Cartesian Vectors:

The force vector F can be represented by vectors in X, Y, and Z directions using scalar quantities in those directions and unit vectors i, j, and k respectively.

$$\vec{F} = F_x \hat{i} + F_y \hat{j} + F_z \hat{k}$$

For coplanar systems:

$$\vec{F} = F_x \hat{i} + F_y \hat{j}$$

For multiple coplanar forces, the resultant in each direction will equal the sum of components in each direction.

e.g $\vec{F}_1 = F_{x1} \hat{i} + F_{y1} \hat{j}$

$\vec{F}_2 = F_{x2} \hat{i} + F_{y2} \hat{j}$

$\vec{F}_{Rx} = \Sigma \vec{F}_x = F_{x1} \hat{i} + F_{x2} \hat{i}$

$\vec{F}_{Ry} = \Sigma \vec{F}_y = F_{y1} \hat{j} + F_{y2} \hat{j}$

$\vec{F}_R = \vec{F}_{Rx} + \vec{F}_{Ry}$

$|F_R| = \sqrt{F_{Rx}^2 + F_{Ry}^2}$

Angle of the resultant vector:

$$\theta = \tan^{-1}\left(\frac{F_{Ry}}{F_{Rx}}\right)$$