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

October 14, 2025

Description

If the resultant force is to be 500 N directed along the positive y-axis, and $F\backslash_2 = 700 N at 195, determine the magn$

1 Known Variables

Symbol	Name	Value	Unit
F_{1_mag}	F$\backslash_1 Magnitude$	959.778	N
F_{1_angle}	F$\backslash_1 Direction$	45.2121	°
F_{2_mag}	F$\backslash_2 Magnitude$	700	N
F_{2_angle}	F$\backslash_2 Direction$	-165	°

2 Unknown Variables (To Calculate)

Symbol	Name	Unit
F_{1_x}	F$\backslash_1 X - Component$	N
F_{1_y}	F$\backslash_1 Y - Component$	N
F_{2_x}	F$\backslash_2 X - Component$	N
F_{2_y}	F$\backslash_2 Y - Component$	N
F_{R_mag}	F$\backslash_R Magnitude$	N
F_{R_angle}	F$\backslash_R Direction$	°
F_{R_x}	F$\backslash_R X - Component$	N
F_{R_y}	F$\backslash_R Y - Component$	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 $F_{1 Magnitude}$

Equation:

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

Substitution:

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

Result:

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

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

Equation:

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

Substitution:

$$\frac{\sin alpha}{700.00\,\text{N}} = \frac{\sin 105.0°}{959.78\,\text{N}}$$

Result:

$$F_{1Direction} = 45.21\,°$$

5 Summary of Results

Variable	Name	Final Value	Unit
F_{1_x}	F\$_1 X - Component$	676.148	N
F_{1_y}	F\$_1 Y - Component$	681.173	N
F_{2_x}	F\$_2 X - Component$	−676.148	N
F_{2_y}	F\$_2 Y - Component$	−181.173	N
$F_{R_{mag}}$	F\$_R Magnitude$	500	N
$F_{R_{angle}}$	F\$_R Direction$	1.5708	°
F_{R_x}	F\$_R X - Component$	$3.061\,62 \times 10^{-14}$	N
F_{R_y}	F\$_R Y - Component$	500	N

6 Vector Diagram

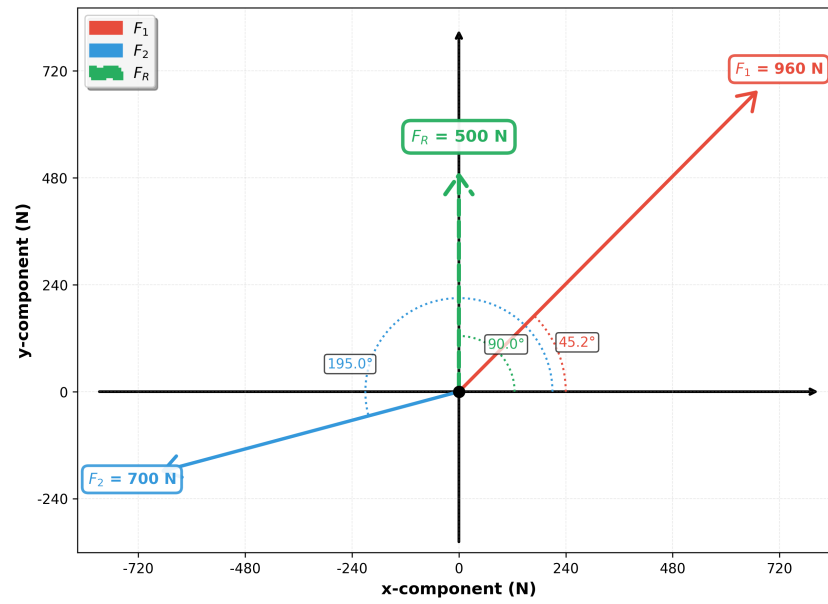**Problem 2-2: Find Force with Known Resultant**

Figure: Vector diagram showing all forces and their orientations

Disclaimer

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