Answer on Question #55643 – Math – Vector Calculus
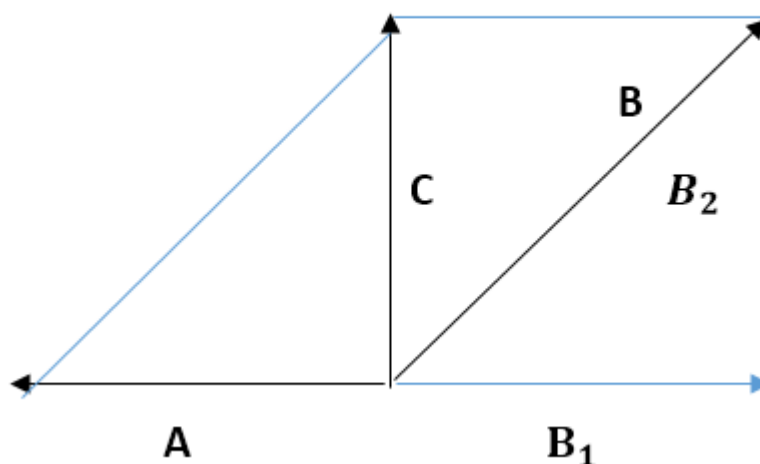
The resultant vector C of vectors A and B is perpendicular to vector A. Also magnitudes of vectors A and C are equal. Find the angle between the vectors A and B.

Solution

Resulting vector of **A** and **B** is vector **C**, which is perpendicular to **A**, and |**A**|=|**C**|.

We represent the vector B = $B_1 + B_2$, where $B_1 = -A$, $B_2 = C$, then

$$A + B = A - A + C = C.$$

$$|B| = \sqrt{B_1{}^2 + B_2{}^2} = \sqrt{A^2 + C^2} = \sqrt{2}\,|A|,$$

Triangle, formed by vectors B_1, B_2 and B, is right and isosceles, hence the measure of the angle between B_1 and B is 45 degrees.

A is perpendicular to **C**, so the measure of the angle between **A** and **C** is 90 degrees. Thus, the angle between vectors B and C is the difference of the right angle and the angle between B_1 and B, that is, measure is 90 -45 = 45 degrees. Now the angle between vectors **A** and **B** is the sum of the angle between **A** and **C** and the angle between **B** and **C,** hence measure is 90 + 45 = 135 degrees.

Answer: 135 degrees.