

# How can I easily calculate the dot product in Google Sheets?

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The dot product is a mathematical operation used to find the scalar quantity of two vectors. In Google Sheets, this can be easily calculated by using the "DOTPRODUCT" function. This function takes two arrays of numbers as inputs and returns the dot product value. Simply enter the function, followed by the two arrays, and press enter to get the result. This makes it convenient and efficient to calculate the dot product in Google Sheets for various mathematical and data analysis tasks.

## Easily Calculate the Dot Product in Google Sheets

This tutorial explains how to calculate the dot product in Google Sheets.

What is the Dot Product?

Given vector  $a =$  and vector  $b =$  , the dot product of vector  $a$  and vector  $b$ , denoted as  $a \cdot b$ , is given by:

$$a \cdot b = a_1 * b_1 + a_2 * b_2 + a_3 * b_3$$

For example, if  $a =$  and  $b =$  , then the dot product of  $a$  and  $b$  would be equal to:

$$a \cdot b = 2*4 + 5*3 + 6*2$$

$$a \cdot b = 8 + 15 + 12$$

$$a \cdot b = 35$$

In essence, the dot product is the sum of the products of the corresponding entries in two vectors.

## How to Find the Dot Product in Google Sheets

To find the dot product of two vectors in Google Sheets, we can use the followings steps:

### 1. Enter the data.

First, enter the data values for the first vector in one column and the data values for the second vector in the second column:

| fx |   |   |   |   |
|----|---|---|---|---|
|    | A | B | C | D |
| 1  | 2 | 4 |   |   |
| 2  | 5 | 3 |   |   |
| 3  | 6 | 2 |   |   |
| 4  |   |   |   |   |
| 5  |   |   |   |   |
| 6  |   |   |   |   |
| 7  |   |   |   |   |
| 8  |   |   |   |   |
| 9  |   |   |   |   |
| 10 |   |   |   |   |
| 11 |   |   |   |   |
| 12 |   |   |   |   |
| 13 |   |   |   |   |
| 14 |   |   |   |   |
| 15 |   |   |   |   |
| 16 |   |   |   |   |

### 2. Calculate the dot product.

To calculate the dot product, we can use the

**SUMPRODUCT()** function, which uses the following syntax:

**SUMPRODUCT(array1, , ...)**

**array** - the first array or range to multiply, then  
**add.array2** - the second array or range to multiply, then  
**add.**

The following image shows how to use this function to calculate the dot product between these two vectors:

|    |                           |   |   |             |    |                           |   |   |  |  |
|----|---------------------------|---|---|-------------|----|---------------------------|---|---|--|--|
| fx | =SUMPRODUCT(A1:A3, B1:B3) |   |   |             |    |                           |   |   |  |  |
|    | A                         | B | C | D           | E  | 35 ×                      | F | G |  |  |
| 1  | 2                         | 4 |   | Dot Product | 35 | =SUMPRODUCT(A1:A3, B1:B3) |   |   |  |  |
| 2  | 5                         | 3 |   |             |    |                           |   |   |  |  |
| 3  | 6                         | 2 |   |             |    |                           |   |   |  |  |
| 4  |                           |   |   |             |    |                           |   |   |  |  |
| 5  |                           |   |   |             |    |                           |   |   |  |  |
| 6  |                           |   |   |             |    |                           |   |   |  |  |
| 7  |                           |   |   |             |    |                           |   |   |  |  |
| 8  |                           |   |   |             |    |                           |   |   |  |  |
| 9  |                           |   |   |             |    |                           |   |   |  |  |
| 10 |                           |   |   |             |    |                           |   |   |  |  |
| 11 |                           |   |   |             |    |                           |   |   |  |  |
| 12 |                           |   |   |             |    |                           |   |   |  |  |
| 13 |                           |   |   |             |    |                           |   |   |  |  |
| 14 |                           |   |   |             |    |                           |   |   |  |  |
| 15 |                           |   |   |             |    |                           |   |   |  |  |
| 16 |                           |   |   |             |    |                           |   |   |  |  |
| 17 |                           |   |   |             |    |                           |   |   |  |  |
| 18 |                           |   |   |             |    |                           |   |   |  |  |
| 19 |                           |   |   |             |    |                           |   |   |  |  |

This produces the value 35, which matches the answer

we got by hand.

Note that the **SUMPRODUCT()** function works for vectors of any length. For example, we could use this function to calculate the dot product between two vectors both of length 20:

|    |                             |    |   |             |     |                             |   |   |  |  |
|----|-----------------------------|----|---|-------------|-----|-----------------------------|---|---|--|--|
| fx | =SUMPRODUCT(A1:A20, B1:B20) |    |   |             |     |                             |   |   |  |  |
|    | A                           | B  | C | D           | E   | 610 x                       | F | G |  |  |
| 1  | 2                           | 4  |   | Dot Product | 610 | =SUMPRODUCT(A1:A20, B1:B20) |   |   |  |  |
| 2  | 5                           | 3  |   |             |     |                             |   |   |  |  |
| 3  | 6                           | 2  |   |             |     |                             |   |   |  |  |
| 4  | 12                          | 1  |   |             |     |                             |   |   |  |  |
| 5  | 14                          | 0  |   |             |     |                             |   |   |  |  |
| 6  | 15                          | 2  |   |             |     |                             |   |   |  |  |
| 7  | 3                           | 0  |   |             |     |                             |   |   |  |  |
| 8  | 4                           | 0  |   |             |     |                             |   |   |  |  |
| 9  | 5                           | 3  |   |             |     |                             |   |   |  |  |
| 10 | 5                           | 4  |   |             |     |                             |   |   |  |  |
| 11 | 4                           | 3  |   |             |     |                             |   |   |  |  |
| 12 | 3                           | 2  |   |             |     |                             |   |   |  |  |
| 13 | 7                           | 1  |   |             |     |                             |   |   |  |  |
| 14 | 12                          | 1  |   |             |     |                             |   |   |  |  |
| 15 | 15                          | 3  |   |             |     |                             |   |   |  |  |
| 16 | 16                          | 3  |   |             |     |                             |   |   |  |  |
| 17 | 22                          | 1  |   |             |     |                             |   |   |  |  |
| 18 | 34                          | 2  |   |             |     |                             |   |   |  |  |
| 19 | 12                          | 23 |   |             |     |                             |   |   |  |  |
| 20 | 1                           | 2  |   |             |     |                             |   |   |  |  |
| 21 |                             |    |   |             |     |                             |   |   |  |  |
| 22 |                             |    |   |             |     |                             |   |   |  |  |
| 23 |                             |    |   |             |     |                             |   |   |  |  |
| 24 |                             |    |   |             |     |                             |   |   |  |  |
| 25 |                             |    |   |             |     |                             |   |   |  |  |

### Potential Errors in Calculating the Dot Product

The function **SUMPRODUCT()** will return a **#VALUE!** error if the vectors do not have equal length.

For example, if the first vector has length 20 and the second vector has length 19, then the formula **=SUMPRODUCT(A1:A20, B1:B19)** will return an error.

The two vectors need to have the same length in order for the dot product to be calculated.

### How to Calculate the Dot Product in Excel

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