

Find the x and y components of $3.0\text{ N } 61^\circ\text{ S of W}$

$$\begin{aligned}\vec{F}_{2x} &= F_2 \cos \theta \\ &= (3.0\text{ N})(\cos 241^\circ) \\ &= -1.45\text{ N}\end{aligned}$$

$$\begin{aligned}\vec{F}_{2y} &= F_2 \sin \theta \\ &= (3.0\text{ N})(\sin 241^\circ) \\ &= -2.62\text{ N}\end{aligned}$$

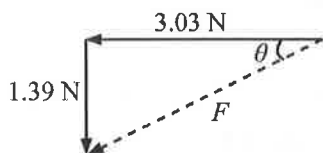
Add x components

$$\begin{aligned}\vec{F}_x &= (-1.58\text{ N}) + (-1.45\text{ N}) \\ &= -3.03\text{ N}\end{aligned}$$

Add y components

$$\begin{aligned}\vec{F}_y &= 1.23\text{ N} + (-2.62\text{ N}) \\ &= -1.39\text{ N}\end{aligned}$$

Add F_x and F_y , using Pythagoras theorem



$$\begin{aligned}F_{\text{net}} &= \sqrt{(F_x)^2 + (F_y)^2} \\ &= \sqrt{(3.03\text{ N})^2 + (1.39\text{ N})^2} \\ &= 3.3\text{ N}\end{aligned}$$

$$\begin{aligned}\tan \theta &= \frac{F_y}{F_x} \\ &= \frac{1.39\text{ N}}{3.03\text{ N}} \\ \theta &= 25^\circ\end{aligned}$$

$$\begin{aligned}\vec{F}_{\text{net}} &= 3.3\text{ N } 25^\circ\text{ S of W} \\ \text{or } 3.3\text{ N } 65^\circ\text{ W of S } (3.3\text{ N } 205^\circ)\end{aligned}$$

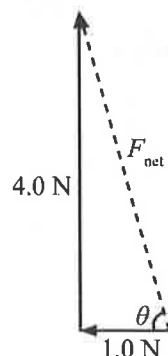
6. Add the horizontal (x) forces:

$$\begin{aligned}\vec{F}_x &= 2.0\text{ N} + (-3.0\text{ N}) \\ &= 1.0\text{ N west}\end{aligned}$$

Add the vertical (y) forces:

$$\vec{F}_y = 4.0\text{ N}$$

Add F_x and F_y , using Pythagoras theorem.



$$\begin{aligned}F_{\text{net}} &= \sqrt{(F_x)^2 + (F_y)^2} \\ &= \sqrt{(1.0\text{ N})^2 + (4.0\text{ N})^2} \\ &= 4.1\text{ N}\end{aligned}$$

$$\begin{aligned}\tan \theta &= \frac{F_y}{F_x} \\ &= \frac{4.0\text{ N}}{1.0\text{ N}} \\ \theta &= 76^\circ\end{aligned}$$

$$\begin{aligned}\vec{F}_{\text{net}} &= 4.1\text{ N } 76^\circ\text{ N of W} \\ \text{or } 4.1\text{ N } 14^\circ\text{ W of N } (4.1\text{ N } 104^\circ)\end{aligned}$$

Lesson 2—Newton's First Law of Motion

PRACTICE EXERCISES ANSWERS AND SOLUTIONS

$$\begin{aligned}1. \quad \vec{F}_{\text{net}} &= m\vec{a} \\ \vec{a} &= \frac{\vec{F}_{\text{net}}}{m} \\ &= \frac{9.0\text{ N}}{20.0\text{ kg}} \\ &= 0.45\text{ m/s}^2 \text{ east}\end{aligned}$$

$$\begin{aligned}2. \quad \text{Magnitude of force is} \\ \vec{F}_{\text{net}} &= m\vec{a} \\ \vec{a} &= \frac{\vec{F}_{\text{net}}}{m} \\ &= \frac{15.0\text{ N}}{8.0\text{ m/s}^2} \\ &= 1.9\text{ kg}\end{aligned}$$