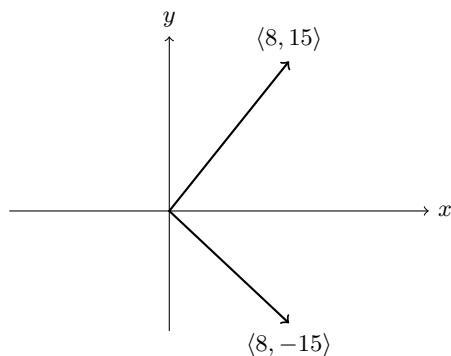


Question 10

A velocity vector has horizontal component 8 and total speed 17. Find all possible vertical components and interpret the two answers.

Question 10 – Solution

Strategy Identify the initial and terminal information first. Build the vector by subtracting coordinates, then use the magnitude formula or normalize only after the components are correct.



Step 1 Let the vertical component be v . The speed condition is $\sqrt{8^2 + v^2} = 17$.

Step 2 Squaring yields $v^2 = 289 - 64 = 225$, so $v = \pm 15$.

Step 3 The velocities are $\boxed{\langle 8, 15 \rangle}$ and $\boxed{\langle 8, -15 \rangle}$, representing upward and downward motion with the same speed.

Verification The result follows from the defining vector formulas used above, and each component, magnitude, or scalar condition has been checked against the information in the question.

Key idea A vector separates two ideas: its components describe displacement, while its magnitude and unit vector describe size and direction. Always check signs and confirm that a unit vector has magnitude 1.