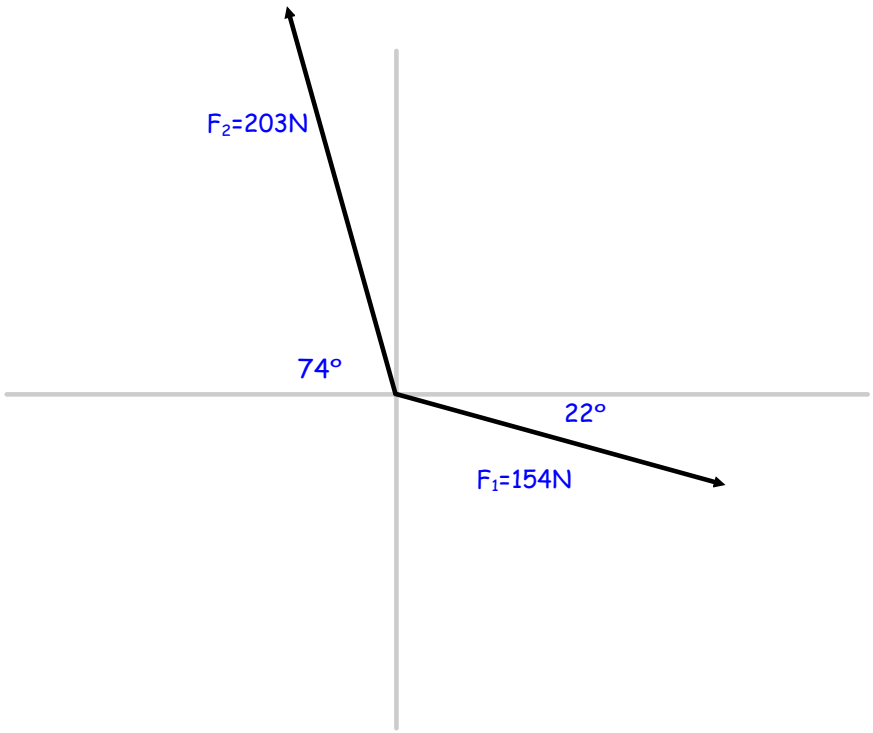
F_1=154N [E22°S]
F_2=203N [W74°N]
F_3=?

Equilibrating Force-makes the vector sum of all forces equal to 0



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Find the *x*-component of each of the force vectors.

$F_{1x} = |\vec{F}_1| \cos 22.0°$

$F_{1x} = (154\text{ N})(0.92718)$

$F_{1x} = 142.786\text{ N}$

The angle is in the 4th quadrant so the *x*-component is positive.

$F_{2x} = -|\vec{F}_2| \cos 74.0°$

$F_{2x} = -(203\text{ N})(0.27564)$

$F_{2x} = -55.954\text{ N}$

The angle is in the 2nd quadrant so the *x*-component is negative.

Find the *y*-component of each of the force vectors.

$F_{1y} = -|\vec{F}_1| \sin 22.0°$

$F_{1y} = -(154\text{ N})(0.37461)$

$F_{1y} = -57.689\text{ N}$

The angle is in the 4th quadrant so the *y*-component is negative.

$F_{2y} = |\vec{F}_2| \sin 74.0°$

$F_{2y} = (203\text{ N})(0.96126)$

$F_{2y} = 195.136\text{ N}$

The angle is in the 2nd quadrant so the *y*-component is positive.

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Sum the x and y-components individuallyto find the components of the unknown vector.

$$F_{1x} + F_{2x} + F_{3x} = 0.0$$
$$F_{3x} = 0.0 - F_{1x} - F_{2x}$$
$$F_{3x} = 0.0 - (142.786\ \text{N}) - (-55.954\ \text{N})$$
$$F_{3x} = -86.832\ \text{N}$$
$$F_{1y} + F_{2y} + F_{3y} = 0.0$$
$$F_{3y} = 0.0 - F_{1y} - F_{2y}$$
$$F_{3y} = 0.0 - (-57.689\ \text{N}) - (195.136\ \text{N})$$
$$F_{3y} = -137.447\ \text{N}$$

Magnitude

$$\left|\vec{F}_3\right|^2 = (F_{3x})^2 + (F_{3y})^2$$
$$\left|\vec{F}_3\right|^2 = (-86.832\ \text{N})^2 + (-137.447\ \text{N})^2$$
$$\left|\vec{F}_3\right|^2 = 26431.474\ \text{N}^2$$
$$\left|\vec{F}_3\right| = 162.578\ \text{N}$$
$$\left|\vec{F}_3\right| \cong 163\ \text{N}$$

Direction

$$\tan\theta = \frac{F_{3y}}{F_{3x}}$$
$$\tan\theta = \frac{-137.447\ \text{N}}{-86.832\ \text{N}}$$
$$\tan\theta = 1.5829$$
$$\theta = \tan^{-1}(1.5829)$$
$$\theta = 57.72^\circ$$
$$\theta \cong 58^\circ$$

$\therefore F_3$=163N[W58°S]

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