

# Engineering Calculation Report: Problem 2-5

November 30, 2025

## 1 Known Variables

Vector	$F_x$ (lbf)	$F_y$ (lbf)	$ \vec{F} $ (lbf)	$\theta$ (deg)	Reference
$\vec{F}_R$	0.0	-350.0	350.0	270.0	+x

## 2 Unknown Variables

Vector	$F_x$ (lbf)	$F_y$ (lbf)	$ \vec{F} $ (lbf)	$\theta$ (deg)	Reference
$\vec{F}_{AB}$	?	?	?	225.0	+x
$\vec{F}_{AC}$	?	?	?	330.0	+x

## 3 Equations Used

$$1. \frac{|\vec{F}_{AB}|}{\sin(\angle(\vec{F}_{AC}, \vec{F}_R))} = \frac{|\vec{F}_R|}{\sin(\angle(\vec{F}_{AB}, \vec{F}_{AC}))}$$

$$2. \frac{|\vec{F}_{AC}|}{\sin(\angle(\vec{F}_{AB}, \vec{F}_R))} = \frac{|\vec{F}_R|}{\sin(\angle(\vec{F}_{AB}, \vec{F}_{AC}))}$$

## 4 Step-by-Step Solution

### Step 1: Solve for triangle angles

$$\begin{aligned}\angle(\vec{F}_{AB}, \vec{F}_R) &= |\angle(\vec{x}, \vec{F}_{AB}) - \angle(\vec{x}, \vec{F}_R)| \\ &= |225^\circ - 270^\circ| \\ &= 45^\circ\end{aligned}$$

$$\begin{aligned}\angle(\vec{F}_{AC}, \vec{F}_R) &= |\angle(\vec{x}, \vec{F}_{AC}) - \angle(\vec{x}, \vec{F}_R)| \\ &= |330^\circ - 270^\circ| \\ &= 60^\circ\end{aligned}$$

$$\begin{aligned}\angle(\vec{F}_{AB}, \vec{F}_{AC}) &= 180^\circ - 45^\circ - 60^\circ \\ &= 75^\circ\end{aligned}$$

### Step 2: Solve for $|\vec{F}_{AB}|$ using Eq 1

$$|\vec{F}_{AB}| = 350 \cdot \frac{\sin(60^\circ)}{\sin(75^\circ)}$$

$$= 314 \text{ lbf}$$

**Step 3: Solve for  $|\vec{F}_{AC}|$  using Eq 2**

$$|\vec{F}_{AC}| = 350 \cdot \frac{\sin(45^\circ)}{\sin(75^\circ)}$$

$$= 256 \text{ lbf}$$

## 5 Summary of Results

Vector	$F_x$ (lbf)	$F_y$ (lbf)	$ \vec{F} $ (lbf)	$\theta$ (deg)	Reference
$\vec{F}_{AB}$	-221.9	-221.9	313.8	225.0	+x
$\vec{F}_{AC}$	221.9	-128.1	256.2	330.0	+x

## Disclaimer

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