Example 1

Find the angle between two vectors $\bar{a} = \{3; 4\}$ and $\bar{b} = \{4; 3\}$.

Example 2

Find the angle between two vectors $\bar{a} = \{7; 1\}$ and $\bar{b} = \{5; 5\}$.

Example 3

Find the angle between two vectors $\bar{a} = \{3; 4; 0\}$ and $\bar{b} = \{4; 4; 0\}$.

Example 4

Find the angle between two vectors $\bar{a} = \{1; 0; 3\}$ and $\bar{b} = \{5; 5; 0\}$.

Answer 1

calculate dot product of vectors:

$$\bar{a} * \bar{b} = 3 \cdot 4 + 4 \cdot 3 = 12 + 12 = 24$$

Calculate vectors magnitude:

$$|\bar{a}| = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$
$$\left|\bar{b}\right| = \sqrt{4^2 + 3^2} = \sqrt{16 + 9} = \sqrt{25} = 5$$

Calculate the angle between vectors:

$$cos\alpha = \frac{\bar{a} * \bar{b}}{|\bar{a}| * \left|\bar{b}\right|} = \frac{24}{5 * 5} = \frac{24}{25} = 0.96$$

Answer 2

calculate dot product of vectors:

$$\bar{a} * \bar{b} = 5 \cdot 7 + 1 \cdot 5 = 35 + 5 = 40$$

Calculate vectors magnitude:

$$|\bar{a}| = \sqrt{7^2 + 1^2} = \sqrt{49 + 1} = \sqrt{50} = 5\sqrt{2}$$

$$\left|\bar{b}\right| = \sqrt{5^2 + 5^2} = \sqrt{25 + 25} = \sqrt{50} = 5\sqrt{2}$$

Calculate the angle between vectors:

$$cos\alpha = \frac{\bar{a} * \bar{b}}{|\bar{a}| * \left|\bar{b}\right|} = \frac{40}{5\sqrt{2} * 5\sqrt{2}} = \frac{40}{50} = 0.8$$

Answer 3

calculate dot product of vectors:

$$\bar{a} * \bar{b} = 3 \cdot 4 + 4 \cdot 4 + 0 \cdot 2 = 12 + 16 + 0 = 28$$

Calculate vectors magnitude:

$$|\bar{a}| = \sqrt{7^2 + 1^2 + 0^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$

$$\left|\bar{b}\right| = \sqrt{4^2 + 4^2 + 2^2} = \sqrt{16 + 16 + 4} = \sqrt{36} = 6$$

Calculate the angle between vectors:

$$cos\alpha = \frac{\bar{a} * \bar{b}}{|\bar{a}| * \left|\bar{b}\right|} = \frac{28}{5 * 6} = \frac{14}{15}$$

Answer 4

calculate dot product of vectors:

$$\bar{a} * \bar{b} = 1 \cdot 5 + 0 \cdot 2 + 3 \cdot 0 = 5$$

Calculate vectors magnitude:

$$|\bar{a}| = \sqrt{1^2 + 0^2 + 3^2} = \sqrt{1 + 9} = \sqrt{10}$$

$$\left|\bar{b}\right| = \sqrt{5^2 + 5^2 + 0^2} = \sqrt{25 + 25} = \sqrt{50} = 5\sqrt{2}$$

Calculate the angle between vectors:

$$cos\alpha = \frac{\bar{a} * \bar{b}}{|\bar{a}| * \left|\bar{b}\right|} = \frac{5}{\sqrt{10} * 5\sqrt{2}} = \frac{1}{2\sqrt{5}} = \frac{\sqrt{5}}{10} = 0.1\sqrt{5}$$