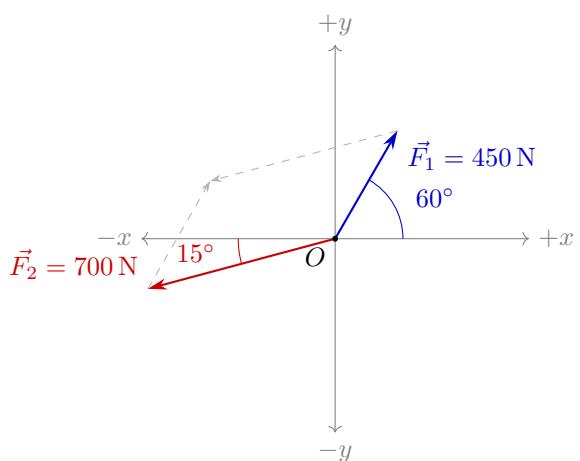


# Engineering Calculation Report: Problem 2-1

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## Problem Setup

Vector	$ \vec{F} $ (N)	$\theta$ (deg)	Ref
$\vec{F}_1$	450.0	60.0	+x
$\vec{F}_2$	700.0	15.0	-x
$\vec{F}_R$	?	?	+x



## Equations Used

$$(1) |\vec{F}_R|^2 = |\vec{F}_1|^2 + |\vec{F}_2|^2 - 2 \cdot |\vec{F}_1| \cdot |\vec{F}_2| \cdot \cos(\angle(\vec{F}_1, \vec{F}_2))$$

$$(2) \frac{\sin(\angle(\vec{F}_1, \vec{F}_R))}{|\vec{F}_2|} = \frac{\sin(\angle(\vec{F}_1, \vec{F}_2))}{|\vec{F}_R|}$$

## Solution

**Step 1:**  $\angle(\vec{F}_1, \vec{F}_2)$

$$\angle(\vec{F}_1, \vec{F}_2) = |\angle(\vec{x}, \vec{F}_1) - \angle(-\vec{x}, \vec{F}_2)| = |60^\circ - 15^\circ| = 45^\circ$$

**Step 2:**  $|\vec{F}_R|$  using Eq 1

$$|\vec{F}_R| = \sqrt{(450.0 \text{ N})^2 + (700.0 \text{ N})^2 - 2(450.0 \text{ N})(700.0 \text{ N}) \cos(45.0^\circ)} = 497.0 \text{ N}$$

**Step 3:**  $\angle(\vec{F}_1, \vec{F}_R)$  using Eq 2

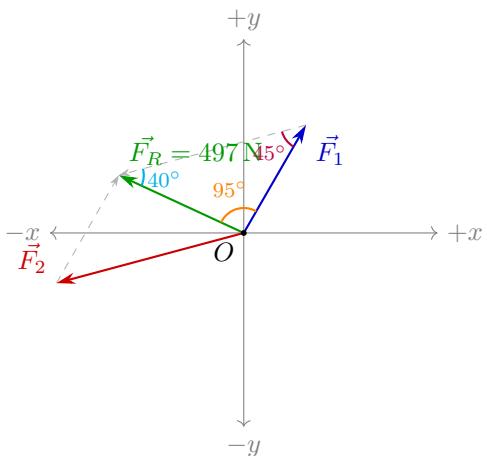
$$\angle(\vec{F}_1, \vec{F}_R) = \sin^{-1}(700.0 \text{ N} \cdot \frac{\sin(45.0^\circ)}{497.0 \text{ N}}) = 95.2^\circ$$

**Step 4:**  $\angle(\vec{x}, \vec{F}_R)$  with respect to +x

$$\angle(\vec{x}, \vec{F}_R) = \angle(\vec{x}, \vec{F}_1) + \angle(\vec{F}_1, \vec{F}_R) = 60.0^\circ + 95.2^\circ = 155.2^\circ$$

## Results

Vector	$ \vec{F} $ (N)	$\theta$ (deg)	Ref
$\vec{F}_R$	497.0	155.2	+x



**Signatures:** Calc. By: \_\_\_\_\_ Rev. By: \_\_\_\_\_ Appr. By: \_\_\_\_\_

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