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	Σx²	Summation of squares of x-values.
4	Σy	Summation of y-values.
5	Σy²	Summation of squares of y-values.
6	Σx·y	Summation of products of x and y-values.

One Variable Statistics

In <u>one-variable</u> 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 <u>two-variable</u> statistical calculations, enter each data pair (the "X and Y-values") by typing the Y-value into the display and pressing **[ENTER]**, 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 ($\sum y$ values) to the stack-Y and R_2 ($\sum x$ values) to the stack-X
[f] clear [Σ]	Clears the statistic registers R_1 to R_6 and the stack.

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.

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

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 work-week.
[X≤Y]	0.9	R2 = 0.9 -> good estimation.
[RCL] [Σ+]	152,000	Total sales (Σx).
[X≤Y]	280	Total hours (Σy).

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.
[X≤Y] [R↓] [X≤Y] [-]	**0.001**	The difference between the first two values for y is the slope (coefficient "m").

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] [x̄,w]	**1.19**	Calculates the weighted mean => average cost per gallon.