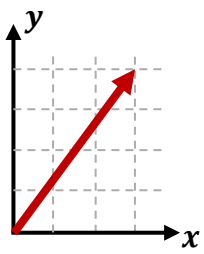
CONCEPT: UNIT VECTORS

● Vectors are sometimes represented using a special notation called **Unit Vectors**.

Graphical

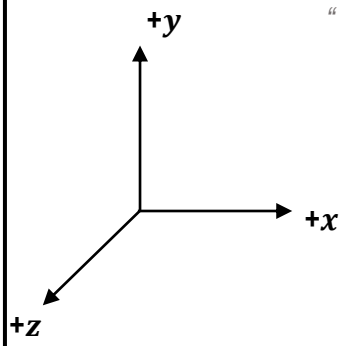


Magnitude & Direction

"5m @ 53°"

Unit Vector

"$3\hat{\imath} + 4\hat{\jmath}$"



$\hat{\imath}$ points in ____ direction.

$\hat{\jmath}$ points in ____ direction.

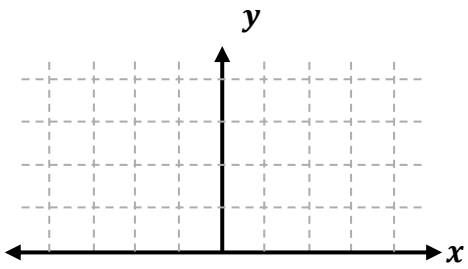
$\hat{k}$ points in ____ direction.

● special kind of vector that _____ in a direction

- has magnitude/length ____.

● Unit vectors make vector addition very straightforward:

EXAMPLE: Vector $\vec{A} = 4\hat{\imath} + 2\hat{\jmath}$ and $\vec{B} = -\hat{\imath} + 2\hat{\jmath}$. Draw the vectors and calculate $\vec{R} = \vec{A} + \vec{B}$ in unit vector form.



Vector Addition w/ Unit Vectors

$\vec{A} = A_x\hat{\imath} + A_y\hat{\jmath} =$ _____

$\vec{B} = B_x\hat{\imath} + B_y\hat{\jmath} =$ _____

$\vec{R} = \vec{A} + \vec{B} =$ _____

PRACTICE: $\vec{A}$ = (4.0 m)$\hat{\imath}$ + (3.0 m)$\hat{\jmath}$ and $\vec{B}$ = (−13.0 m)$\hat{\imath}$ + (7.0 m)$\hat{\jmath}$. You add them together to produce another vector $\vec{C}$. **(a)** Express this new vector $\vec{C}$ in unit-vector notation. **(b)** What are the magnitude and direction of $\vec{C}$?

EXAMPLE**:** Consider the three displacement vectors $\vec{\boldsymbol{A}} = (3\,\hat{\boldsymbol{\imath}} - 3\,\hat{\boldsymbol{\jmath}})$ m, $\vec{\boldsymbol{B}} = (\hat{\boldsymbol{\imath}} - 4\,\hat{\boldsymbol{\jmath}})$ m, and $\vec{\boldsymbol{C}} = (-\mathbf{2}\,\hat{\boldsymbol{\imath}} + \mathbf{5}\,\hat{\boldsymbol{\jmath}})$ m**.**

(a) Find the magnitude and direction of **D** = **A** + **B** + **C.**

(b) Find the magnitude and direction of **E** = −**A** − **B** + **C.**