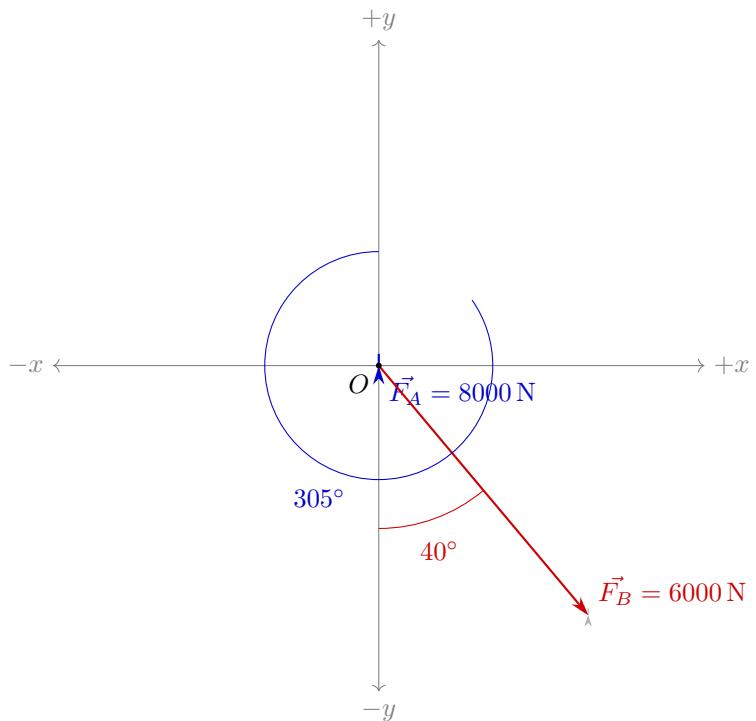


Engineering Calculation Report: Problem 2-12

Generated: 2025-12-08

Problem Setup

Vector	$ \vec{F} $ (N)	θ (deg)	Ref
\vec{F}_B	6000.0	40.0	$-y$
\vec{F}_A	8000.0	?	$+y$
\vec{F}_R	?	0.0	$+x$



Equations Used

$$(1) \frac{\sin(\angle(\vec{F}_A, \vec{F}_R))}{|\vec{F}_B|} = \frac{\sin(\angle(\vec{F}_A, \vec{F}_B))}{|\vec{F}_A|}$$

$$(2) |\vec{F}_R|^2 = |\vec{F}_A|^2 + |\vec{F}_B|^2 - 2 \cdot |\vec{F}_A| \cdot |\vec{F}_B| \cdot \cos(\angle(\vec{F}_A, \vec{F}_B))$$

Solution

Step 1: $\angle(\vec{F}_A, \vec{F}_R)$ using Eq 1

$$\angle(\vec{F}_A, \vec{F}_R) = \sin^{-1}(6000.0 \text{ N} \cdot \frac{\sin(50.0^\circ)}{8000.0 \text{ N}}) = 35.1^\circ$$

Step 2: $\angle(y, \vec{F}_A)$ with respect to $+y$

$$\angle(y, \vec{F}_A) = 90^\circ - \angle(\vec{F}_R, \vec{F}_A) = 90^\circ - 35.1^\circ = 54.9^\circ$$

Step 3: Interior angle opposite \vec{F}_R

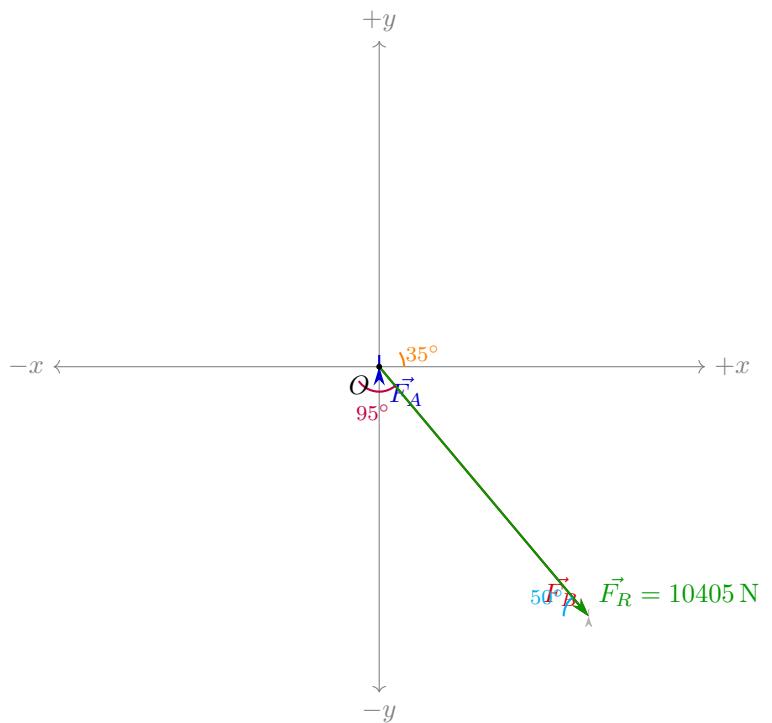
$$180^\circ - 50.0^\circ - 35.1^\circ = 94.9^\circ$$

Step 4: $|\vec{F}_R|$ using Eq 2

$$|\vec{F}_R| = \sqrt{(8000.0 \text{ N})^2 + (6000.0 \text{ N})^2 - 2(8000.0 \text{ N})(6000.0 \text{ N}) \cos(94.9^\circ)} = 10404.6 \text{ N}$$

Results

Vector	$ \vec{F} $ (N)	θ (deg)	Ref
\vec{F}_A	8000.0	305.1	+y
\vec{F}_R	10 404.6	0.0	+x



Signatures: Calc. By: _____ Rev. By: _____ Appr. By: _____

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