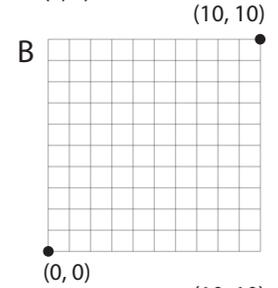
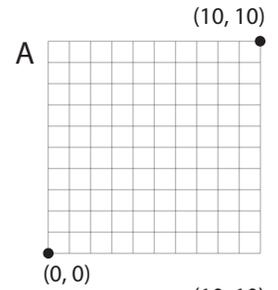


Name: _____

8-A Two-Dimensional Vectors

1. Let \mathbf{u} be the vector $\langle 3, -1 \rangle$, and let \mathbf{v} be the vector $\langle 1, 2 \rangle$.

- a) Sketch and label \mathbf{u} in grid A.
- b) Sketch and label \mathbf{u} again in grid A, in a different position than before.
- c) Sketch and label \mathbf{v} in grid B.
- d) Sketch and label $-\mathbf{u}$ in grid B, starting at the end of \mathbf{v} .
- e) Sketch and label $\mathbf{v} - \mathbf{u}$ in grid B, starting where \mathbf{v} started and ending where $-\mathbf{u}$ ended.
- f) Sketch $3\mathbf{u} - 2\mathbf{v}$ in grid B.

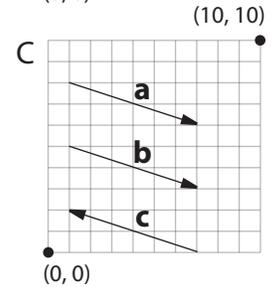


2. Write the components of the vectors shown in grid C.

- a) $\mathbf{a} = \langle \quad, \quad \rangle$
- b) $\mathbf{b} = \langle \quad, \quad \rangle$
- c) $\mathbf{c} = \langle \quad, \quad \rangle$

3. Let $\mathbf{a} = \begin{pmatrix} 4 \\ 9 \end{pmatrix}$ and let $\mathbf{b} = \begin{pmatrix} -3 \\ 10 \end{pmatrix}$. Calculate the following.

- a) $3\mathbf{a}$
- b) $-2\mathbf{b}$
- c) $3\mathbf{a} - 2\mathbf{b}$
- d) $\|\mathbf{b}\|$



4. Find the direction of the following vectors.

- a) $\langle 4, -3 \rangle$
- b) $\langle -4, 3 \rangle$
- c) $\langle 4, 0 \rangle$
- d) $\langle 0, 4 \rangle$

8-B Vector Equations

5. Write the following lines as vector equations.

- a) the line in the direction $\langle 2, 9 \rangle$ passing through the point $(3, 8)$
- b) the line through the points $(-4, 9)$ and $(5, 3)$

6. Consider the line $\mathbf{a} = \langle 3, 4 \rangle + t\langle 8, 2 \rangle$.

- a) Give two points that are on the line.
- b) Is the point $(43, 14)$ on the line?

7. Find the intersection of the lines $\mathbf{a} = \langle -4, -9 \rangle + t\langle 3, 2 \rangle$ and $\mathbf{b} = \langle 13, -23 \rangle + q\langle 2, -5 \rangle$.

8-C Three-Dimensional Vectors

8. Find the vector from the point $(4, 6, -10)$ to the point $(-8, 2, 1)$.

9. Let $\mathbf{a} = \langle 4, 10, -2 \rangle$, and let $\mathbf{b} = \langle -3, 5, 6 \rangle$. Calculate the following.

- a) $3\mathbf{a}$ b) $-2\mathbf{b}$ c) $3\mathbf{a} - 2\mathbf{b}$ d) $\|\mathbf{b}\|$

10. Write a vector equation of the line that passes through the points $(10, 14, 2)$ and $(16, -4, 1)$.

11. Consider the line $\mathbf{a} = \langle 3, 4, 5 \rangle + t\langle 8, 2, -4 \rangle$.

- a) Give two points that are on the line. b) Is the point $(43, 14, 21)$ on the line?

8-D Unit Vectors

12. Let $\mathbf{a} = 4\mathbf{i} + 10\mathbf{j} - 2\mathbf{k}$ and let $\mathbf{b} = -3\mathbf{i} + 5\mathbf{j} + 6\mathbf{k}$. Calculate the following.

- a) $3\mathbf{a}$ b) $-2\mathbf{b}$ c) $3\mathbf{a} - 2\mathbf{b}$ d) $\|\mathbf{b}\|$

13. Find a unit vector parallel to each given vector.

- a) $\mathbf{a} = \langle -5, 12 \rangle$ b) $6\mathbf{i} + 7\mathbf{j}$ c) $2\mathbf{i} - 8\mathbf{j} + 3\mathbf{k}$

8-E Angles Between Vectors

14. Find the angle between each pair of vectors.

- a) $\langle 7, 2 \rangle$ and $\langle -3, 4 \rangle$ b) $\langle 1, 3, -4 \rangle$ and $\langle 10, 30, -40 \rangle$ c) $3\mathbf{i} + 4\mathbf{j} - 10\mathbf{k}$ and $4\mathbf{i} + 7\mathbf{j} + 4\mathbf{k}$

15. Given the vectors $\mathbf{a} = \langle 2, 5, 10 \rangle$ and $\mathbf{b} = \langle 3, 1, 15 \rangle$, change one component of \mathbf{b} so that...

- a) \mathbf{a} and \mathbf{b} are parallel b) \mathbf{a} and \mathbf{b} are orthogonal