

### What is dot product?

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- Dot product (or scalar product) of two vectors is a scalar quantity.
- It is an operation that takes two vectors as input, and returns a scalar number as output.
- The dot product is a value expressing the **angular relationship** between two vectors.

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### How do I calculate dot product?

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if  $\vec{v} = \langle v_1, v_2 \rangle$  and  $\vec{w} = \langle w_1, w_2 \rangle$ ,

then the dot product is

$$\vec{v} \cdot \vec{w} = v_1 w_1 + v_2 w_2$$

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### Examples:

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- Find each dot product.

a)  $\langle 3, 5 \rangle \cdot \langle 2, 6 \rangle$

b)  $\langle -2, 4 \rangle \cdot \langle -1, -3 \rangle$

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### Orthogonal Vectors

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- Two vectors are said to be **orthogonal** if  $\vec{v} \cdot \vec{w} = 0$ .
- "Orthogonal" means the vectors are perpendicular (form a  $90^\circ$  angle).

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### Examples:

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- Are  $\langle 2, -3 \rangle$  and  $\langle 6, 4 \rangle$  orthogonal?

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### Parallel Vectors

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- Two vectors are said to be **parallel** if they are scalar multiples of one another.
- Example:  $\langle 1, -5 \rangle$  and  $\langle 2, -10 \rangle$  are parallel because  $2\langle 1, -5 \rangle = \langle 2, -10 \rangle$ .
- Parallel vectors would have the same direction and different magnitudes.

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