

TOPIC: GEOMETRIC VECTORS

Introduction to Vectors

◆ **Vectors** are quantities with _____ (how much) & _____ (where), e.g. velocity, force.

- Visually represented by *arrows* with **initial** (starting) & **terminal** (ending) points. Written notations: $\vec{v}$, $\overrightarrow{AB}$, or v

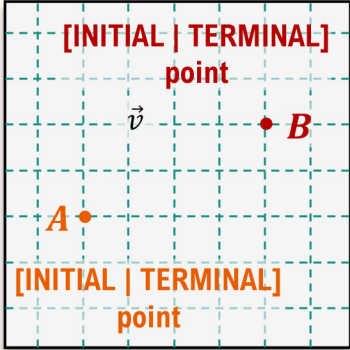
New

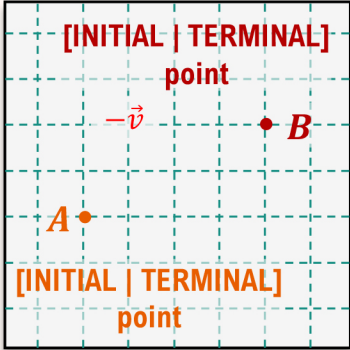
Vectors

Magnitude represented by
[LENGTH | ANGLE] of arrow

Direction represented by
[LENGTH | ANGLE] of arrow

- A **negative** vector has same mag. & _____ direction.





◆ The **zero** vector ($\vec{0}$) has magnitude = 0 & _____ direction.

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PRACTICE

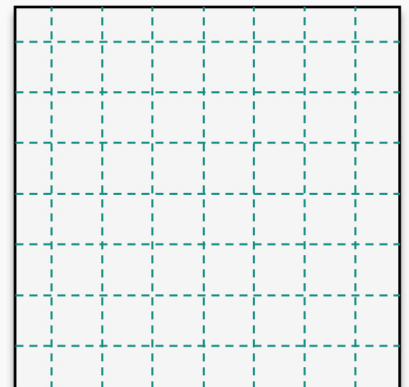
Determine if the following statement is *true* or *false*: Temperature is a vector.

PRACTICE

Determine if the following statement is *true* or *false*: Acceleration is a vector.

PRACTICE

Determine if the following statement is *true* or *false*: The vectors $\vec{v}$ and $-\vec{v}$ point in the same direction.



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Adding Vectors Geometrically

- ◆ To **add** vectors ($\vec{u} + \vec{v}$), connect them ____ - to _____. **Resultant** vector is from *init. pt.* of $\vec{u}$ to *term. pt.* of $\vec{v}$.
 - To **subtract** vectors, just add the first vector to the opposite (_____) of the second vector.

Add Vectors	Subtract Vectors
$\vec{u} + \vec{v}$ Order [DOES DOESN'T] matter	$\vec{u} - \vec{v} = \vec{u} + \underline{\hspace{1cm}}$ Order [DOES DOESN'T] matter

EXAMPLE

Using the vectors $\vec{u}$ & $\vec{v}$ above, sketch the resultant sum or difference vector.

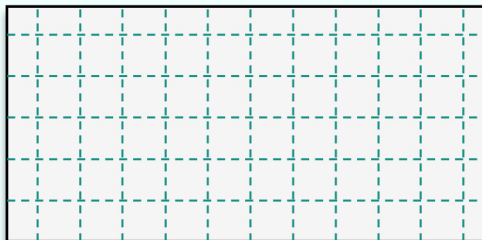
(A)

$$\vec{v} + \vec{u}$$



(B)

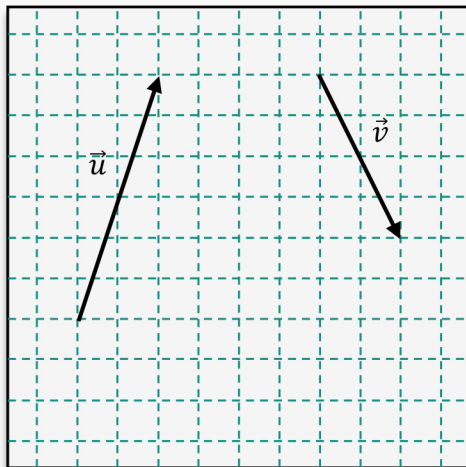
$$\vec{v} - \vec{u}$$



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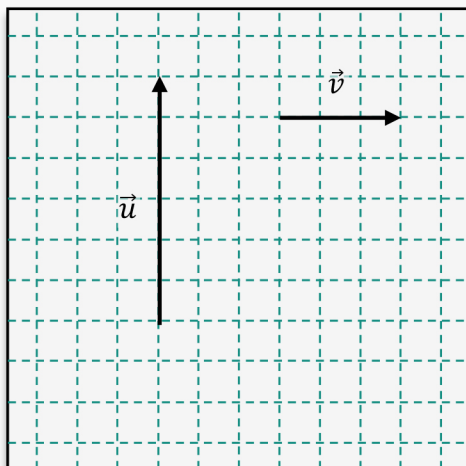
PRACTICE

Given vectors $\vec{u}$ and $\vec{v}$, sketch the resultant vector $\vec{u} + \vec{v}$.



PRACTICE

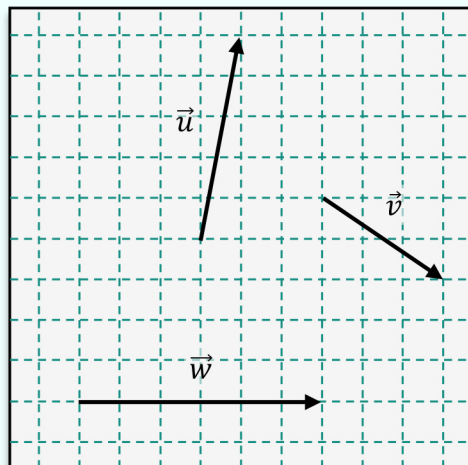
Given vectors $\vec{u}$ and $\vec{v}$, sketch the resultant vector $\vec{u} - \vec{v}$.



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EXAMPLE

Given vectors $\vec{u}$, $\vec{v}$ and $\vec{w}$, sketch the resultant vector $\vec{u} + (\vec{v} - \vec{w})$.



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Multiplying Vectors by Scalars

- ◆ Instead of repeatedly adding vectors, you can multiply **vectors** by **scalars** (#s with magnitude, but _____ direction, like 3).
 - To **multiply** a vector by a scalar, _____ or _____ the *length* of the vector by the scalar amount.

Recall	Add Vectors	New	Multiply Vectors by Scalars
	$\vec{v} + \vec{v} + \vec{v}$		$3\vec{v}$

EXAMPLE

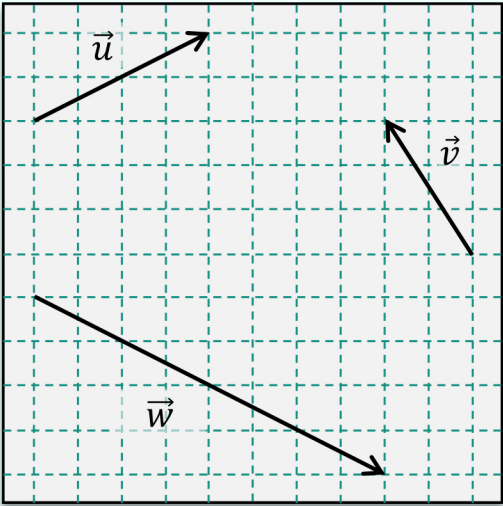
Given vectors $\vec{u}$, $\vec{v}$, & $\vec{w}$, sketch the resultant vector based on the operations below.

- (A)

$\frac{1}{2}\vec{u}$
- (B)

$-2\vec{v}$
- (C)

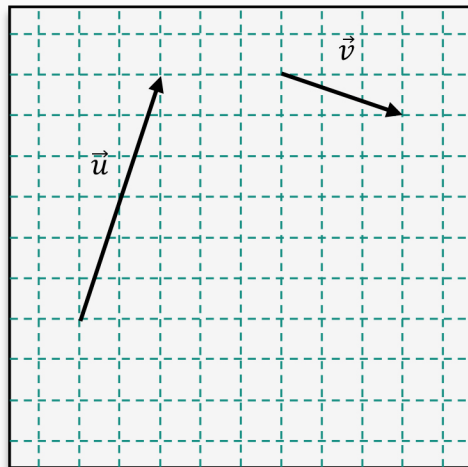
$\frac{1}{2}(\vec{w} + \vec{v})$



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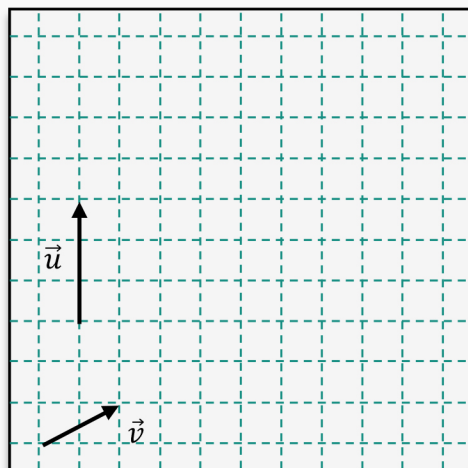
PRACTICE

Given vectors $\vec{u}$ and $\vec{v}$, sketch the resultant vector $\frac{1}{2}\vec{u} + \vec{v}$.



PRACTICE

Given vectors $\vec{u}$ and $\vec{v}$, sketch the resultant vector $-2\vec{u} + 3\vec{v}$.



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EXAMPLE

Given vectors $\vec{u}$, $\vec{v}$ and $\vec{w}$, sketch the resultant vector $-2\vec{w} + (\vec{u} - \vec{v})$.

