Statistics Functions

The HP-12C calculator provides functions to perform one or two variable statistical calculations. The data samples are entered into the calculator using the **[Σ+]** key, which automatically calculates statistics sums and store them in the Storage Registers from 1 to 6 (called the "Statistics Registers"):

Register	Sum	Description
1	**n**	Number of data samples.
2	**Σx**	Summation of x-values.
3	**Σx^2**	Summation of squares of x-values.
4	**Σy**	Summation of y-values.
5	**Σy^2**	Summation of squares of y-values.
6	**$\Sigma x \cdot y$**	Summation of products of x and y-values.

One Variable Statistics

In one-variable statistical calculations, enter each data point (the "X-value") by keying in the X-value and pressing **[Σ+]**. Each time you press **[Σ+]** the calculator does the following:

- Adds 1 to the number in R_1 and displays the number of samples entered.
- The X-value is added to the number in R_2.
- The square of the X-value is added to R_3.

Two Variable Statistics

In two-variable statistical calculations, enter each data pair (the "X and Y-values") by typing the Y-value into the display and pressing **[ENTER]** (or **[=]** in ALG mode), then type in the X-value and press **[Σ+]**. Each time you press **[Σ+]** the calculator does the following:

- Adds 1 to the number in R_1 and displays the number of samples entered.
- The X-value is added to the number in R_2.
- The square of the X-value is added to R_3.
- The Y-value is added to the number in R_4.
- The square of the Y-value is added to R_5.
- The product of the X and Y-values is added to R_6.

The functions keys involved in the statistics calculations are:

Keys	Description
[g] [ẋ]	Calculates the means (arithmetic averages) of the X and Y-values. The mean of the X-values appears in the display; to display the mean of the Y-values, press **[X⇆Y]**.
[g] [s]	Calculates the standard deviation of the X and Y-values. The standard deviation of the X-values appears in the display. To display the standard deviation of the Y-values, press **[X⇆Y]**.
[g] [ẋ,r]	Calculates a linear estimation of a new X-value given a Y-value. The new X-value appears in the display. To display the correlation coefficient (R^2) of the regression, press **[X⇆Y]**.
[g] [ẏ,r]	Calculates a linear estimation of a new Y-value given an X-value. The new Y-value appears in the display. To display the correlation coefficient (R^2) of the regression, press **[X⇆Y]**.
[g] [ẋ,w]	Calculates the weighted mean of the Y-values with the corresponding weights of X-values.
[RCL] [Σ+]	Recalls the content of R_4 (∑y values) to the stack-Y and R_2 (∑x values) to the stack-X
[f] clear [Σ]	Clears the statistic registers R_1 to R_6 and the stack.

As a special feature, the RLM's 12C calculators have a special tool to perform additional regression calculations. To show it, press the OPT key, touch the "Statistics" menu button and select the "Regresson Model" option.

Correcting Accumulated Statistics:
If the data was entered incorrectly, the accumulated statistics can easily be corrected. Simply key in the incorrect data point or data pair again and press [g] [Σ-] to subtract the incorrect data from the statistic registers. Then enter the correct data point or data pair and press **[Σ+]**. Each time you press [g] [Σ-] the calculator does the following:

- Subtracts 1 from the number in R_1 displaying the new number of samples.
- The x-value is subtracted from the number in R_2.
- The square of the x-value is subtracted from R_3.
- The y-value is subtracted from the number in R_4.
- The square of the y-value is subtracted from R_5.
- The product of the x and y-values is subtracted from R_6.

As a special feature, the RLM's 12C "Pro" versions have a more convenient tool to enter or edit data samples. To show it, press the OPT key, touch the "Statistics" menu button and select the "X,Y Data Editor" option.

Example of Statistic Calculations

Enter the following data samples :

Salesman	Hours / Week	Sales / Month
1	32	$17,000
2	40	$25,000
3	45	$26,000
4	40	$20,000
5	38	$21,000
6	50	$28,000
7	35	$15,000

To enter the data, follow this sequence:

Keystrokes	Display	Comment
[f] clear [REG]	0	Clears statistics registers.
“32” **[Enter]** “17000” **[Σ+]**	1	First sample entry.
“40” **[Enter]** “25000” **[Σ+]**	2	Second sample entry.
“45” **[Enter]** “26000” **[Σ+]**	3	Third sample entry.
“40” **[Enter]** “20000” **[Σ+]**	4	Fourth sample entry.
“38” **[Enter]** “21000” **[Σ+]**	5	Fifth sample entry.
“50” **[Enter]** “28000” **[Σ+]**	6	Sixth sample entry.
“35” **[Enter]** “15000” **[Σ+]**	7	Seventh sample entry.

Based on the data entered, calculate:

- How many hours the average salesman worked each week?
- How much did the average salesman sell each month?
- What is the standard deviation of sales?
- What is the standard deviation of hours worked?
- What are the estimated sales for a 48-hour workweek? How accurate is that approximation?
- What are the total hours worked per week and the total sales per month?

Keystrokes to find the answers **(RPN or ALG mode)**

Keystrokes	Display	Comment
[g] [ẋ]	21,714.29	Mean sales per month.
[X⇆Y]	40	Mean workweek in hours.
[g] [s]	4,820.59	Standard deviation of sales.
[X⇆Y]	6.03	Standard deviation of hours.
"48" [g] [ẋ,r]	28,818.93	Estimated sales for 48 hour workweek.
[X⇆Y]	0.9	R2 = 0.9 -> good estimation.
[RCL] [Σ+]	152,000	Total sales (∑x).
[X⇆Y]	280	Total hours (∑y).

What is the linear equation that represents the relation between hours per week and sales per month? (Straight line equation of the form y = mx + b)

Keystrokes:

Keystrokes	Display	Comment
"0" [g] [ẏ,r]	**15.55**	Calculates the y intercept (the value of y when x = 0) which is coefficient "b".
"1" [g] [ẏ,r]	15.55	Calculates the value of y when x = 1.
RPN mode: [X⇆Y] [R↓] [X⇆Y] [-]	**0.001**	The difference between the first two values for y is the slope (coefficient "m").
ALG mode: [X⇆Y] [R↓] [-] [X⇆Y] [=]		

Finally, the equation is: **y = 0.001x + 15.55**

Example: Weighted Mean
In a trip a car was loaded with 15 gallons of gasoline at $1.16 per gallon, 7 gallons at $1.24 per gallon, 10 gallons at $1.20 per gallon, and 17 gallons at $1.18 per gallon. What was the average cost per gallon?

Keystrokes to get the answer:

Keystrokes	Display	Comment
[f] clear [REG]	0	Clears statistics registers.
"1.16" **[Enter]**"15" **[Σ+]**	1	First sample entry.
"1.24" **[Enter]**"7" **[Σ+]**	2	Second sample entry.
"1.2" **[Enter]**"10" **[Σ+]**	3	Third sample entry.
"1.18" **[Enter]**"17" **[Σ+]**	4	Fourth sample entry.
[g] [ẋ,w]	**1.19**	Calculates the weighted mean => average cost per gallon.