Given

$\vec{A} = 1.0 \ m \ \angle -35°$

$\vec{B} = 1.8 \ m \ \angle \phi$

Solution

Find the angle ϕ such that the sum only has a vertical component.

First break each vector into components.

$$\vec{A} = \left\{ A \cos \theta \hat{i} + A \sin \theta \hat{j} \right\}$$

$$\vec{A} = \left\{ 1.0 \cos (-35) \, \hat{i} + 1.0 \sin (-35) \, \hat{j} \right\} \ m$$

$$\vec{A} = \left\{ 0.819 \hat{i} - 0.574 \hat{j} \right\} \ m$$

and

$$\vec{B} = \left\{ B \cos \theta \hat{i} + B \sin \theta \hat{j} \right\}$$

$$\vec{B} = \left\{ 1.8 \cos \phi \hat{i} + 1.8 \sin \phi \hat{j} \right\} \ m$$

$$\vec{C} = \vec{A} + \vec{B}$$

$$\vec{C} = \left\{ 0.819 \hat{i} - 0.574 \hat{j} \right\} m + \left\{ 1.8 \cos \phi \hat{i} + 1.8 \sin \phi \hat{j} \right\} \ m$$

$$\vec{C} = \left\{ (0.819 + 1.8 \cos \phi) \, \hat{i} + (-0.574 + 1.8 \sin \phi) \, \hat{j} \right\} \ m$$

$$\vec{C} = \left\{ 0 \hat{i} + C_y \hat{j} \right\} \ m$$

Therefore,

$$0 = 0.819 + 1.8 \cos \phi$$

Solving for ϕ gives

$$\cos \phi = \frac{-0.819}{1.8}$$

$$\phi = \cos^{-1} \left(\frac{-0.819}{1.8} \right) = 117°$$