DOT PRODUCT · AS A MATRIX PRODUCT

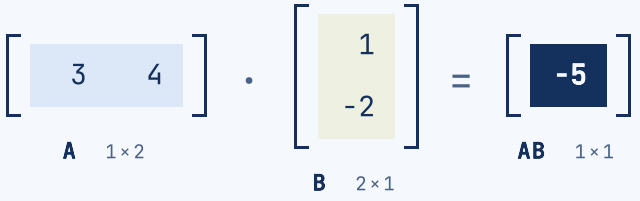
Two vectors, one number

1
ENTRIES

Written as a 1×2 row times a 2×1 column, the dot product of $(3, 4)$ and $(1, -2)$ is a matrix product with a single entry: $3(1) + 4(-2) = -5$.

A 1 × 2 · B 2 × 1 → AB 1×1

The inner pair matches, then vanishes. Only the outer numbers survive into the result.



HOW THAT ENTRY WAS FORMED

c11 = 3 · 1 + 4 · -2 = 3 - 8 = **-5**

Row 1 of A pairs off against column 1 of B, term by term, and the 2 products are summed. The shared length 2 is the inner dimension — it is consumed by the sum and does not appear in the answer.

MULTIPLICATIONS

2

m · n · p — one per term of every entry

ADDITIONS

1

m(n−1)p — one fewer than the terms

REVERSE PRODUCT

2×2

defined here, and a different size

WHY THE RESULT IS A SCALAR

The products are added, not kept. $(3, -8)$ is a stop halfway; the dot product is the single number -5, which is why it is also called the scalar product.