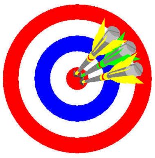
The Dot Product with Geometric Vectors 7.3

Math Learning Target:

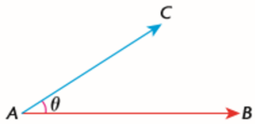


"I can calculate the dot product. I know all properties of the dot product, and can prove them. I understand when it is appropriate to apply the dot product. I can apply what I have learned in familiar and unfamiliar settings."

Recall: Geometric Vectors versus Algebraic Vectors

Definition

Dot Product of Two Vectors



$\overrightarrow{AC} \cdot \overrightarrow{AB} = |\overrightarrow{AC}||\overrightarrow{AB}|\cos\theta,\ 0 \le \theta \le 180°$

Properties

Properties of the Dot Product

Commutative Property: $\vec{p} \cdot \vec{q} = \vec{q} \cdot \vec{p}$,

Distributive Property: $\vec{p} \cdot (\vec{q} + \vec{r}) = \vec{p} \cdot \vec{q} + \vec{p} \cdot \vec{r}$,

Magnitudes Property: $\vec{p} \cdot \vec{p} = |\vec{p}|^2$,

Associative Property with a scalar K: $(k\vec{p}) \cdot \vec{q} = \vec{p} \cdot (k\vec{q}) = k(\vec{p} \cdot \vec{q})$

Example Prove the Commutative and Magnitudes Properties of the dot product.

Example Does the Associative Property $(\vec{a} \cdot \vec{b}) \cdot \vec{c} = \vec{a} \cdot (\vec{b} \cdot \vec{c})$ hold? Justify.

Theorem Two nonzero vectors $\vec{a}$ and $\vec{b}$ are perpendicular iff $\vec{a} \bullet \vec{b} = 0$

Recall: Properties of a Parallelogram and Rhombus

Example If the diagonals of a parallelogram are perpendicular, prove that is also a rhombus.

MathSIP! Page 377 #1 to 5, 6bde, 7ae, 9b, 11, 13, 15, 17