Engineering Calculation Report: Problem 2-2: Find Force with Known Resultant

October 13, 2025

Description

If the resultant force is to be 500 N directed along the positive y-axis, and F\$_2$ = 700$Nat195, determinethemagn

1 Known Variables

Symbol	Name	Value	Unit
$F_{1_{mag}}$	F\$_1$$Magnitude$	959.778	N
$F_{1_{angle}}$	F\$_1$$Direction$	45.2121	°
$F_{2_{mag}}$	F\$_2$$Magnitude$	700	N
$F_{2_{angle}}$	F\$_2$$Direction$	−165	°

2 Unknown Variables (To Calculate)

Symbol	Name	Unit
F_{1_x}	F\$_1$$X - Component$	N
F_{1_y}	F\$_1$$Y - Component$	N
F_{2_x}	F\$_2$$X - Component$	N
F_{2_y}	F\$_2$$Y - Component$	N
$F_{R_{mag}}$	F\$_R$$Magnitude$	N
$F_{R_{angle}}$	F\$_R$$Direction$	°
F_{R_x}	F\$_R$$X - Component$	N
F_{R_y}	F\$_R$$Y - Component$	N

3 Equations Used

1. $F_1^2 = F_R^2 + F_2^2 - 2 \cdot F_R \cdot F_2 \cdot \cos gamma$
2. $\frac{\sin alpha}{F_2} = \frac{\sin gamma}{F_1}$

4 Step-by-Step Solution

Step 1: Solve for $F_{1Magnitude}$

Equation:

$$F_1^2 = F_R^2 + F_2^2 - 2 \cdot F_R \cdot F_2 \cdot \cos gamma$$

Substitution:

$$F_1^2 = (500.00\,\mathrm{N})^2 + (700.00\,\mathrm{N})^2 - 2 \cdot (500.00\,\mathrm{N}) \cdot (700.00\,\mathrm{N}) \cdot \cos 105.0^\circ$$

Result:

$$F_{1Magnitude} = 959.78\,N$$

Step 2: Solve for $F_{1Direction}$

Equation:

$$\frac{\sin alpha}{F_2} = \frac{\sin gamma}{F_1}$$

Substitution:

$$\frac{\sin alpha}{700.00\,\mathrm{N}} = \frac{\sin 105.0^\circ}{959.78\,\mathrm{N}}$$

Result:

$$F_{1Direction} = 45.21\,^\circ$$

5 Summary of Results

Variable	Name	Final Value	Unit
F_{1_x}	$\mathrm{F\backslash}_1X - Component$	676.148	N
F_{1_y}	$\mathrm{F\backslash}_1Y - Component$	681.173	N
F_{2_x}	$\mathrm{F\backslash}_2X - Component$	−676.148	N
F_{2_y}	$\mathrm{F\backslash}_2Y - Component$	−181.173	N
F_{R_mag}	$\mathrm{F\backslash}_RMagnitude$	500	N
F_{R_angle}	$\mathrm{F\backslash}_RDirection$	1.5708	°
F_{R_x}	$\mathrm{F\backslash}_RX - Component$	$3.061\,62 \times 10^{-14}$	N
F_{R_y}	$\mathrm{F\backslash}_RY - Component$	500	N

6 Vector Diagram

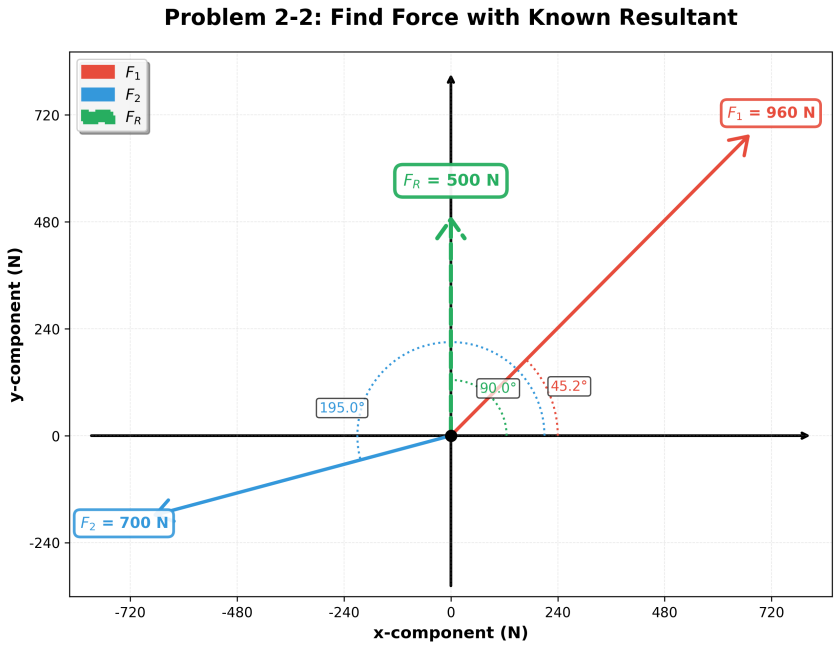

Figure: Vector diagram showing all forces and their orientations

Disclaimer

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