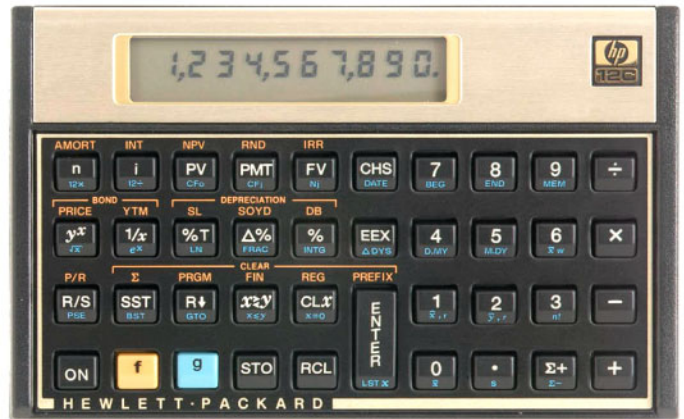




hp calculators

HP 12C Statistics - Weighted mean



Weighted mean

HP12C weighted mean

Practice finding average price sales

Practice finding averages and standard deviations with two variables

Weighted mean

Statistics can be understood as a set of tools that involves the study of methods and procedures used for collecting, classifying, and analyzing data. Statistical tools also offer the means for making scientific inferences from such resulting summarized data.

In a simple average, the individual values are added together and divided by the number of values involved. In effect, each value's weight or contribution to the average is $1/n$, where n is the number of values in the sample. Comparatively, a weighted mean is an average computed by giving different weights to some of the individual values. For example, a simple average of the three numbers 5, 10 and 15 applies an equal weight ($1/3$) to each value and the resulting average is 10. A weighted mean or average might apply a weight of 50% to the 5 and 25% to each of the 10 and 15, resulting in a weighted average of 8.75. There are many situations where a weighted average computation saves a great deal more time than using a simple average approach. More generally, given a set of collected data where repeating values v_n occur k_n times (weight), the weighted mean is computed as:

$$\bar{x}_w = \frac{\sum (k_n \times v_n)}{\sum k_n}$$

Figure 1

HP12C weighted mean

On the HP12C, statistics data are stored as a set of summations resulting from the originally collected data. The collected data set must be typed in prior to using any statistics features available in the HP12C because all statistics functions use values produced during the summations. The weighted mean is computed with the use of the $\boxed{g} \boxed{\bar{x}w}$ key and the contents of two of the summations are used.

$$\bar{x}_w = \frac{\sum wx}{\sum w}$$

Figure 2

where:

- x is the repeating value
- w is the number of occurrences of x (weight)
- \bar{x}_w is the weighted mean

Practice finding weighted mean of sale prices

Example 1: A big mall wants to know the weighted mean of the sales price of 2,000 units of one product that had its final price adjusted according to the first ten days of sales. The table below summarizes the relation between final price and number of sold units.

Price per unit	# of sold units	Price per unit	# of sold units
\$24.20	354	\$24.14	288
\$24.10	258	\$24.06	240
\$24.00	209	\$23.95	186
\$23.90	133	\$23.84	121
\$23.82	110	\$23.75	101

Figure 3

Compute both the average price and the weighted average sales price of this product.

Solution: Be sure to clear the statistics / summation memories before starting the problem.

f Σ



Figure 4

Regular averages and weighted averages can both be computed from the same accumulated data in the HP12C, provided the order of the values is correctly entered: value Σ weight.

2 4 . 2 0 ENTER 3 5 4 Σ +



Figure 5

The remaining values and their weights are entered the same way.

2 4 . 1 4 ENTER 2 8 8 Σ + 2 4 . 1 0 ENTER 2 5 8 Σ +
 2 4 . 0 6 ENTER 2 4 0 Σ + 2 4 . 0 0 ENTER 2 0 9 Σ +
 2 3 . 9 5 ENTER 1 8 6 Σ + 2 3 . 9 0 ENTER 1 3 3 Σ +
 2 3 . 8 4 ENTER 1 2 1 Σ + 2 3 . 8 2 ENTER 1 1 0 Σ +
 2 3 . 7 5 ENTER 1 0 1 Σ +



Figure 6

To compute the weighted mean of the sales price:

9 \bar{x}_w



Figure 7

To compute the mean price:

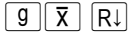


Figure 8

Answer: Although the average price for this product is \$23.98, the weighted mean for the sales occurred in the first ten days was \$24.03. Note that the **R↓** key is pressed because the value that appears in the display after **g** **x̄** is pressed is the mean of the weights and is of no use in this example.

Example 2: Estimating fuel costs during a vacation drive allows better planning for the next trips. The weighted mean is a better reference for computing the actual average when purchasing gasoline in gas stations with different prices per gallon. The table below refers to a regular vacation trip and relates the purchased gasoline (weight) in gallons to price per gallon (value).

Qty of gas (gallons)	Price per gallon	Qty of gas (gallons)	Price per gallon
12	\$1.26	9	\$1.32
13	\$1.20	29	\$1.12
31	\$1.18	13	\$1.25

Figure 9

Based on these values, compute both the weighted mean and the average cost per gallon of gasoline purchased.

Solution: Be sure to clear the statistics / summation memories before starting the problem.

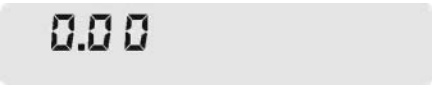


Figure 10

Regular averages and weighted averages can both be computed from the same accumulated data in the HP12C, provided the order of the values is correctly entered: value **ENTER** weight.

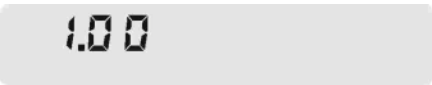


Figure 11

The remaining values and their weights are entered the same way.

$1 \cdot 32$ ENTER $9 \Sigma+$
 $1 \cdot 20$ ENTER $13 \Sigma+$
 $1 \cdot 12$ ENTER $29 \Sigma+$
 $1 \cdot 18$ ENTER $31 \Sigma+$
 $1 \cdot 25$ ENTER $13 \Sigma+$

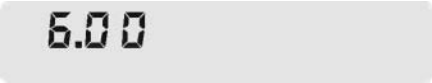


Figure 12

To compute the weighted mean of the purchased gasoline:

$g \bar{x}_w$

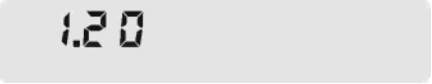


Figure 13

To compute the mean price of the gasoline:

$g \bar{x} R\downarrow$



Figure 14

Answer: Although the mean price of gasoline is \$1.22 per gallon, the weighted mean for this trip was \$1.20 per gallon. Note that the $R\downarrow$ key is pressed because the value that appears in the display after $g \bar{x}$ is pressed is the mean of the weights and is of no use in this example.