

Excel #15: Weighted Averages (SumProduct function)

Averages and sums are straightforward to compute in Excel. Just use the sigma (Σ) icon or the Sum or Average functions. But some situations are more complex and require that values be weighted. As a simple example, consider a survey that asks people to evaluate a product with one of five responses: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1). You ran the survey and obtained the following responses which you entered into an Excel worksheet.

	5	4	3	2	1	
	SA	A	N	D	SD	Wtd Avg
Google	71	37	12	5	1	
Bing	65	43	27	8	4	
Yahoo	32	55	45	32	12	

If you add up the entries for the first row (Google) you will get 126. The weighted average for that row would be computed as:
 $5*71 / 126 + 4*37 / 126 + 3*12 / 126 + 2*5 / 126 + 1*1 / 126 = 4.365$

You could write the formula to compute that value but Excel has a function to make this process easier.

First, simplify the computation by noting that the divisor (126) is the same in each case so it can be handled at the end:

$$(5*71 + 4*37 + 3*12 + 2*5 + 1*1) / 126$$

The value for 126 can be computed using the Sum function.

The value for the numerator can be computed using the SumProduct function which does just what its name implies: Multiply pairs of numbers then add everything up.

It works on two arrays (rows in this example). The first two arrays are highlighted. The function multiplies the first number in the first row by the first number in the second row (5 and 71). It does the same for the second pair of numbers and keeps the running total. The formula actually supports more than two arrays (up to 255) for multiplication.

Assuming the Google entries are on Row 3, starting with Column A, the formula is:
`=SumProduct(B1:F1, B3:F3)/Sum(B3:F3)`

Because the row of weights are fixed (\$) the formula can be copied to the other two rows. With Office 2010 or later you can also insert a small Spark Lines chart to obtain:

	5	4	3	2	1	
	SA	A	N	D	SD	Wtd Avg.
Google	71	37	12	5	1	4.365079 
Bing	65	43	27	8	4	4.068027 
Yahoo	32	55	45	32	12	3.357955 