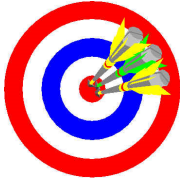


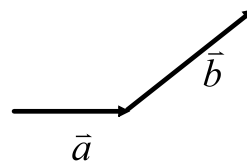
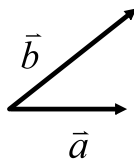
Properties of Vectors (6.4)

Math Learning Target:



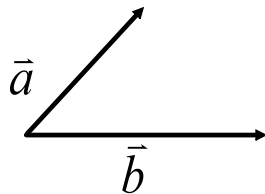
"I can prove and apply the commutative, associative and distributive properties of vector addition. I can apply other properties, including the associative and distributive laws of scalar multiplication. I can apply what I have learned in familiar and unfamiliar settings."

Recall: Vector Addition



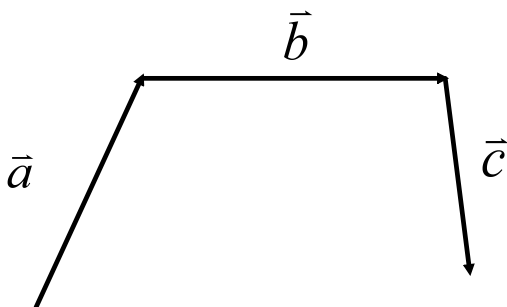
Commutative Property of Vector Addition

$$\vec{a} + \vec{b} = \vec{b} + \vec{a}$$



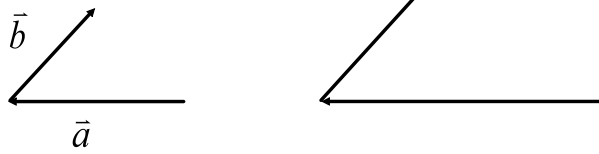
Associative Property of Vector Addition

$$(\vec{a} + \vec{b}) + \vec{c} = \vec{a} + (\vec{b} + \vec{c})$$



**Distributive Property
of Vector Addition**

$$k(\vec{a} + \vec{b}) = k\vec{a} + k\vec{b} \quad \text{where } k \in \mathbb{R}$$



Further Properties

If \vec{a} is a vector, and m and n are real numbers:

1. Each nonzero vector \vec{a} has a corresponding negative vector $-\vec{a}$ such that $\vec{a} + (-\vec{a}) = \vec{0}$
2. $1\vec{a} = \vec{a}$
3. $\vec{a} + \vec{0} = \vec{a}$
4. $m(n\vec{a}) = (mn)\vec{a} = mn\vec{a}$
5. $(m+n)\vec{a} = m\vec{a} + n\vec{a}$

Example

If $\vec{a} = 3\vec{x} - 5\vec{y}$ and $\vec{b} = -2\vec{x} + 9\vec{y}$, find $5\vec{a} - 9\vec{b}$