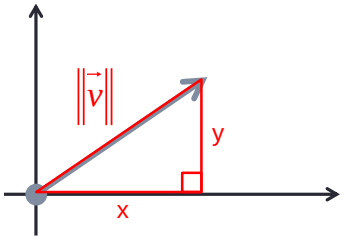
Magnitude of a Vector …

- is its length, $\|\vec{v}\|$

If $\vec{v} = \langle x, y \rangle$, then $\|\vec{v}\| = \sqrt{x^2 + y^2}$.



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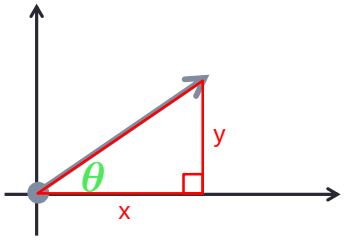
Direction of a Vector …

- is the angle it makes with the x-axis.

If $\vec{v} = \langle x, y \rangle$,

then $\tan\theta = \dfrac{y}{x}$

or $\theta' = \tan^{-1}\left(\dfrac{y}{x}\right)$



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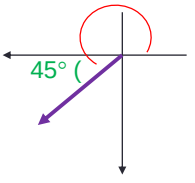
Example 1:

Find the magnitude and direction of $\vec{v} = \langle -3, -3 \rangle$. Use [0°, 360°).

$$\|\vec{v}\| = \sqrt{x^2 + y^2}$$
$$= \sqrt{(-3)^2 + (-3)^2}$$
$$= \sqrt{9+9}$$
$$= \sqrt{18}$$
$$\boxed{\|\vec{v}\| = 3\sqrt{2}}$$



$$\theta' = \tan^{-1}\left(\frac{y}{x}\right)$$
$$\theta' = \tan^{-1}\left(\frac{-3}{-3}\right)$$
$$\theta' = \tan^{-1}(1) = 45°$$
$$\theta = 180° + 45°$$
$$\boxed{\theta = 225°}$$

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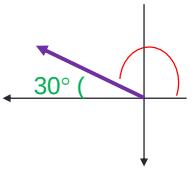
Example 2:

Find the magnitude and direction of $\vec{v} = \langle -2\sqrt{3}, 2 \rangle$. Use [0°, 360°).

$$\|\vec{v}\| = \sqrt{x^2 + y^2}$$
$$= \sqrt{(-2\sqrt{3})^2 + 2^2}$$
$$= \sqrt{12+4}$$
$$= \sqrt{16}$$
$$\boxed{\|\vec{v}\| = 4}$$



$$\theta' = \tan^{-1}\left(\frac{y}{x}\right)$$
$$\theta' = \tan^{-1}\left(\frac{2}{-2\sqrt{3}}\right)$$
$$\theta' = \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) = 30°$$
$$\theta = 180° - 30°$$
$$\boxed{\theta = 150°}$$

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