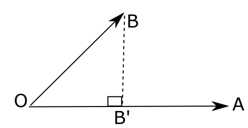
The product is also called **dot product** or **inner product** , and also denoted by $A|B$, (A,B), $< A,B >$ or $\ll A,B \gg$.

The scalar product $\mathrm{A}\cdot\mathrm{B}$ certainly vanishes when $\mathrm{A}=0$ or $\mathrm{B}=0$. For nonzero vectors, the product is positive, zero or negative according as θ is an acute, right or obtuse angle.

Geometric Interpretations:

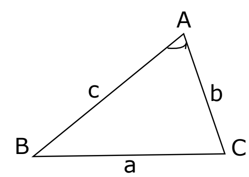
1. If $\vec{\mathrm{OB}}'$ is the projection of $\vec{\mathrm{OB}}$ on $\vec{\mathrm{OA}}$, then

$\vec{\mathrm{OA}}\cdot\vec{\mathrm{OB}}=\vec{\mathrm{OA}}\cdot\vec{\mathrm{OB}}'$



2. The cosine law $a^2 = b^2 + c^2 - 2bc\cos\alpha$ for a triangle $mathrmABC$ can be expressed in the form

$|\mathrm{BC}|^2=|\mathrm{AB}|^2+|\mathrm{AC}|^2-2\vec{\mathrm{AB}}\cdot\vec{\mathrm{AC}}$



3. Two nonzero vectors are perpendicular (orthogonal) if and only if their dot product is zero:

$$\mathrm{A}\perp\mathrm{B} \iff \theta=\frac{\Pi}{2} \iff \mathrm{A}\cdot\mathrm{B}=0$$

4. The dot product of two vectors with known lengths (of variable directions) is maximum or minimum when they are parallel in the same or opposite senses.

Physical Interpretation:

If a particle is moving on a line in the direction of a vector $\vec{\mathrm{R}}$, under a force $\vec{\mathrm{F}}$ then the effective force $\vec{\mathrm{F}}_{\mathrm{e}}$ is the projection vector of $\vec{\mathrm{F}}$ on $\vec{\mathrm{R}}$ in the direction of motion: $\vec{\mathrm{F}}\cdot\vec{\mathrm{R}}=\vec{\mathrm{F}}_{\mathrm{e}}\cdot\vec{\mathrm{R}}$.