

6.1 Vectors in the Plane

Target 8A: Perform vector operations: scalar multiple and sums and represent them graphically

Target 8B: Perform vector operations: magnitude, direction angle, and unit vector

Review of Prior Concepts

$$P = \begin{bmatrix} 3 \\ 1 \end{bmatrix}, Q = \begin{bmatrix} 4 \\ -2 \end{bmatrix}, R = \begin{bmatrix} -4 \\ 2 \end{bmatrix}, \text{ and } S = \begin{bmatrix} -1 & 2 \\ 6 & 1 \end{bmatrix}$$

Perform the indicated matrix operation.

a) $P + Q$

b) $Q + R$

c) $Q - R$

d) $3Q$

e) QS

f) SR

More Practice

Operations with Matrices

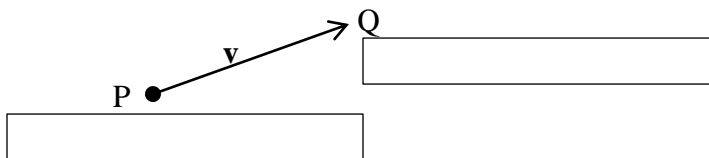
<http://www.mathsisfun.com/algebra/matrix-introduction.html><https://www.khanacademy.org/math/precalculus/precalc-matrices#adding-and-subtracting-matrices>http://www.algebra-lab.org/lessons/lesson.aspx?file=algebra_matrix_operations.xml<https://www.youtube.com/watch?v=xr6qsiEznKU><https://www.youtube.com/watch?v=SPFWVUkxk8E>https://www.youtube.com/watch?v=kuiXy2bCc_0<https://www.youtube.com/watch?v=sYIOjyPyX3g>

Vectors

Vector -- _____ with an initial point and terminal point.

The vector is represented with a **bold** lowercase letter.

$\overrightarrow{PQ} = \underline{\hspace{2cm}}$

*Note:* The arrow on the vector shows the direction --- a vector is NOT a ray

The vector above stops at Q.

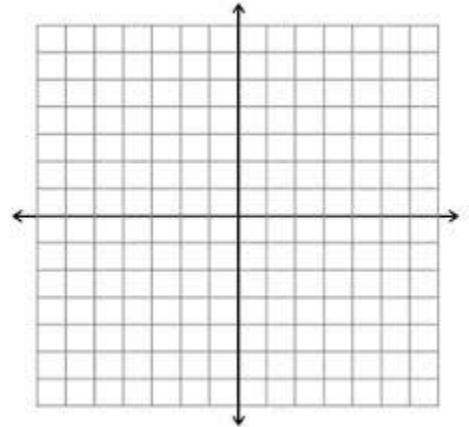
A vector has _____ (length of the vector) represented by $|\overrightarrow{PQ}|$ or _____

and _____ (slope of the vector) represented by an angle.

Vectors are equal if both _____ AND _____ are equal.
(pointing in the same direction)

Example

\mathbf{u} is represented by \overline{RS} and \mathbf{v} is represented by \overline{OP} , where $R = (7, -3)$, $S = (4, -5)$, $O = (1, 1)$, $P = (-2, -1)$. Prove $\mathbf{u} = \mathbf{v}$.



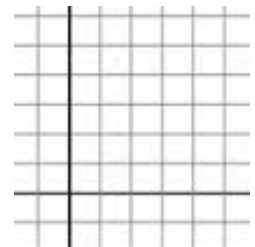
Component Form and Magnitude of a Vector

If \mathbf{v} is a vector in a plane equal to the vector with initial point at $(0,0)$ and terminal point at (v_1, v_2) , then the **component form** of \mathbf{v} is

$$\mathbf{v} = \langle \quad , \quad \rangle$$

The *components* are _____ and _____.

The vector is called the *position vector*, where position = $\langle \quad , \quad \rangle$

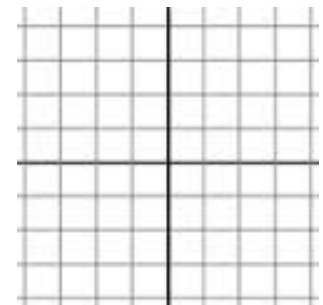


Writing a Vector in Component Form (Head Minus Tail Rule)

Given $\overline{PQ} = \mathbf{v}$, where $P = (x_1, y_1)$ and $Q = (x_2, y_2)$, then

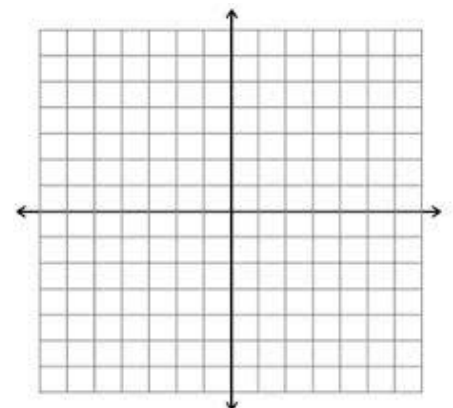
$$\begin{aligned} \mathbf{v} &= \langle \quad , \quad \rangle \\ &= \langle \quad , \quad \rangle \end{aligned}$$

Magnitude of $\mathbf{v} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
 or $\underline{\hspace{2cm}}$



Example

Write the vector, $\mathbf{v} = \overline{PQ}$, in component form and find the magnitude of \mathbf{v} , where $P = (-2, 5)$ and $Q = (4, -1)$.



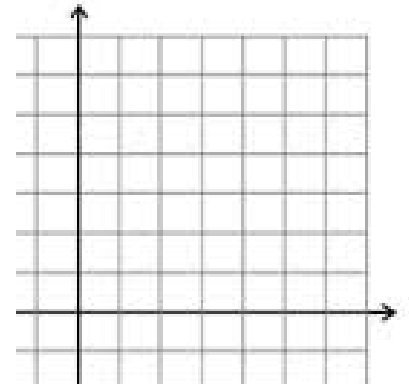
Vector Addition (Tail-to-Head Rule) and Scalar Multiplication

Let $\mathbf{u} = \langle u_1, u_2 \rangle$ and $\mathbf{v} = \langle v_1, v_2 \rangle$ and k is a constant, then

$$\mathbf{u} + \mathbf{v} = \langle \quad, \quad \rangle$$

and

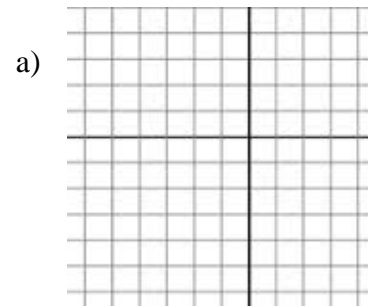
$$k\mathbf{u} = \langle \quad, \quad \rangle$$



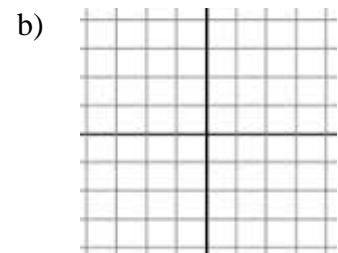
Example

Let $\mathbf{u} = \langle -3, -2 \rangle$ and $\mathbf{v} = \langle 1, 4 \rangle$. Sketch and label a geometric representation of the given vector operations:

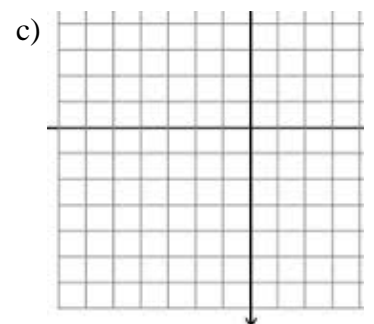
a) $2\mathbf{u}$



b) $\mathbf{u} + \mathbf{v}$



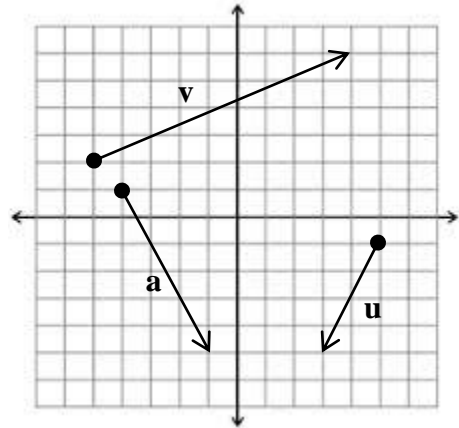
c) $2\mathbf{u} - \mathbf{v}$



Vector Practice

Component Form and Magnitude

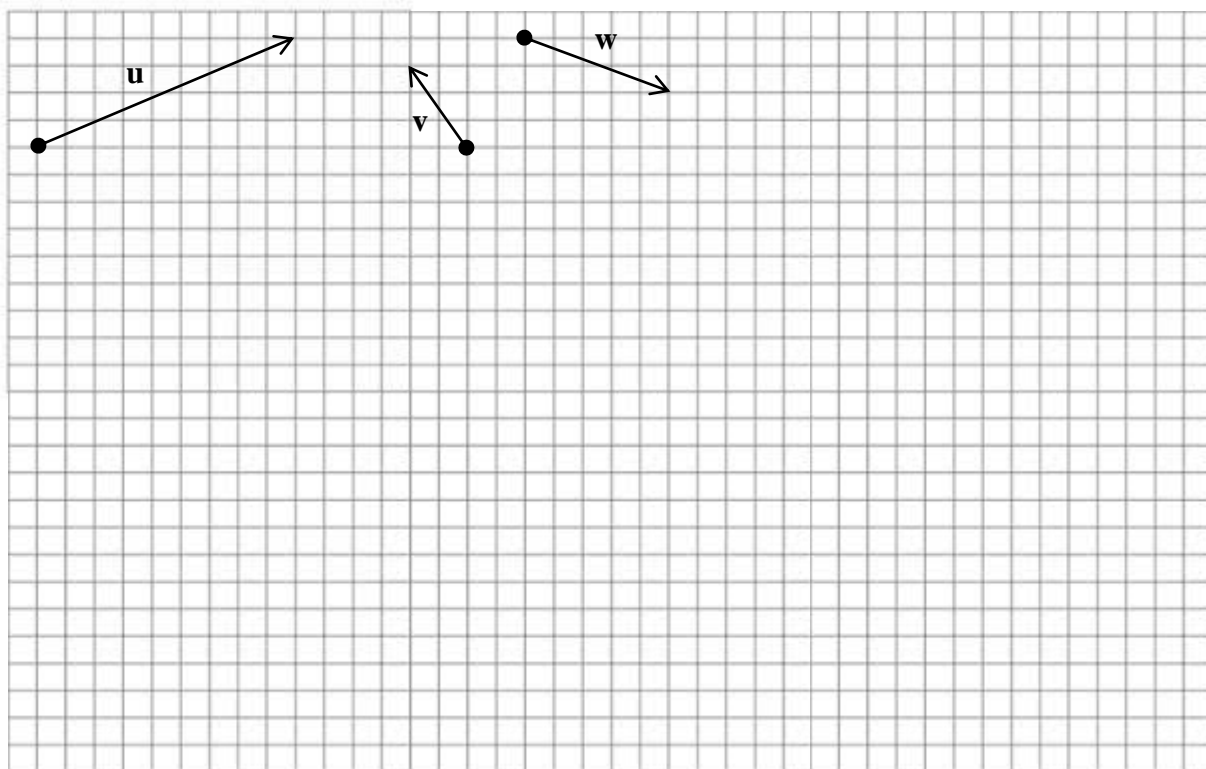
Find the component form and magnitude of each vector.



Addition and Scalar Multiplication

Sketch and label a geometric representation of the given vector operations:

$\mathbf{u} + \mathbf{v}$, $3\mathbf{v}$, $-\mathbf{u}$, $\mathbf{u} - \mathbf{v}$, and $\mathbf{u} + 2\mathbf{v} + \mathbf{w}$



More Practice**Introduction to Vectors**

<https://www.mathsisfun.com/algebra/vectors.html>

<https://www.khanacademy.org/math/precalculus/vectors-precac>

<http://philschatz.com/precalculus-book/contents/m49412.html>

<https://www.varsitytutors.com/precalculus-help/matrices-and-vectors/geometric-vectors>

https://youtu.be/_YkIivLaVJs

<https://youtu.be/60btq9PN8IM>

<https://youtu.be/IKzR0Odurm0>

Component Form of Vectors

<https://braingenie.ck12.org/skills/108146>

<https://www.khanacademy.org/math/precalculus/vectors-precac/vector-basic/v/example-finding-components-of-a-vector>

<https://www.mathway.com/examples/precalculus/vectors/finding-the-position-vector?id=582>

<https://youtu.be/pimr9I92GZY>

<https://youtu.be/-0qEDcZZS9E>

<https://youtu.be/wz5AvyKWjb8>

Vector Addition and Scalar Multiplication

<http://www.mathplanet.com/education/geometry/transformations/vectors>

<http://www.softschools.com/math/pre-calculus/scalar-multiplication-and-vector-addition/>

<https://www.khanacademy.org/math/precalculus/vectors-precac#scalar-multiplication>

<https://youtu.be/pNMrYACjHXQ>

<https://youtu.be/Z1o-DGohM60>

https://youtu.be/_YkIivLaVJs

<https://youtu.be/lulSApFPw1M>

<https://youtu.be/0i9Cp-6QuUk>

Homework Assignment

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