

Statistics with a TI-89

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See the manual: p. 241-59

To do each of the following, first type

APPS

6. Data/Matrix Editor

3: New (if you are about to enter new data)

1: Current (if you have just entered the data)

2: Open (if you have entered several sets of data and want to chose which set to work with)

After you have set the parameters as directed below, it is necessary to key ENTER (sometimes twice) to save them. Follow the instructions on the screen.

(Or type 2nd MATH 6:Statistics and enter your data as a list.)

How to enter data

When defining a new entry use Data (not Matrix or List - list is for 1 variable data only).

Give the variable (the table of data) a useful name e.g. the problem number (Note a period "." is not allowed).

Name your columns (e.g. height, weight. This is optional.)

Enter the data. The easiest is to enter a column at a time.

How to calculate \bar{x} , S_x , σ_x , min, max, quartiles, median, etc. for 1 variable

In the Data/Matrix Editor screen key F5 Calc.

key 1: OneVar

Assuming the data has already been entered, name the variable if not already done, e.g. C1.

ENTER

The STAT VARS screen with the above values (& others) will appear.

The population standard deviation, σ_x , is calculated & stored, but not shown on the STAT VARS screen, so to see it you need to type σ_x in the entry line. Either type α (alpha s x or CHAR 1:Greek G:sigma x. and ENTER.

How to calculate \bar{x} , S_x , etc. for 2 variables

In the Data/Matrix Editor screen key F5 Calc.

key 2: TwoVar

name x & y

x = c1 (if it was entered in that column)

y = c2 (if it was entered in that column)

freq and Categories = no

ENTER

The STAT VARS screen with the above values (& others) for x & y will appear.

Unfortunately quartiles & the median are not calculated for TwoVar, so to get them you have to use OneVar

How to make a Boxplot p. 254

In the Data/Matrix Editor screen key F2 Plot Setup.

F1 Define

key 3: Box Plot

name x (the data you wish a boxplot for)

x = c1 (if it was entered in that column)

◆ GRAPH

If the boxplot is not displayed in the screen, use F2 9:ZoomData. If other graphs appear in the screen, deselect them. See "How to make a Scatterplot".

How to make a Histogram p. 255

In the Data/Matrix Editor screen key F2 Plot Setup.

F1 Define

key 4: Histogram

Set bucket (i.e. class) width. See below.

◆ GRAPH

If your histogram does not show up in the graph screen, F2 9:ZoomData will fit the window in x to your data, but better still use ◆ WINDOW to set xmin & xmax to round numbers corresponding to your chosen bucket size. For example, if you have 20 data points from 67 to 368, pick xmin = 0, xmax = 400 & bucket width = 50, giving 8 buckets or bucket width = 100, giving 4 buckets. Set ymin = 0 (The minimum number of data points in a given class is, of course, zero.. Set ymax = the maximum number of data points in one bucket (i.e. class). In our example this might be 6 (if for example there are 6 data points between 1 & 100). Note ymax is not 368. A data point at the class boundary, e.g. 100, is counted in the class to the right.

F3 Trace will tell you the minimum, maximum and height of a traced bar.

You may need to deselect other graphs or select your histogram. See "How to make a Scatterplot".

How to make a Scatterplot p. 252, 254

In the Data/Matrix Editor screen key F2 Plot Setup.

F1 Define

key 1 Scatter

name x & y

x = c1 (if it was)

y = c2 (if it was)

Freq and Categories = no (Normally. Categories allow analyzing & graphing clusters separately as in Moore fig 2.16)

◆ GRAPH.

You may need to zoom with F2 9:ZoomData.

You may need to select your regression line or deselect another previously selected equation. Use ◆ F1 and then F4 to select or deselect as needed.

F3 Trace ◀ or ▶ will read out each data point. ▲ or ▼ will toggle back and forth between the scatterplot and the regression line or lines.

With the trace on the regression line, keying a value for x will give the predicted y value for that x, i.e. y-hat.

How to fit a regression line

In the Data/Matrix Editor screen key F5 Calc.

You can choose the following regression equations: 3: cubic, 4: exponential, 5: linear 6: logarithmic, 7: MedMed, 8: power law, 9: quadratic, A: quartic, B: sinusoid or C: logistic. See p. 249-50 for an explanation of each of these types. Key whichever you wish to try. Once the data is keyed in, trying several different fits is very quick and easy. The one with the R^2 closest to 1 is the best fit. Unfortunately R^2 is defined only for polynomial regressions, i.e. cubic, linear, quadratic & quartic.

So that you can plot the line on top of your scatterplot store RegEQ (the regression equation whose parameters the grapher is about to calculate) to y1(x) or whatever equation number you want the equation stored to.

Key ENTER.

See p. 251 for an explanation of the parameters displayed in the STAT VARS screen, which now appears.

To recall the most recently calculated STAT VARS screen, key ShowStat, which is in Catalog, in the entry line or key F7 in the Data/Matrix Editor screen.

For a linear regression $y = ax + b$ (In Moore a & b have the exact opposite definitions.) a, b, r (called "corr") and r^2 (called "R²") are displayed.

How to calculate and plot Residuals

Suppose you have x stored in c1 and y stored in c2 in the Data/Matrix Editor.

Do a regression using your favorite fit e.g. LinReg.

In F5 Calc key store RegEQ (the regression equation whose parameters the grapher is about to calculate) to y1(x) or whatever equation number you want the equation stored to.

Name c3 y-hat and c4 resid, i.e. type this in the boxes above c3 and c4.

Highlight the box which says c3. Key in (c3 =) y1(c1). ENTER The values of y-hat will appear in column c3.

Highlight the box which says c4. Key in (c4 =) c2 - c3. ENTER The values of the residuals will appear in column c4.

To plot the residuals:

In the Data/Matrix Editor screen key F2 Plot Setup

F1 Define

Highlight plot 2, if you don't want to delete plot 1, which presumably was the x, y scatterplot.

Plot type = Scatter

x = c1

y = c4 (the residuals)

◆ Graph

You can repeat the above for a different regression, e.g. cubic, and when defining plot 3 choose a different mark,

(e.g. box, cross, plus, square or dot). By selecting both plots 2 & 3 you can then display the residuals for the two regressions on the same screen and decide visually which is the better fit.

How to calculate $E(X)$ and σ

$\mu \equiv E(X) \equiv \Sigma[X P(X)]$. $\sigma^2 \equiv \Sigma[(X-\mu)^2 P(X)]$. See Moore p. 258 & 260, which uses slightly different symbols.

Enter your variable, X, in c1. Enter the corresponding probability of the variable, P(X), in c2. Highlight the box which says c3. Define (c3 =) c1 × c2. The values of X P(X) will now appear in c3. Run a OneVar analysis of c3 to get μ . The $\Sigma\xi$ listed in the STAT VARS screen is μ . Highlight the box which says c4. Define (c4 =) (c1 - μ)² × c2. (You type in the number you just found for μ , not the symbol, of course.) Run a OneVar analysis of c4 to get σ^2 . The Σx listed in the STAT VARS screen is σ^2 .

$\sigma = \sqrt{\sigma^2}$. Also see p. 238, 507.

To calculate s, the Standard Error about the Least Squares Line

Set F1 Tools 9: Format Results -> Editor: YES, then when you calculate the linear regression equation, the residuals will be stored in a list called resid.

To calculate s (if, for example, n = 16)

$s = \sqrt{((1/14) \times \text{sum}(\text{statvars}\backslash\text{resid}^2))}$

To get sum(key 2nd math 3: list 6: sum(.

To get statvars\resid key

2nd VAR-LINK

2 (to go to the r's)

Highlight resid

key ENTER