Engineering Calculation Report: Two Force Resultant

October 13, 2025

Description

Determine the magnitude and direction of the resultant of two forces

1 Known Variables

Symbol	Name	Value	Unit
$F_{1_{mag}}$	F_1$Magnitude$	450	N
$F_{1_{angle}}$	F_1$Direction$	60	°
$F_{2_{mag}}$	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. $F_R^2 = F_1^2 + F_2^2 - 2 \cdot F_1 \cdot F_2 \cdot \cos gamma$
2. $\frac{\sin alpha}{F_1} = \frac{\sin gamma}{F_R}$

4 Step-by-Step Solution

Step 1: Solve for $F_{RMagnitude}$

Equation:

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

Substitution:

$$F_R^2 = (450.00\,\mathrm{N})^2 + (700.00\,\mathrm{N})^2 - 2 \cdot (450.00\,\mathrm{N}) \cdot (700.00\,\mathrm{N}) \cdot \cos 45.0^\circ$$

Result:

$$F_{RMagnitude} = 497.01\,N$$

Step 2: Solve for $F_{RDirection}$

Equation:

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

Substitution:

$$\frac{\sin alpha}{450.00\,\mathrm{N}} = \frac{\sin 45.0^\circ}{497.01\,\mathrm{N}}$$

Result:

$$F_{RDirection} = 155.19\,^\circ$$

5 Summary of Results

Variable	Name	Final Value	Unit
F_{1_x}	$\mathrm{F}\backslash_1 X - Component$	225	N
F_{1_y}	$\mathrm{F}\backslash_1 Y - Component$	389.711	N
F_{2_x}	$\mathrm{F}\backslash_2 X - Component$	−676.148	N
F_{2_y}	$\mathrm{F}\backslash_2 Y - Component$	−181.173	N
$F_{R_{mag}}$	$\mathrm{F}\backslash_R Magnitude$	497.014	N
$F_{R_{angle}}$	$\mathrm{F}\backslash_R Direction$	2.708 61	°
F_{R_x}	$\mathrm{F}\backslash_R X - Component$	−451.148	N
F_{R_y}	$\mathrm{F}\backslash_R Y - Component$	208.538	N

6 Vector Diagram

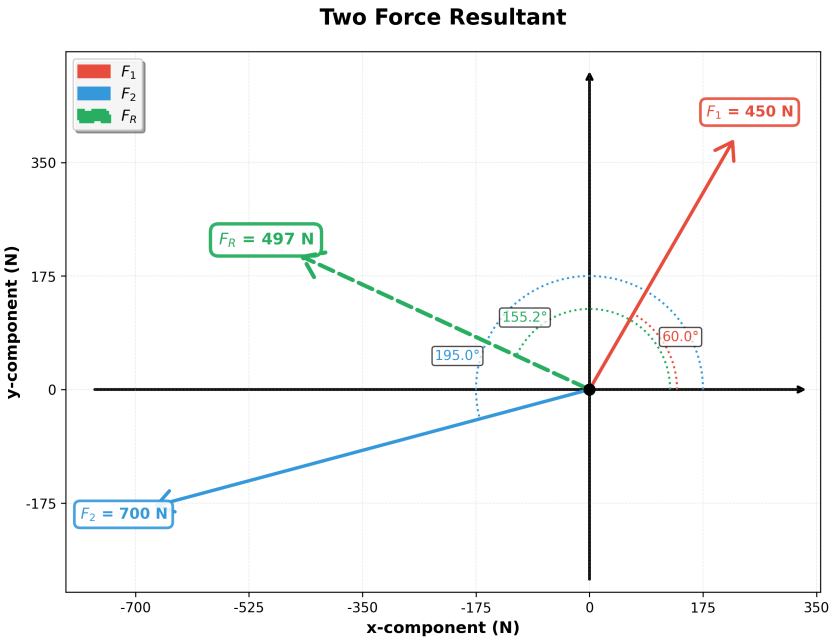

Figure: Vector diagram showing all forces and their orientations

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