



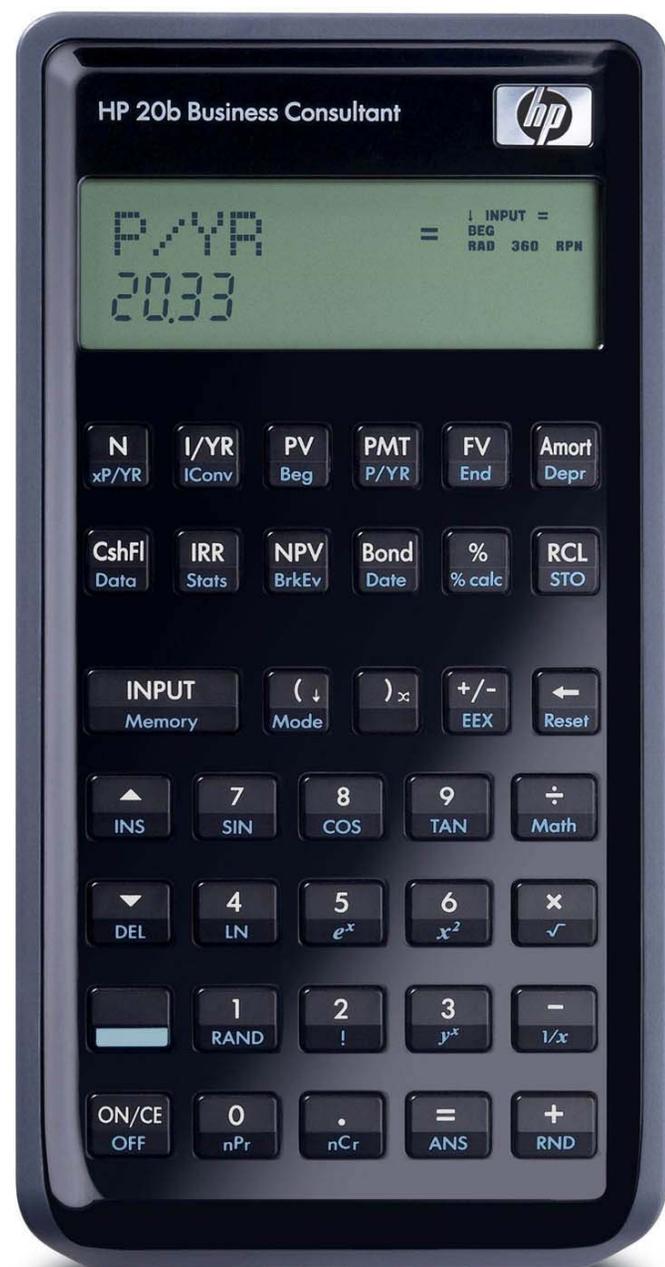
hp calculators

HP 20b Statistics

Averages and standard deviations

Statistics on the HP 20b

Practice solving problems involving averages and standard deviations



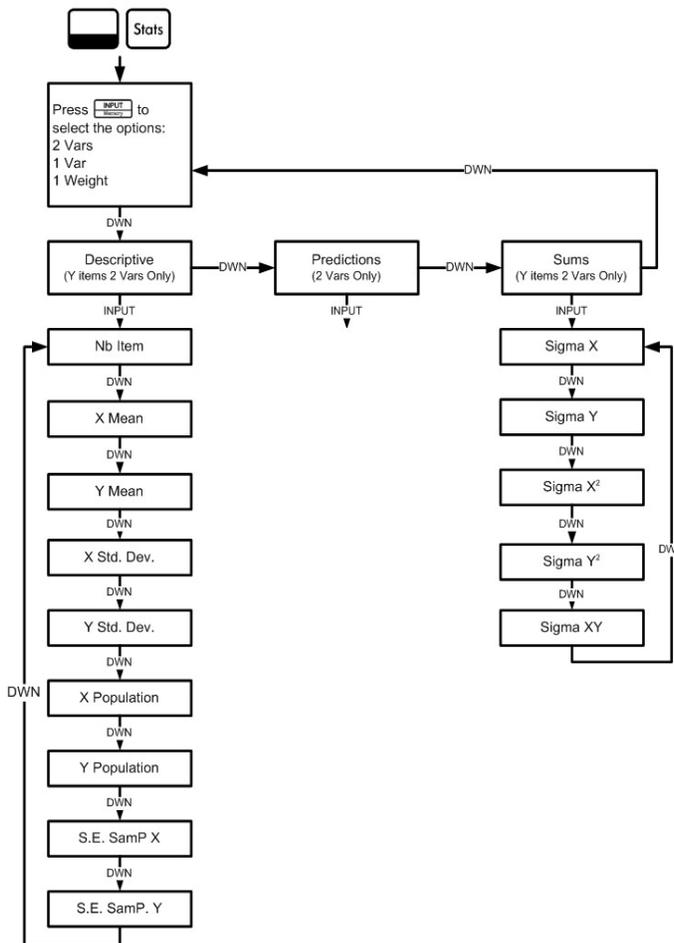
Averages and standard deviations

The average is defined as the sum of all data points divided by the number of data points included. It is a measure of central tendency and is the most commonly used measure.

The standard deviation is a measure of dispersion around a central value. To compute the standard deviation, the sum of the squared differences between each individual data point and the average of all the data points is taken and then divided by the number of data points included (or, in the case of sample data, the number of data points included minus one). The square root of this value is then taken to obtain the standard deviation. The property of the standard deviation is such that when the underlying data is normally distributed, approximately 68% of all values will lie within one standard deviation on either side of the mean and approximately 95% of all values will lie within two standard deviations on either side of the mean. This has application to many fields, particularly when trying to decide if an observed value is unusual by being significantly different from the mean.

Statistics on the HP 20b

The HP 20b has many built-in statistics functions that apply to finding averages, standard deviations, standard error of the means as well as linear regression, correlation, and covariance. The HP 20b also accumulates many statistical sums for your use. Many of the HP 20b statistics functions are found in the  Stats menu., shown in the menu map below. The portion of the menu map for predictions is not shown in this map, since it is covered in a separate learning module.



The data the statistics functions use for computations must be entered first by pressing  Data. If you enter the stats menu before you have entered any data, you will automatically be placed in the data menu. In this menu, enter a list of x values for one-variable statistics, a list of pairs, (x, y) for two-variable statistics, or a list of pairs, (x, y) for weighted, one-variable statistics, where the y values would be the weights. To enter data, key in a number and press  INPUT. To enter a list of x values only, press  INPUT  INPUT to bypass the entry of y values. To review the data items that are in the data menu, you can press  or  to scroll through the values. To clear the data menu while in the menu, press  Reset  INPUT, followed by pressing  ON/CE. To simply exit the menu, press  ON/CE.

When you press  Stats, your first choice needs to be the type of statistics you will be analyzing: 2 Variable, 1 Variable, or 1 Weight. Press  INPUT to scroll through the options. When the option you wish to use is displayed, press  to enter the second level of the menu, where you will need to choose descriptive, predictions, or sums by pressing  to move between the choices and by pressing  INPUT when the choice you want is displayed.

In this learning module, we will focus on the descriptive and sums choices of the stats menu.

HP 20b Statistics

The table below explains each of the entries in the Statistics – Descriptive sub-menu in more detail. Each of these menu items is input only.

HP 20b Statistics Menu – Descriptive Sub-Menu items

Item	Description
Nb Item	The number of data values entered in the data menu.
X Mean	The arithmetic average of the X values
Y Mean	The arithmetic average of the Y values
X Std. Dev	The sample standard deviation of the X values. Uses n-1 in the denominator.
Y Std. Dev	The sample standard deviation of the Y values. Uses n-1 in the denominator.
X Population Dev	The sample standard deviation of the X values. Uses n in the denominator.
Y Population Dev	The sample standard deviation of the X values. Uses n in the denominator.
S.E.Samp.X	The standard error of the sample X mean. Computed as the sample standard deviation of the X values divided by the square root of the number of X items in the data menu.
S.E.Samp.Y	The standard error of the sample Y mean. Computed as the sample standard deviation of the Y values divided by the square root of the number of Y items in the data menu.

The table below explains each of the entries in the Statistics – Sums sub-menu in more detail. Each of these menu items is input only.

HP 20b Statistics Menu – Sums Sub-Menu items

Item	Description
ΣX	The sum of all the X values in the data menu.
ΣY	The sum of all the Y values in the data menu.
ΣX^2	The sum of all the squared X values in the data menu.
ΣY^2	The sum of all the squared Y values in the data menu.
ΣXY	The sum of all the X values multiplied by the corresponding Y values in the data menu.

Practice solving problems involving averages and standard deviations

Example 1: The sales price of the last 10 homes sold in the Parkdale community were: \$198,000; \$185,000; \$205,200; \$225,300; \$206,700; \$201,850; \$200,000; \$189,000; \$192,100; \$200,400. What is the average of these sales prices and what is the sample standard deviation? Would a sales price of \$240,000 be considered unusual in the same community? Since this is one-dimensional data, use the 1-Var choice in the Stats menu.

Solution:



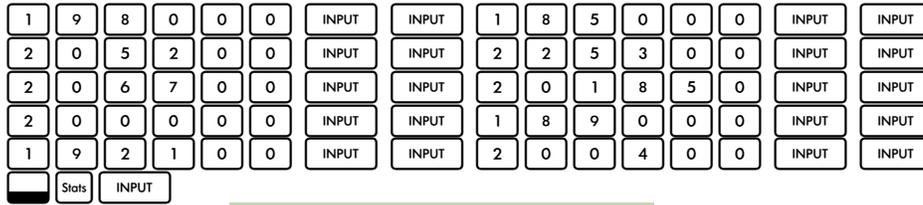


Figure 1



Figure 2



Figure 3



Figure 4

Answer: The average sales price is \$200,355 and the sample standard deviation is \$11,189. Within two standard deviations on either side of this average, in this case between \$177,977 and \$222,733, 95% of all home sales prices should fall. If a home were to sell for \$240,000 in this area, it would be an unusual event using this quick measure.

Example 2: Assuming the data from Example 1 is still in the HP 20b, what is the standard error of the mean?

Solution:



Figure 5

Answer: The standard error of the mean of the x values is \$3,538.29.

Example 3: Assuming the data from Examples 1 and 2 are still in the HP 20b, what were the sums of the X values and the squared X values?

Solution: To get to the Sums sub-menu, re-enter the Stats menu.





Figure 6



Figure 7



Figure 9

Answer: The sum of the X values is 2,003,550 and the sum of the squared X values is 402,548,012,500.