Introduction

Vectors for geometry:

- straight line trajectories;
- surfaces;
- ...

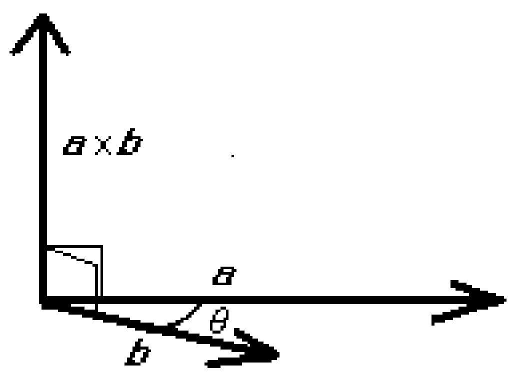
- Dot (scalar) product:

$$\vec{a} \cdot \vec{b} = a_x b_x + a_y b_y + a_z b_z = |\vec{a}||\vec{b}| \cos \vartheta$$

- Cross (vector) product:

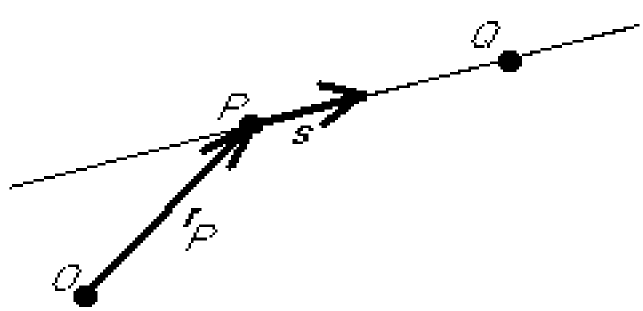
$$|\vec{a} \times \vec{b}| = |\vec{a}||\vec{b}| \sin \vartheta$$

  and normal to both vectors. Seen from below:



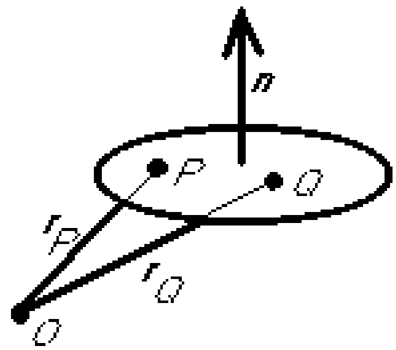
- Line through point P parallel to vector $\vec{s}$:

$$\vec{r} = \vec{r}_P + \lambda \vec{s}$$



- Plane through point P normal to vector $\vec{n}$:

$$\vec{n} \cdot \vec{r} = \vec{n} \cdot \vec{r}_P$$



- Each equation ordinarily reduces the dimensionality by one: 3D (space) $\rightarrow$ 2D (plane) $\rightarrow$ 1D (line) $\rightarrow$ 0D (point) $\rightarrow$ nothing.