶ ▶ 2
$\hat{y}$	SHIFT S-VAR ▶ ▶ ▶ 3

- The values in the above tables can be used inside of expressions the same way you use variables.

• LInear Regression

- The regression formula for linear regression is: $y = A + Bx$.

- **Example:** Atmospheric Pressure vs. Temperature

Temperature	Atmospheric Pressure
10°C	1003 hPa
15°C	1005 hPa
20°C	1010 hPa
25°C	1011 hPa
30°C	1014 hPa

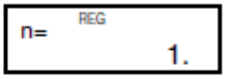
Perform linear regression to determine the regression formula terms and correlation coefficient for the data nearby. Next, use the regression formula to estimate atmospheric pressure at 18°C and temperature at 1000 hPa. Finally, calculate the coefficient of determination (r^2) and sample covariance $\left(\frac{\Sigma xy - n \cdot \bar{x} \cdot \bar{y}}{n-1}\right)$.

In the REG Mode:

[1] (Lin)

[SHIFT] [CLR] [1] (Scl) [=] (Stat clear)

10 [,] 1003 [DT]



Each time you press [DT] to register your input, the number of data input up to that point is indicated on the display (*n* value).

15 [,] 1005 [DT]

20 [,] 1010 [DT] 25 [,] 1011 [DT]

30 [,] 1014 [DT]

Regression Coefficient A = ***997.4*** [SHIFT] [S-VAR] [▶] [▶] [1] [=]

Regression Coefficient B = ***0.56*** [SHIFT] [S-VAR] [▶] [▶] [2] [=]

Correlation Coefficient *r* = ***0.982607368*** [SHIFT] [S-VAR] [▶] [▶] [3] [=]

Atmospheric Pressure at 18°C = ***1007.48*** 18 [SHIFT] [S-VAR] [▶] [▶] [▶] [2] [=]

Temperature at 1000 hPa = ***4.642857143*** 1000 [SHIFT] [S-VAR] [▶] [▶] [▶] [1] [=]

Coefficient of Determination = ***0.965517241*** [SHIFT] [S-VAR] [▶] [▶] [3] [x^2] [=]

Sample Covariance = ***35*** [(] [SHIFT] [S-SUM] [▶] [3] [−]
[SHIFT] [S-SUM] [3] [×] [SHIFT] [S-VAR] [1] [×]
[SHIFT] [S-VAR] [▶] [1] [)] [÷]
[(] [SHIFT] [S-SUM] [3] [−] 1 [)] [=]

• Logarithmic, Exponential, Power, and Inverse Regression

- Use the same key operations as linear regression to recall results for these types of regression.
- The following shows the regression formulas for each type of regression.

Logarithmic Regression	$y = A + B \cdot \ln x$
Exponential Regression	$y = A \cdot e^{B \cdot x}$ ($\ln y = \ln A + Bx$)
Power Regression	$y = A \cdot x^B$ ($\ln y = \ln A + B \ln x$)
Inverse Regression	$y = A + B \cdot {}^1/_x$

• Quadratic Regression

- The regression formula for quadratic regression is: $y = A + Bx + Cx^2$.
- **Example:**

x_i	y_i
29	1.6
50	23.5
74	38.0
103	46.4
118	48.0

Perform quadratic regression to determine the regression formula terms for the data nearby. Next, use the regression formula to estimate the values for $\hat{y}$ (estimated value of y) for xi = 16 and $\hat{x}$ (estimated value of x) for yi = 20.

In the REG Mode:

▶ 3 (Quad)

SHIFT CLR 1 (Scl) = (Stat clear)

29 , 1.6 DT 50 , 23.5 DT
74 , 38.0 DT 103 , 46.4 DT
118 , 48.0 DT

Regression Coefficient A = *–35.59856934* SHIFT S-VAR ▶ ▶ 1 =

Regression Coefficient B = *1.495939413* SHIFT S-VAR ▶ ▶ 2 =

Regression Coefficient C = *–6.71629667 × 10⁻³* SHIFT S-VAR ▶ ▶ 3 =

$\hat{y}$ when xi is 16 = *–13.38291067* 16 SHIFT S-VAR ▶ ▶ ▶ 3 =

$\hat{x}1$ when yi is 20 = *47.14556728* 20 SHIFT S-VAR ▶ ▶ ▶ 1 =

$\hat{x}2$ when yi is 20 = *175.5872105* 20 SHIFT S-VAR ▶ ▶ ▶ 2 =

Data Input Precautions

- DT DT inputs the same data twice.
- You can also input multiple entries of the same data using SHIFT ; . To input the data "20 and 30" five times, for example, press 20 , 30 SHIFT ; 5 DT.
- The above results can be obtained in any order, and not necessarily that shown above.
- Precautions when editing data input for standard deviation also apply for regression calculations.

Source:

Fx-570 MS user guide p. 28-32