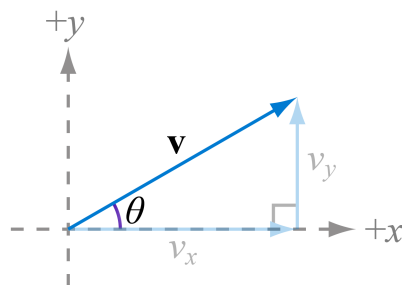


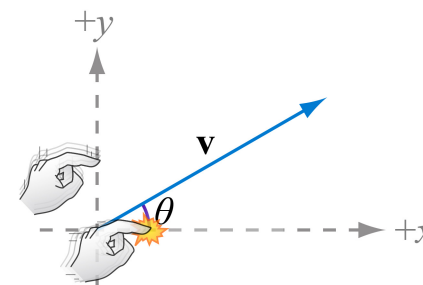
Resolve components for “slanted” vectors using trigonometry

Slower method: Draw and analyze a right triangle

Faster method: Swipe the axes



1. Draw and label the vector of interest (in this example \vec{v})
2. Draw an axis system.
3. Draw the angle θ between the direction of \vec{v} and one of the axes.



4. Draw a right triangle with \vec{v} as the hypotenuse and legs parallel to the axes. **For now**, use v_x and v_y to label the **lengths** of the legs parallel to the x -axis and y -axis, respectively.
5. Apply mnemonic SOH-CAH-TOA to form leg-hypotenuse ratios. In this example, the ratios are

$$\cos \theta = \frac{v_x}{v} \qquad \sin \theta = \frac{v_y}{v}$$

6. Solve for the component lengths

$$v_x = v \cos \theta \qquad v_y = v \sin \theta$$

7. Assuming that the symbols v_x and v_y represented non-negative **lengths** might have resulted in failing to capture one or two negative signs that should have been part of the expressions for the **scalar** components v_x and v_y . Determine whether a + or - should lead each expression for each component by identifying the direction of each component on the drawing of the right triangle.

$$v_x = \pm v \cos \theta \qquad v_y = \pm v \sin \theta$$

4. Determine the sign of the x -component of \vec{v} :

...	“ \vec{v} is more in the $+x$ direction than in the $-x$ direction.”	“ \vec{v} is more in the $-x$ direction than in the $+x$ direction.”
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✎	$v_x = +$	$v_x = -$
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5. Write the symbol for the magnitude of the vector:

✎	$v_x = +v$	$v_x = -v$
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6. Determine which trigonometric function to use:

- a. Swipe your finger back-and-forth along the x -axis.

...	“My finger bumps into the arc labeling the angle θ .”	“My finger misses the arc labeling the angle θ .”
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...	Bumping into Near Adjacent cosine	Missing Far Opposite sine
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✎	$v_x = \pm v \cos \theta$	$v_x = \pm v \sin \theta$
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7. Repeat steps 4-6 for the y -component of \vec{v} .