

# Engineering Calculation Report: Problem 2-1

November 24, 2025

## Description

Determine the magnitude of the resultant force and its direction, measured counterclockwise from the positive x axis.

## 1 1. Known Variables

| Symbol | X (N)    | Y (N)    | Magnitude (N) | Angle (deg) | Reference |
|--------|----------|----------|---------------|-------------|-----------|
| $F_1$  | 225      | 389.711  | 450           | 60          | +x        |
| $F_2$  | -676.148 | -181.173 | 700           | 15          | -x        |

## 2 2. Unknown Variables (To Calculate)

| Symbol | X (N)    | Y (N)   | Magnitude (N) | Angle (deg) | Reference |
|--------|----------|---------|---------------|-------------|-----------|
| $F_R$  | -451.148 | 208.538 | ?             | 155.192     | +x        |

## 3 3. Equations Used

1.  $F_{1\_x} = -F_1 \cos(\theta)$
2.  $F_{1\_y} = -F_1 \sin(\theta)$
3.  $F_{2\_x} = -F_2 \cos(\theta)$
4.  $F_{2\_y} = -F_2 \sin(\theta)$
5.  $F_{R\_x} = F_{1\_x} + F_{2\_x}$
6.  $F_{R\_y} = F_{1\_y} + F_{2\_y}$
7.  $F_R = \sqrt{(F_{R\_x})^2 + (F_{R\_y})^2}$
8.  $\theta = \tan^{-1}(F_{R\_y} / F_{R\_x})$

## 4 4. Step-by-Step Solution

**Step 1:** Solve for  $F_{1\_x}$

**Equation:**

$$F_{1_x} = |F_1| \cos(60^\circ)$$

**Result:**

$$F_{1_x} = 225.000 \text{ N}$$

**Step 2: Solve for F\_1\_y**

**Equation:**

$$F_{1y} = |F_1| \sin($$

**Result:**

$$F_{1y} = 389.711 \text{ N}$$

**Step 3: Solve for F\_2\_x**

**Equation:**

$$F_{2x} = |F_2| \cos($$

**Result:**

$$F_{2x} = -676.148 \text{ N}$$

**Step 4: Solve for F\_2\_y**

**Equation:**

$$F_{2y} = |F_2| \sin($$

**Result:**

$$F_{2y} = -181.173 \text{ N}$$

**Step 5: Solve for F\_R\_x**

**Equation:**

$$F_{Rx} = F_{1x} + F_{2x}$$

**Result:**

$$F_{Rx} = -451.148 \text{ N}$$

**Step 6: Solve for F\_R\_y**

**Equation:**

$$F_{Ry} = F_{1y} + F_{2y}$$

**Result:**

$$F_{Ry} = 208.538 \text{ N}$$

**Step 7: Solve for —F\_R—**

**Equation:**

$$|F_R| = ((F_{Rx} + (F_{Ry})$$

**Result:**

$$|F_R| = 497.014 \text{ N}$$

**Step 8: Solve for**

**Equation:**

$$= \tan(F_{Ry}/F_{Rx})$$

**Result:**

$$= 155.192^\circ$$

## 5 5. Summary of Results

| Symbol | Magnitude (N) | Angle (deg) | F_x (N) | F_y (N) |
|--------|---------------|-------------|---------|---------|
|        |               |             |         |         |

## Disclaimer

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