**Example 1**

Calculate the dot product of $\vec{a}$ = (2,3,5) and $\vec{b}$ = (4,1,-2). Do the vectors form an acute angle, right angle, or obtuse angle?

**Example 2**

Calculate the dot product of $\vec{c}$ = (6,−5) and $\vec{d}$ = (8,2).

Do the vectors form an acute angle, right angle, or obtuse angle?

**Example 3**

If $\vec{a}$ = (2,−1,9), for what value of c is the vector $\vec{b}$ = (1,c,−3) perpendicular to $\vec{a}$?

**Example 4**

If $\vec{a}$ = (8,−11,3), for what value of c is the vector $\overrightarrow{b}$ = (0,c,4) perpendicular to $\vec{a}$?

**Example 5**

Calculate the dot product of $c^{\rightarrow}$ = (8,−4) and $d^{\rightarrow}$ = (3,1).

Do the vectors form an acute angle, right angle, or obtuse angle?

**Answer 1**

Using the component formula for the dot product of three-dimensional vectors,

$\vec{a} \cdot \vec{b}$ = a1b1+a2b2+a3b3, we calculate the dot product to be

$\vec{a} \cdot \vec{b}$ = 2 · 4 + 3 · 1 + 5 · (-2) = 8 + 3 -10 = 1.

Since $\vec{a} \cdot \vec{b}$ is positive, we can infer from the geometric definition, that the vectors form an acute angle.

**Answer 2**

Using the component formula for the dot product of two-dimensional vectors, $\vec{a} \cdot \vec{b}$ =a1b1+a2b2,

we calculate the dot product to be $\vec{c} \cdot \vec{d}$ = 6 · 8 + (-5) · 2 = 48 – 10 = 38

Since $\vec{c} \cdot \vec{d}$ is negative, we can infer from the geometric definition, that the vectors form an acute angle.

**Answer 3**

For $\vec{a}$ and $\vec{b}$ to be perpendicular, we need their dot product to be zero. Since

$\vec{a} \cdot \vec{b}$ = 2 · 1 + (-11) · c + 9 · (-3) = 2 – c - 27, the number c must satisfy -25 −c=0, or c = -25

You can double-check that the vector b = (1, -25, -3) is indeed perpendicular to a by verifying that $\vec{a}$ · $\vec{a} \cdot \vec{b}$ = 2 · 1 + (-1) · (-25) + 9 · (-3) = 2 + 25 – 27 = 0.

**Answer 4**

For $\vec{a}$ and $\vec{b}$ to be perpendicular, we need their dot product to be zero. Since

a → · b → = 8 · 0 + (-1) · c + 4 · 3 = 0 – 11c + 12, the number c must satisfy 12 − 11c=0, or c = 12/11.

**Answer 5**

Using the component formula for the dot product of two-dimensional vectors, $\vec{a} \cdot \vec{b}$ =a1b1+a2b2,

we calculate the dot product to be $\vec{c} \cdot \vec{d}$ = 3 · 8 + (-4) · 1 = 24 – 4 = 20.

Since $\vec{c} \cdot \vec{d}$ is negative, we can infer from the geometric definition, that the vectors form an acute angle.