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In general, the magnitude of a vector $\vec{v} = (v_1, v_2)$ is represented by the notation $\|\vec{v}\|$ and is given by the formula

$$\|\vec{v}\| = \sqrt{v_1^2 + v_2^2}$$

Example Let $\vec{u} = (3, -4)$. Find $\|\vec{u}\|$

$$\|\vec{u}\| = \sqrt{3^2 + (-4)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$

Ans: $\|\vec{u}\| = 5$

Example: Let $\vec{v} = (-2, 3)$. Find $\|\vec{v}\|$

$$\|\vec{v}\| = \sqrt{13}$$

Example Let $\vec{w} = (x, -6)$. For what values of x does the vector \vec{w} have magnitude equal to 10?

$$\|\vec{w}\| = \sqrt{x^2 + (-6)^2} = \sqrt{x^2 + 36} = 10 \quad \text{Square both sides.}$$

$$(\sqrt{x^2 + 36})^2 = 10^2$$

$$x^2 + 36 = 100$$

$$x^2 = 100 - 36$$

$$x^2 = 64$$

$$x = \pm\sqrt{64}$$

$$x = \pm 8$$

Square Root both sides