

Diagram illustrating the dot product of two vectors a and b .

Vector a is represented by the array $[2, 3, 4, 5]$.

Vector b is represented by the array $[6, 7, 8, 9]$.

The dot product $a \cdot b$ is calculated as:

$$a \cdot b = 2 \cdot 6 + 3 \cdot 7 + 4 \cdot 8 + 5 \cdot 9 = 110$$

The result of the dot product is 110.

Diagram illustrating the calculation of $a * b[0]$ using two different representations of the array b .

Left side: $a * b[0] =$

2	3	4	5
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*

6	7	8	9
---	---	---	---

$=$ 110 $= (x *_N y)[0] =$

Right side: $a * b[0] =$

2	3	4	5	0	0	0	0
---	---	---	---	---	---	---	---

*

6	7	8	9	0	0	0	0
---	---	---	---	---	---	---	---

$=$ 110

$$a \cdot b[1] = \begin{array}{|c|c|c|c|} \hline 2 & 3 & 4 & 5 \\ \hline \end{array} * \begin{array}{|c|c|c|c|} \hline 6 & 7 & 8 & 9 \\ \hline \end{array} = \boxed{74} = (x *_N y)[1] = \begin{array}{|c|c|c|c|c|c|c|c|} \hline 2 & 3 & 4 & 5 & 0 & 0 & 0 & 0 \\ \hline \end{array} * \begin{array}{|c|c|c|c|c|c|c|c|} \hline 7 & 8 & 9 & 0 & 0 & 0 & 0 & 6 \\ \hline \end{array} = \boxed{74}$$

Diagram illustrating the dot product of two vectors:

$a \cdot b[2] =$

6	7	8	9
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 \cdot

2	3	4	5
---	---	---	---

 $=$

43

 $= (x \cdot_N y)[2] =$

2	3	4	5	0	0	0	0
---	---	---	---	---	---	---	---

 \cdot

8	9	0	0	0	0	6	7
---	---	---	---	---	---	---	---

 $=$

43

No equivalent

$(x *_N y)[4] =$

0	0	0	0	6	7	8	9
---	---	---	---	---	---	---	---

 $=$

0

The diagram illustrates the computation of $a * b[-2]$ using a 2D array and a 1D array. The 2D array is represented as a grid of 4 columns and 2 rows. The first row contains the values 2, 3, 4, and 5. The second row contains the values 6, 7, 8, and 9. The 1D array is represented as a single row of 8 cells. The first 4 cells contain the values 2, 3, 4, and 5, and the next 4 cells contain the values 0, 0, 0, and 0. The computation is shown as $a * b[-2] =$ followed by the 2D array, then $=$ followed by a box containing the value 59, then $= (x *_N y)[6] =$ followed by the 1D array, and finally $=$ followed by a box containing the value 59.

Diagram illustrating the computation of $a * b[-1]$ using a 2D array representation. The array is 2 rows by 4 columns. The first row contains [2, 3, 4, 5] and the second row contains [6, 7, 8, 9]. The operation $a * b[-1]$ is shown as the first row multiplied by the last element of the second row (9). The result is 86, which is $(x *_{\mathcal{N}} y)[7]$.