How to calculate weighted standard deviation in Excel

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December 9, 2025

The **weighted standard deviation** is a useful way to measure of values in a dataset when some values in the dataset have higher weights than others.

The formula to calculate a weighted standard deviation is:

$$\sqrt{\frac{\sum_{i=1}^{N} w_i(x_i - \bar{x}^*)^2}{\frac{(M-1)}{M}\sum_{i=1}^{N} w_i}},$$

where:

N: The total number of
M: The number of non-zero weights
wi: A vector of weights
xi: A vector of data values
x: The weighted mean

The following step-by-step example shows how to calculate a weighted standard deviation in Excel.

Step 1: Create the Data

First, let's create a column of data values along with their weights:

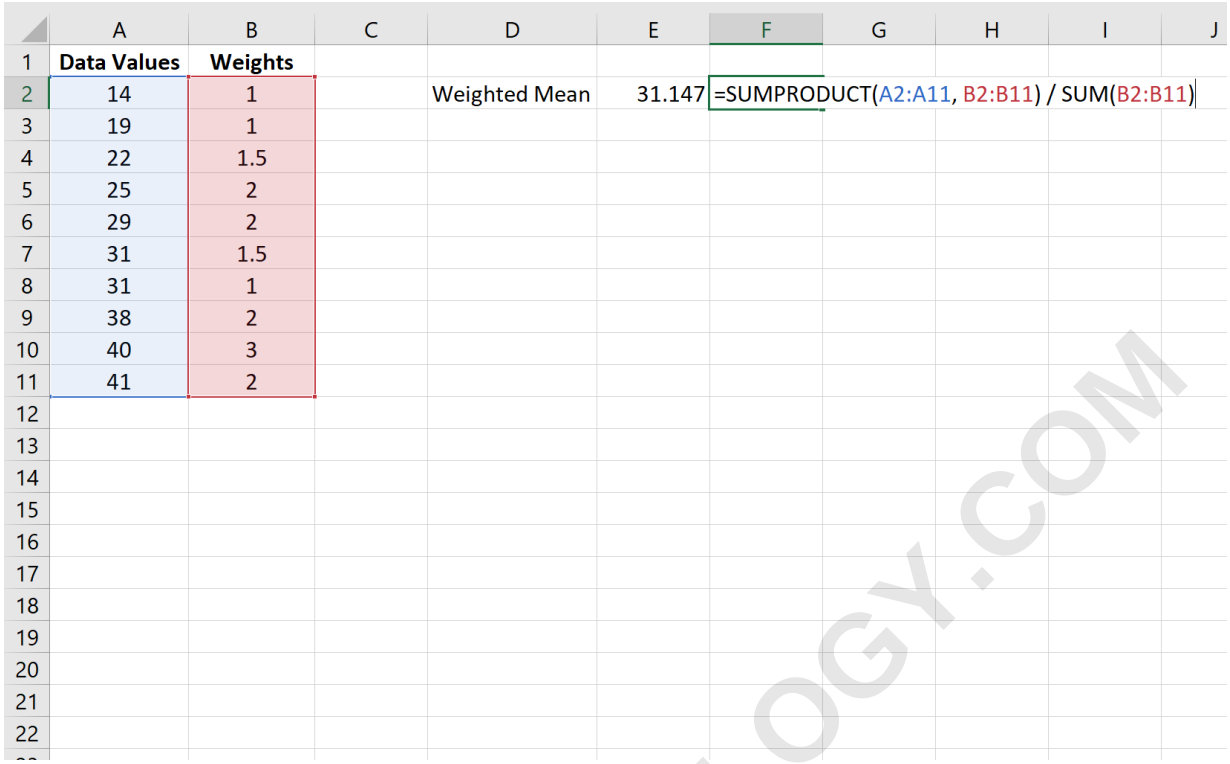
	A	B	C	D	E	F
1	**Data Values**	**Weights**				
2	14	1				
3	19	1				
4	22	1.5				
5	25	2				
6	29	2				
7	31	1.5				
8	31	1				
9	38	2				
10	40	3				
11	41	2				
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

Step 2: Calculate the Weighted Mean

Next, we can use the following formula to calculate the weighted mean:

=SUMPRODUCT(A2:A11, B2:B11) / SUM(B2:B11)

The weighted mean turns out to be **31.147**:



	A	B	C	D	E	F	G	H	I	J
1	**Data Values**	**Weights**								
2	14	1		Weighted Mean	31.147	=SUMPRODUCT(A2:A11, B2:B11) / SUM(B2:B11)				
3	19	1								
4	22	1.5								
5	25	2								
6	29	2								
7	31	1.5								
8	31	1								
9	38	2								
10	40	3								
11	41	2								
12										
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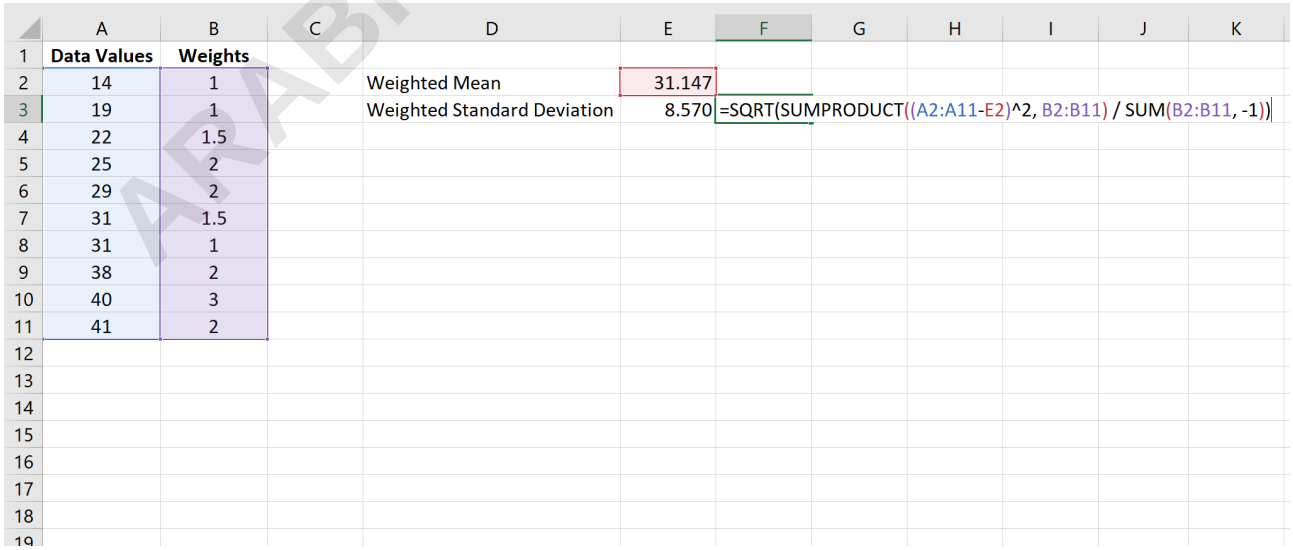
Step 3: Calculate the Weighted Standard Deviation

Next, we can use the following formula to calculate the weighted standard deviation:

=SQRT(SUMPRODUCT((A2:A11-E2)^2, B2:B11) / SUM(B2:B11, -1))



	A	B	C	D	E	F	G	H	I	J	K
1	**Data Values**	**Weights**									
2	14	1		Weighted Mean	31.147						
3	19	1		Weighted Standard Deviation	8.570	=SQRT(SUMPRODUCT((A2:A11-E2)^2, B2:B11) / SUM(B2:B11, -1))					
4	22	1.5									
5	25	2									
6	29	2									
7	31	1.5									
8	31	1									
9	38	2									
10	40	3									
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And if you'd like to calculate the weighted variance, it's simply 8.5702 = **73.44**.