

Topic: Vector Triple Product :-

If three vectors are combined into product, then their product is ~~the~~ called triple vector product. The triple vector product of three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are given as

$$(1) \quad \vec{a}(\vec{b} \times \vec{c}) = \text{A vector quantity.}$$

$$(2) \quad \vec{a} \cdot (\vec{b} \times \vec{c}) = \quad "$$

$$(3) \quad \vec{a} \times (\vec{b} \times \vec{c}) = \quad "$$

Thus, $\vec{a} \cdot (\vec{b} \times \vec{c})$ is called scalar triple product and $\vec{a} \times (\vec{b} \times \vec{c})$ is called vector triple product.

Scalar Triple Product :-

If $\vec{a}$, $\vec{b}$, $\vec{c}$ are three vectors, then the scalar triple product of vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are taken in the order as

$$\vec{a} \cdot (\vec{b} \times \vec{c}) \text{ or } (\vec{a} \times \vec{b}) \cdot \vec{c}$$

Properties of Scalar triple product -

(1) If two of its vectors are equal then the value of a scalar triple product is zero.

(2) If two of its vectors are parallel then value of a scalar triple product is zero.

(3) $[abc] = 0$ is the necessary and sufficient condition that three non-parallel and non-zero vectors a , b , and c are co-planar.