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HO 2.1

Sam Hanna

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1. Given:

$$F_A = 350 \text{ N}$$

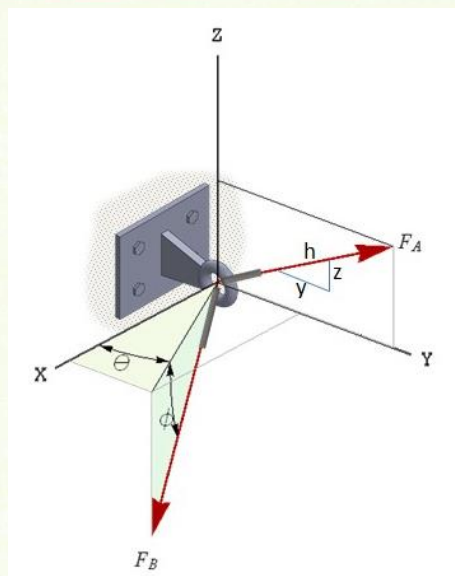
$$F_B = 600 \text{ N}$$

$$y, z, h \text{ (respectively): } 12, 5, 13$$

$$\theta = 35^\circ$$

$$\phi = 40^\circ$$

Find:

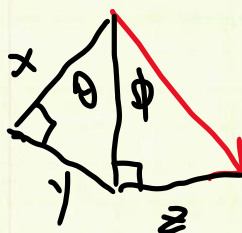
 F_R 

Solution:

$$\vec{F}_A \quad F_{Ax} = 0 \quad F_{Ay} = 350 \left(\frac{12}{13} \right)$$

$$F_{Az} = 350 \left(\frac{5}{13} \right)$$

$$\vec{F}_A = \langle 0, 323.08, 134.62 \rangle$$

$$\vec{F}_B$$


$$F_{Bx} = 600 \cos 40 \cos 35$$

$$F_{By} = 600 \cos 40 \sin 35$$

$$F_{Bz} = -600 \sin 40$$

$$\vec{F}_B = \langle 376.50, 263.63, -385.67 \rangle$$

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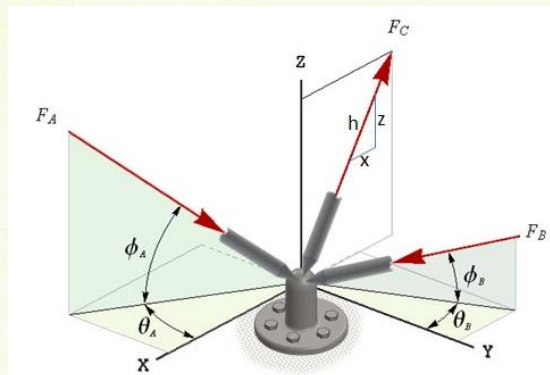
$$\vec{F}_R = \vec{F}_A + \vec{F}_B = \langle 376.5, 586.7, -261.1 \rangle \text{ N} \leftarrow \vec{F}_R$$

2. Given:

$$F_A = 170 \text{ lbs } \theta_A = 25^\circ \phi_A = 60^\circ$$

$$F_B = 180 \text{ lbs } \theta_B = 65^\circ \phi_B = 65^\circ$$

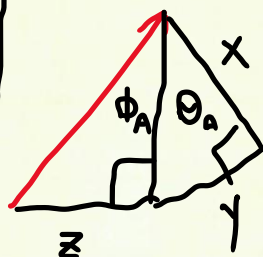
$$F_C = 230 \text{ lbs } x, z, h \text{ (respectively): } 12, 5, 13$$



Find:

$$F_R, \alpha, \beta, \gamma$$

Solution:

 \vec{F}_A 

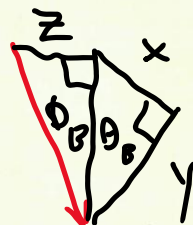
$$F_{Ax} = -170 \cos 60^\circ \cos 25^\circ$$

$$F_{Ay} = 170 \cos 60^\circ \sin 25^\circ$$

$$F_{Az} = -170 \sin 60^\circ$$

 \vec{F}_A

$$\vec{F}_A = \langle -77.04, 35.92, -147.22 \rangle$$

 \vec{F}_B 

$$F_{Bx} = 180 \cos 65^\circ \sin 65^\circ$$

$$F_{By} = -180 \cos 65^\circ \cos 65^\circ$$

$$F_{Bz} = -180 \sin 65^\circ$$

 \vec{F}_B

$$\vec{F}_B = \langle 68.94, -32.14, -163.14 \rangle$$

 \vec{F}_C

$$F_{Cx} = -230(12/13) \quad F_{Cy} = 0 \quad F_{Cz} = 230(5/13)$$

$$\vec{F}_C = \langle -212.31, 0, 88.46 \rangle$$

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$$\vec{F}_R = \vec{F}_A + \vec{F}_B + \vec{F}_C = \langle -220.40, 3.77, -221.90 \rangle$$

$$F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2 + F_{Rz}^2} = 312.78165 \leftarrow F_R$$

$$\alpha = \cos^{-1} \left(\frac{-220.40}{312.78} \right) = 134.8^\circ \leftarrow \alpha$$

$$\beta = \cos^{-1} \left(\frac{3.77}{312.78} \right) = 89.3^\circ \leftarrow \beta$$

$$\gamma = \cos^{-1} \left(\frac{-221.90}{312.78} \right) = 135.2^\circ \leftarrow \gamma$$

3. Given:

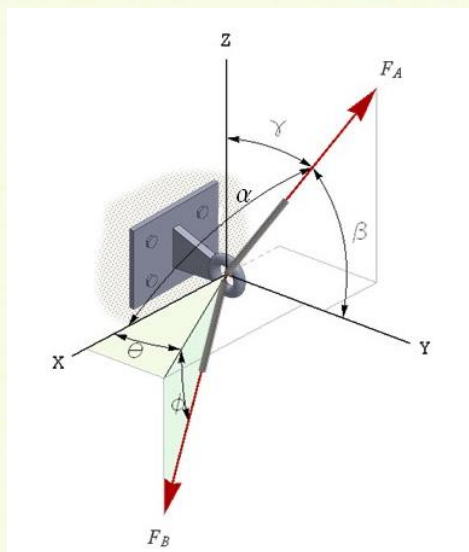
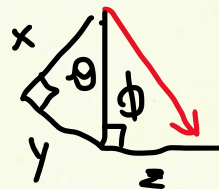
$$F_B = 500 \text{ N } \theta = 40^\circ \phi = 30^\circ$$

$$\vec{F}_R = \langle -250, 500, 400 \rangle \text{ N}$$

Find:

$$F_A, \alpha, \beta, \gamma$$

Solution:

 \vec{F}_B 

$$F_{Bx} = 500 \cos 30^\circ \cos 40^\circ$$

$$F_{By} = 500 \cos 30^\circ \sin 40^\circ$$

$$F_{Bz} = -500 \sin 30^\circ$$

$$\vec{F}_B = \langle 331.71, 278.34, -250 \rangle$$

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~~SPH 1010~~

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$$\vec{F}_A = \vec{F}_R - \vec{F}_B = \langle -581.71, 221.66, 650 \rangle$$

$$F_A = \sqrt{F_{Ax}^2 + F_{Ay}^2 + F_{Az}^2} = \underline{\underline{900.01 \text{ N}}} \quad F_A$$

$$\alpha = \cos^{-1}\left(\frac{-581.71}{900.01}\right) = \underline{\underline{130.27^\circ}} \quad \alpha$$

$$\beta = \cos^{-1}\left(\frac{221.66}{900.01}\right) = \underline{\underline{75.74^\circ}} \quad \beta$$

$$\gamma = \cos^{-1}\left(\frac{650}{900.01}\right) = \underline{\underline{43.76^\circ}} \quad \gamma$$
