

Core Content

Cluster Title: Perform operations on vectors.
<p>Standard (Honors) N.VM.4: Add and subtract vectors.</p> <ol style="list-style-type: none"> Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. Understand vector subtraction $\mathbf{v} - \mathbf{w}$ as $\mathbf{v} + (-\mathbf{w})$, where $-\mathbf{w}$ is the additive inverse of \mathbf{w}, with the same magnitude as \mathbf{w} and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
Concepts and Skills to Master
<ul style="list-style-type: none"> Draw vectors end-to-end to find the resultant sum of the vectors. Add vectors using components. Use the parallelogram rule to find the sum of two vectors. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. Understand vector subtraction as the vector you would add to \mathbf{w} to get \mathbf{v}.

Supports for Teachers

Critical Background Knowledge	
<ul style="list-style-type: none"> Vector notation, magnitude, and direction Graph ordered pairs and vectors Distance Formula 	
Academic Vocabulary	
vector, end-to-end, component-wise, parallelogram rule, magnitude, resultant vector	
Suggested Instructional Strategies	Resources
<ul style="list-style-type: none"> Use contextual situations from a variety of disciplines to model vector addition. Use real-life examples to justify why vectors cannot be added by summing magnitudes. 	Precalculus textbook
Sample Formative Assessment Tasks	
Skill-based Task Given the vectors $\langle 4, 7 \rangle$ and $\langle -1, 2 \rangle$ select a method to find their sum. What is the magnitude of the sum?	Problem Task Under what conditions is the sum of the magnitudes of two vectors be equal to the magnitude of the sum?

Core Content

Cluster Title: Perform operations on vectors.
<p>Standard (Honors) N.VM.5: Multiply a vector by a scalar.</p> <ol style="list-style-type: none"> Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$. Compute the magnitude of a scalar multiple $c\mathbf{v}$ using $\ c\mathbf{v}\ = c v$. Compute the direction of $c\mathbf{v}$ knowing that when $c v \neq 0$, the direction of $c\mathbf{v}$ is either along \mathbf{v} (for $c > 0$) or against \mathbf{v} (for $c < 0$).
Concepts and Skills to Master
<ul style="list-style-type: none"> Represent scalar multiplication graphically. Compute the product of a scalar and a vector.

Supports for Teachers

Critical Background Knowledge	
Distributive property, draw a vector,	
Academic Vocabulary	
Scalar, vector, product	
Suggested Instructional Strategies	Resources
<ul style="list-style-type: none"> Connect scalar multiplication to dilations and similarity. Explore representations and magnitudes created by scalar multiples of vectors. 	Precalculus textbook IB Maths SL textbooks
Sample Formative Assessment Tasks	
Skill-based Task	Problem Task
Draw and find the magnitude of $-3\mathbf{v}$ where $\mathbf{v} = \langle -2, 3 \rangle$.	Under what conditions is a scalar product of the sum of two vectors the same as the sum of the scalar products of the two vectors?