8-1

Study Guide

Geometric Vectors

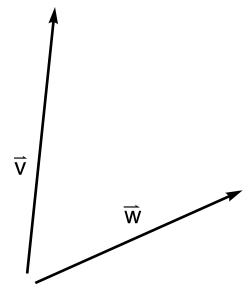
The **magnitude** of a **vector** is the length of a directed line segment. The **direction** of the vector is the directed angle between the positive x-axis and the vector. When adding or subtracting vectors, use either the parallelogram or the triangle method to find the **resultant**.

Example 1 **Use the parallelogram method to find the sum of $\vec{\mathbf{v}}$ and $\vec{\mathbf{w}}$.**

Copy $\vec{\mathbf{v}}$ and $\vec{\mathbf{w}}$, placing the initial points together.

Form a parallelogram that has $\vec{\mathbf{v}}$ and $\vec{\mathbf{w}}$ as two of its sides.

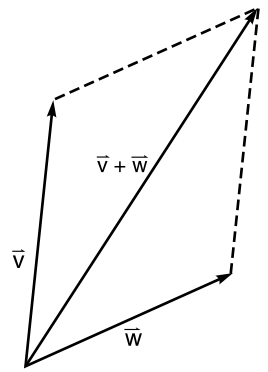
Draw dashed lines to represent the other two sides.



The resultant is the vector from the vertex of $\vec{\mathbf{v}}$ and $\vec{\mathbf{w}}$ to the opposite vertex of the parallelogram.

Use a ruler and protractor to measure the magnitude and direction of the resultant.

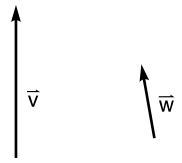
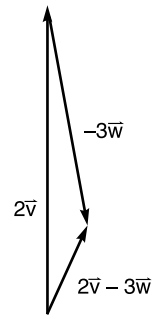
The magnitude is 6 centimeters, and the direction is 40°.



Example 2 **Use the triangle method to find $2\vec{\mathbf{v}} - 3\vec{\mathbf{w}}$.**

$2\vec{\mathbf{v}} - 3\vec{\mathbf{w}} = 2\vec{\mathbf{v}} + (-3\vec{\mathbf{w}})$

Draw a vector that is twice the magnitude of $\vec{\mathbf{v}}$ to represent $2\vec{\mathbf{v}}$. Then draw a vector with the opposite direction to $\vec{\mathbf{w}}$ and three times its magnitude to represent $-3\vec{\mathbf{w}}$. Place the initial point of $-3\vec{\mathbf{w}}$ on the terminal point of $2\vec{\mathbf{v}}$. *Tip-to-tail method.*



Draw the resultant from the initial point of the first vector to the terminal point of the second vector. The resultant is $2\vec{\mathbf{v}} - 3\vec{\mathbf{w}}$.