TOPIC: DIRECTION OF A VECTOR

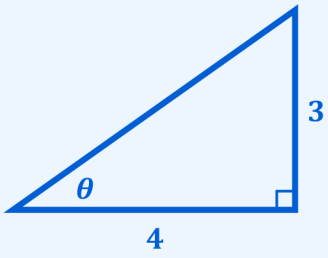
Finding Direction of a Vector

◆ Recall: The **direction** (*where*) of a vector represents the _____ with the x – axis.

- Find the angle by forming a right triangle with the components & using _____.

Recall **Missing Angle in Right Triangle**

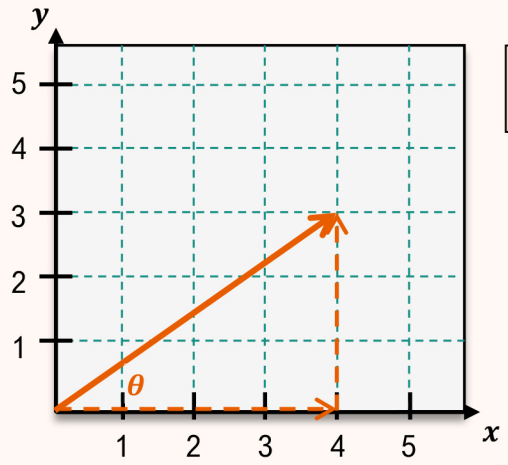
SOH – CAH – TOA $\tan\theta = \frac{opp}{adj}$



$\tan\theta = \frac{3}{4}$

$\theta = \tan^{-1}\frac{3}{4}$

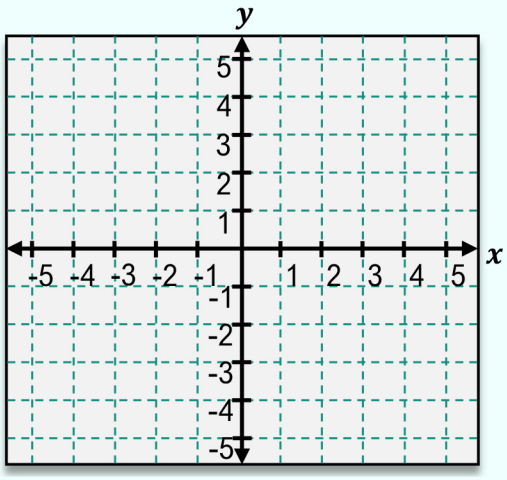
New **Direction of a Vector**



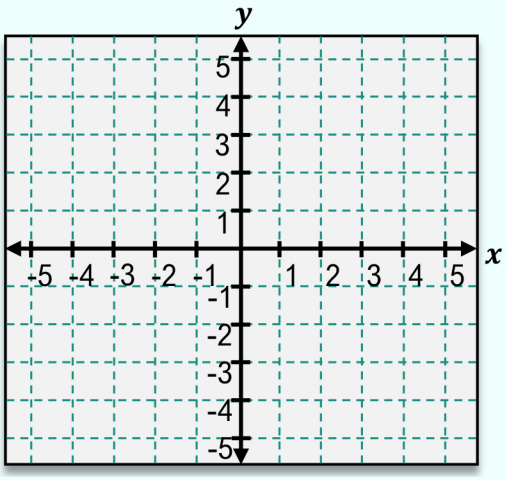
$\tan\theta =$ —

EXAMPLE Draw the vector and find the direction angle of each vector, expressed as a positive number from the +x-axis.

(A) $\langle 2, -1\rangle$



(B) $\langle -3, -3\rangle$



TOPIC: DIRECTION OF A VECTOR

PRACTICE Find the direction of the following vector: $\vec{u} = \langle -10, 10 \rangle$.

PRACTICE Find the direction of the following vector: $\vec{u} = \left\langle \frac{5\sqrt{3}}{3}, 5 \right\rangle$.

EXAMPLE If vectors $\vec{a} = \langle 2, 2 \rangle$, $\vec{b} = \langle 2, -3 \rangle$ and $\vec{c} = 2\vec{a} - 3\vec{b}$, calculate the magnitude and direction of $\vec{c}$.

Magnitude: $|\vec{c}| =$_____

Direction: $\theta =$ _____

TOPIC: DIRECTION OF A VECTOR

Finding Components from Magnitude & Direction

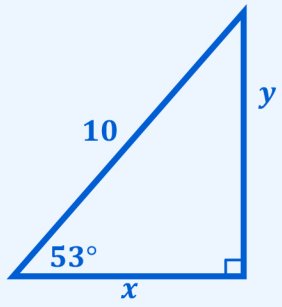
◆ If you're given the magnitude & direction of a vector, find the components using $\sin$ & $\cos$.

EXAMPLE Solve for the x & y components of vector $\vec{v}$ given below.

Recall — Missing Side in Right Triangle

SOH – CAH – TOA

$$\cos\theta = \frac{adj}{hyp} \qquad \sin\theta = \frac{opp}{hyp}$$



$$\sin 53° = \frac{y}{10}$$

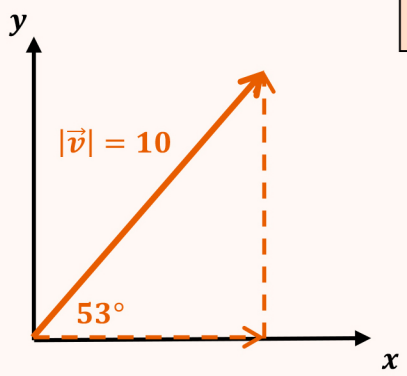
$$y = 10\sin 53°$$

$$y = 10 \cdot \_\_\_\_\_ \approx 8$$

New — Vector Components

$$v_x = |\vec{v}| \_\_\_\_\_ \theta^*$$
$$v_y = |\vec{v}| \_\_\_\_\_ \theta^*$$

*θ wrt. x-axis



EXAMPLE If vector $\vec{v}$ has a magnitude of $|\vec{v}| = 5$ and direction $\theta = \frac{2\pi}{3}$, calculate the x & y components.

TOPIC: DIRECTION OF A VECTOR

PRACTICE If a vector has magnitude $|\vec{v}| = 13$ and direction $\theta = 157.38°$, find the vector's horizontal and vertical components.

PRACTICE If a vector has magnitude $|\vec{v}| = 5$ and direction $\theta = \frac{7\pi}{4}$, find the vector's horizontal and vertical components.