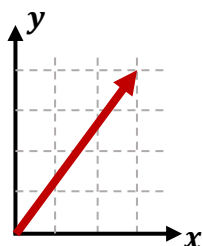


CONCEPT: UNIT VECTORS

- Vectors are sometimes represented using a special notation called Unit Vectors.

Graphical

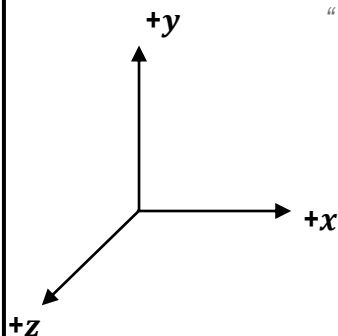


Magnitude & Direction

"5m @ 53°"

Unit Vector

" $3\hat{i} + 4\hat{j}$ "

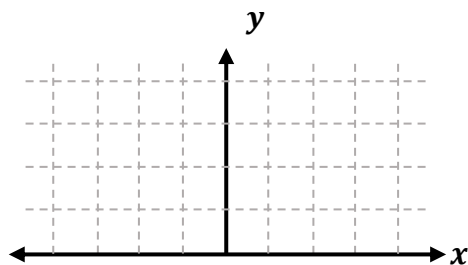


$\hat{i}$ points in ____ direction.
 $\hat{j}$ points in ____ direction.
 $\hat{k}$ points in ____ direction.

- special kind of vector that _____ in a direction
 - has magnitude/length ____.

- Unit vectors make vector addition very straightforward:

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



Vector Addition w/ Unit Vectors

$$\vec{A} = A_x \hat{i} + A_y \hat{j} = \underline{\hspace{2cm}}$$

$$\vec{B} = B_x \hat{i} + B_y \hat{j} = \underline{\hspace{2cm}}$$

$$\vec{R} = \vec{A} + \vec{B} = \underline{\hspace{2cm}}$$

PRACTICE: $\vec{A} = (4.0 \text{ m})\hat{i} + (3.0 \text{ m})\hat{j}$ and $\vec{B} = (-13.0 \text{ m})\hat{i} + (7.0 \text{ m})\hat{j}$. 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 $\vec{A} = (3\hat{i} - 3\hat{j})$ m, $\vec{B} = (\hat{i} - 4\hat{j})$ m, and $\vec{C} = (-2\hat{i} + 5\hat{j})$ m.

(a) Find the magnitude and direction of $\mathbf{D} = \mathbf{A} + \mathbf{B} + \mathbf{C}$.

(b) Find the magnitude and direction of $\mathbf{E} = -\mathbf{A} - \mathbf{B} + \mathbf{C}$.