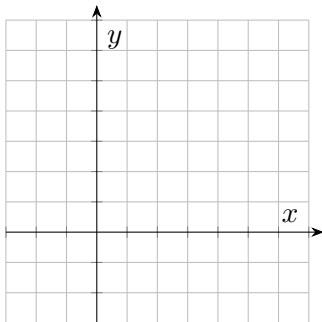


Vectors

1. Let $A = (2, 0)$ and $B = (6, 3)$.

(a) Draw the vector from A to B (which we will call $\mathbf{u} = \overrightarrow{AB}$).



(b) Suppose $C = (1, -2)$ and the vector from C to D has the same length and direction as the vector $\mathbf{u}$. Find the coordinates of point D .

🔗 Vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$ are said to be *equal*.

2. Now suppose $A = (12, -5)$ and $B = (-10, 8)$.

(a) Suppose $\mathbf{u}$ is the vector from A to B . If $\mathbf{u} = \langle x, y \rangle$, find x and y .

(b) Suppose $\mathbf{v}$ is the vector from B to A . If $\mathbf{v} = \langle x, y \rangle$, find x and y .

(c) Are $\mathbf{u}$ and $\mathbf{v}$ equal? Why or why not?

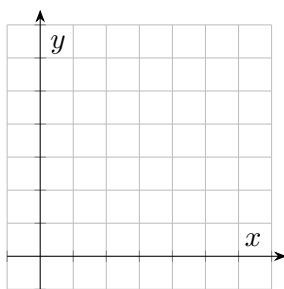
3. Consider the vectors $\mathbf{u} = \langle 4, 1 \rangle$ and $\mathbf{v} = \langle 1, 2 \rangle$.

(a) Compute the *sum* $\mathbf{u} + \mathbf{v}$.

🔗 Make your best guess as to HOW to add two vectors.

(b) Sketch $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{u} + \mathbf{v}$ on the grid below (emanating from the origin). Geometrically, how are these three vectors related to each other?

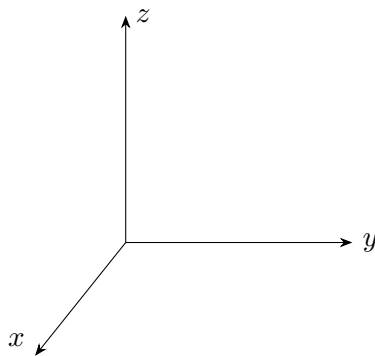
(c) Use your sketch to explain why $\mathbf{u} + \mathbf{v} = \mathbf{v} + \mathbf{u}$.



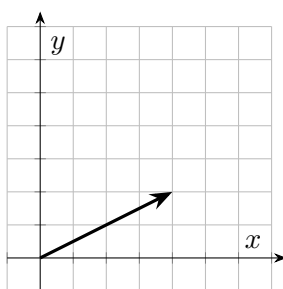
(d) How would you interpret $2\mathbf{v}$ and $3\mathbf{v}$? Sketch these vectors on the grid above.

4. Now let's move up to three dimensions. To the best of your ability, sketch the vectors $\mathbf{u} = \langle 1, 2, 3 \rangle$ and $\mathbf{v} = \langle 1, 5, 3 \rangle$ below.

📌 First draw the "shadow" in the xy -plane.



5. (a) The vector $\mathbf{u} = \langle 4, 2 \rangle$ is drawn below. What is the length of $\mathbf{u}$? How did you compute its length?



- (b) **Group chat:** How do you compute the length of the 2-dimensional vector $\langle a, b \rangle$?

- (c) **Group chat:** How do you compute the length of the 3-dimensional vector $\langle a, b, c \rangle$?

6. Let $\mathbf{u} = \langle 4, 2 \rangle$ and $\mathbf{v} = \langle 4, 2, -7 \rangle$.

- (a) Write the vectors $\mathbf{u}$ and $\mathbf{v}$ in terms of $\mathbf{i}$, $\mathbf{j}$, and $\mathbf{k}$.
 (b) Find a unit vector in the same direction as $\mathbf{u}$. Find a unit vector in the same direction as $\mathbf{v}$.

7. Given vectors $\mathbf{u}$ and $\mathbf{v}$ in each diagram, find the unknown vector. How are $|\mathbf{u}|$, $|\mathbf{v}|$, and $|\mathbf{?}|$ related to the angle?

