**POINT AND VECTOR**

**Vector Operations**

**Addition**
\[ \mathbf{a} + \mathbf{b} = (a_x, a_y, a_z) + (b_x, b_y, b_z) = (a_x + b_x, a_y + b_y, a_z + b_z) \]

**Subtraction**
\[ \mathbf{a} - \mathbf{b} = (a_x - b_x, a_y - b_y, a_z - b_z) \]

**Scaling**
\[ k\mathbf{a} = (ka_x, ka_y, ka_z) \]

**Length**
\[ |\mathbf{a}| = \sqrt{a_x^2 + a_y^2 + a_z^2} \]

**Unitization**
\[ \hat{\mathbf{a}} = \mathbf{a} / |\mathbf{a}| \]

**Setting Length**
\[ L\hat{\mathbf{a}} = \hat{\mathbf{a}} \times L = \mathbf{a} / |\mathbf{a}| \times L \]

**Dot Product**
\[ \mathbf{a} \cdot \mathbf{b} = a_x b_x + a_y b_y + a_z b_z \]

**Cross Product**
\[ \mathbf{a} \times \mathbf{b} = \begin{pmatrix} a_y b_z - a_z b_y \\ a_z b_x - a_x b_z \\ a_x b_y - a_y b_x \end{pmatrix} \]
Make small diagrid and model fins perpendicular to the diagrid on any platform you choose.

**Hint**

**In Microstation**

Set ACS to the plane of the triangle which consists of one horizontal line and one diagonal line by “Rotate ACS” option with key-in of “BA” specifying 3 vertices of the triangle.

Then rotate ACS 90 degree by “Cycle Rotation” option with key-in of “BE” or “Rotate about X” with key-in of “BX” or “Rotate about Y” with key-in of “BY”.

**In Rhinoceros**

Set Control Plane to the plane of the triangle which consists of one horizontal line and one diagonal line by “CPlane” command choosing “3Point” option and specifying vertices of the triangle for 3 points.