

How can the dot product be calculated in R, and can you provide some examples?

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The dot product, also known as the scalar product, is a mathematical operation that calculates the sum of the products of corresponding elements in two vectors. In R, the dot product can be calculated using the "." or "%*%" operators. These operators can be applied between two vectors or a vector and a matrix. For example, if we have two vectors $A = (1,2,3)$ and $B = (4,5,6)$, the dot product can be calculated as $A \cdot B = (1*4) + (2*5) + (3*6) = 32$. Similarly, if we have a vector $A = (1,2,3)$ and a matrix $B = ((4,5),(6,7),(8,9))$, the dot product can be calculated as $A \cdot B = (1*4 + 2*6 + 3*8, 1*5 + 2*7 + 3*9) = (40, 50)$. In summary, the dot product can be easily calculated in R using the "." or "%*%" operators and can be applied to both vectors and matrices.

Calculate the Dot Product in R (With Examples)

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 Calculate the Dot Product in R

There are two ways to quickly calculate the dot product of two vectors in R:

Method 1: Use %*%

The following code shows how to use the %*% function to calculate the dot product between two vectors in R:

```
#define vectors  
a <- c(2, 5, 6)  
b <- c(4, 3, 2)  
  
#calculate dot product between vectors  
a %*% b
```

35

The dot product turns out to be 35.

Note that this function works for data frame columns as well:

```
#define data  
df <- data.frame(a=c(2, 5, 6),  
b=c(4, 3, 2))
```

#calculate dot product between columns 'a' and 'b' of data frame

```
df$a %*% df$b
```

35

Method 2: Use the dot() function

We can also calculate the dot product between two vectors by using the dot() function from the pracma library:

```
library(pracma)
```

```
#define vectors
```

```
a <- c(2, 5, 6)
```

```
b <- c(4, 3, 2)
```

```
#calculate dot product between vectors
```

```
dot(a, b)
```

35

Once again, the dot product between the two vectors turns out to be 35.

The following tutorials explain how to calculate a dot product using other statistical software:

[How to Calculate the Dot Product in Excel](#)

[How to Calculate the Dot Product in Google Sheets](#)

[How to Calculate the Dot Product on a TI-84 Calculator](#)

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