

## 성분을 이용한 내적의 공식 (The Formula of Dot Product Using Components)

# The Formula of Dot Product Using Components


▶ Start

▶ End

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▶ Start

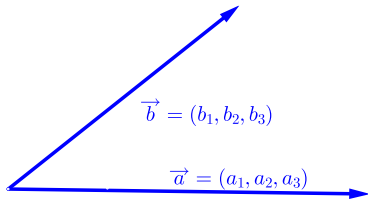
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$$\vec{a} = (a_1, a_2, a_3)$$


# The Formula of Dot Product Using Components

▶ Start

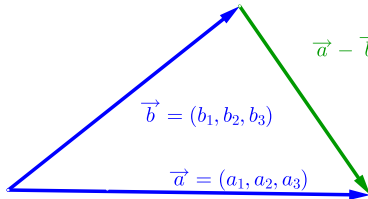
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# The Formula of Dot Product Using Components

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$$\vec{b} = (b_1, b_2, b_3)$$

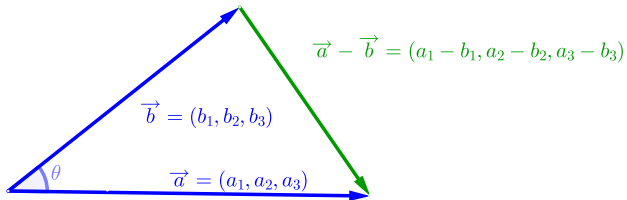
$$\vec{a} = (a_1, a_2, a_3)$$

$$\vec{a} - \vec{b} = (a_1 - b_1, a_2 - b_2, a_3 - b_3)$$

# The Formula of Dot Product Using Components

▶ Start

▶ End

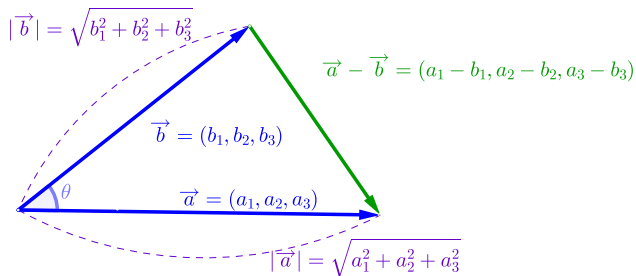




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▶ Start

▶ End







# The Formula of Dot Product Using Components

▶ Start

▶ End

$|\vec{b}| = \sqrt{b_1^2 + b_2^2 + b_3^2}$

$\vec{a} - \vec{b} = (a_1 - b_1, a_2 - b_2, a_3 - b_3)$

$|\vec{a} - \vec{b}| = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2}$

$\vec{b} = (b_1, b_2, b_3)$

$\vec{a} = (a_1, a_2, a_3)$

$|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

$|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2|\vec{a}| \times |\vec{b}| \cos \theta$  (제2 코사인법칙)

# The Formula of Dot Product Using Components

▶ Start

▶ End

$|\vec{b}| = \sqrt{b_1^2 + b_2^2 + b_3^2}$

$\vec{b} = (b_1, b_2, b_3)$

$\vec{a} = (a_1, a_2, a_3)$

$\theta$

$\vec{a} - \vec{b} = (a_1 - b_1, a_2 - b_2, a_3 - b_3)$

$|\vec{a} - \vec{b}| = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2}$

$|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

$|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2(\vec{a} \cdot \vec{b})$

# The Formula of Dot Product Using Components

▶ Start

▶ End

$|\vec{b}| = \sqrt{b_1^2 + b_2^2 + b_3^2}$

$\vec{b} = (b_1, b_2, b_3)$

$\vec{a} = (a_1, a_2, a_3)$

$\theta$

$\vec{a} - \vec{b} = (a_1 - b_1, a_2 - b_2, a_3 - b_3)$

$|\vec{a} - \vec{b}| = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2}$

$|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

$|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2(\vec{a} \cdot \vec{b})$

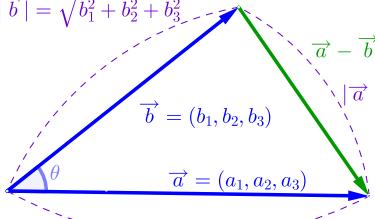
$\vec{a} \cdot \vec{b} = \frac{1}{2} (|\vec{a}|^2 + |\vec{b}|^2 - |\vec{a} - \vec{b}|^2)$

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▶ Start

▶ End

$$|\vec{b}| = \sqrt{b_1^2 + b_2^2 + b_3^2}$$



$$\vec{a} - \vec{b} = (a_1 - b_1, a_2 - b_2, a_3 - b_3)$$

$$|\vec{a} - \vec{b}| = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2}$$

$$|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$$

$$|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2(\vec{a} \cdot \vec{b})$$

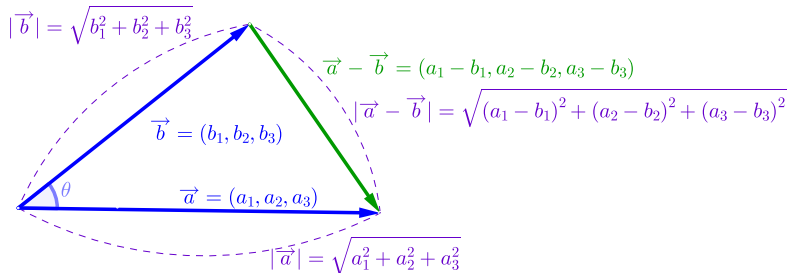
$$\vec{a} \cdot \vec{b} = \frac{1}{2} (|\vec{a}|^2 + |\vec{b}|^2 - |\vec{a} - \vec{b}|^2)$$

$$= \frac{1}{2} \{ a_1^2 + a_2^2 + a_3^2 + b_1^2 + b_2^2 + b_3^2 - (a_1 - b_1)^2 - (a_2 - b_2)^2 - (a_3 - b_3)^2 \}$$

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▶ Start

▶ End



$$|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2(\vec{a} \cdot \vec{b})$$

$$\vec{a} \cdot \vec{b} = \frac{1}{2} \left( |\vec{a}|^2 + |\vec{b}|^2 - |\vec{a} - \vec{b}|^2 \right)$$

$$= \frac{1}{2} \left\{ a_1^2 + a_2^2 + a_3^2 + b_1^2 + b_2^2 + b_3^2 - (a_1 - b_1)^2 - (a_2 - b_2)^2 - (a_3 - b_3)^2 \right\}$$

$$\therefore \vec{a} \cdot \vec{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$$

Github:

<https://min7014.github.io/math20221101002.html>

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and you can see a picture moving.