

# How can matrix multiplication be performed in R, and can you provide some examples?

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## RECOMMENDED CITATION

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Matrix multiplication is a fundamental operation in linear algebra that involves multiplying two matrices to produce a third matrix. In R, this can be performed using the `%*%` operator or the `crossprod()` function. The `%*%` operator performs traditional matrix multiplication, where the number of columns in the first matrix must match the number of rows in the second matrix. The `crossprod()` function, on the other hand, performs the cross product of two matrices, where the number of columns in the first matrix must match the number of columns in the second matrix. Both methods can be easily implemented in R and can be used to solve a variety of mathematical problems. Some examples of matrix multiplication in R include calculating the dot product of two vectors, transforming data using linear transformations, and solving systems of linear equations.

## Perform Matrix Multiplication in R (With Examples)

You can use the following syntax to perform matrix multiplication in R:

**#perform element-by-element multiplication**

**A \* B**

**#perform matrix multiplication**

**A %\*% B**

The following examples show how to use this syntax in practice.

### Example 1: Element-by-Element Multiplication

The following code shows how to perform element-by-element multiplication between two matrices in R:

**#define matrix A**

```
A <- matrix(c(1, 2, 3, 4), ncol=2)
```

```
A
```

```
1 3
```

```
2 4
```

```
#define matrix B
```

```
B <- matrix(c(5, 6, 7, 8), ncol=2)
```

```
B
```

```
5 7
```

```
6 8
```

```
#perform element-by-element multiplication
```

```
A*B
```

```
5 21
```

```
12 32
```

Using the `*` operator, R simply multiplied the corresponding elements in each matrix to produce a new matrix.

Here are the exact calculations that were performed:

Position :  $1 * 5 = 5$  Position :  $3 * 7 = 21$  Position :  $2 * 6 =$

**12Position :  $4 * 8 = 32$**

### Example 2: Matrix Multiplication

The following code shows how to perform matrix multiplication between two matrices in R:

```
#define matrix A
```

```
A <- matrix(c(1, 2, 3, 4), ncol=2)
```

```
A
```

```
1 3
```

```
2 4
```

```
#define matrix B
```

```
B <- matrix(c(5, 6, 7, 8), ncol=2)
```

```
B
```

```
5 7
```

```
6 8
```

```
#perform matrix multiplication
```

```
A %*% B
```

```
23 31
```

```
34 46
```

**Here are the exact calculations that were performed:**

**Position :  $1*5 + 3*6 = 23$  Position :  $1*7 + 3*8 = 31$  Position  
:  $2*5 + 4*6 = 34$  Position :  $2*7 + 4*8 = 46$**

**Refer to these tutorials for a quick primer on the formulas to use to perform matrix multiplication between matrices of various sizes:**

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