Problem 1:

We have two vectors $\vec{A}$ and $\vec{B}$ with equal magnitude 8.50 m.

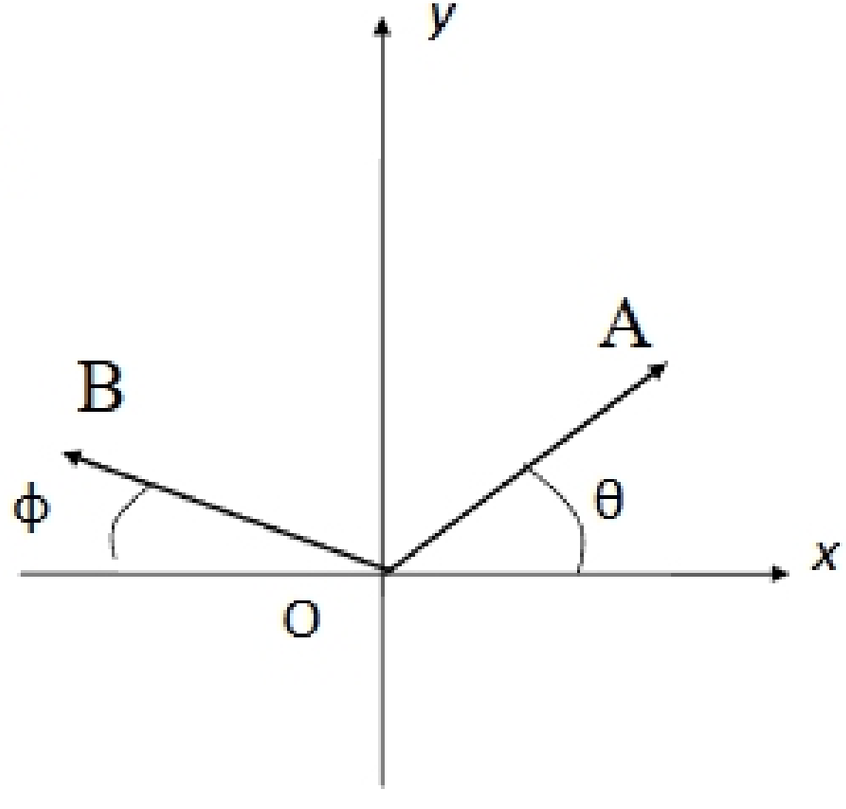
Vector $\vec{A}$ forms an angle $\theta = 45.0\ ^\circ$ with the positive x - axis. Vector $\vec{B}$ forms an angle $\phi = 35.0^\circ$ with the negative $x-$axis as shown in the figure.

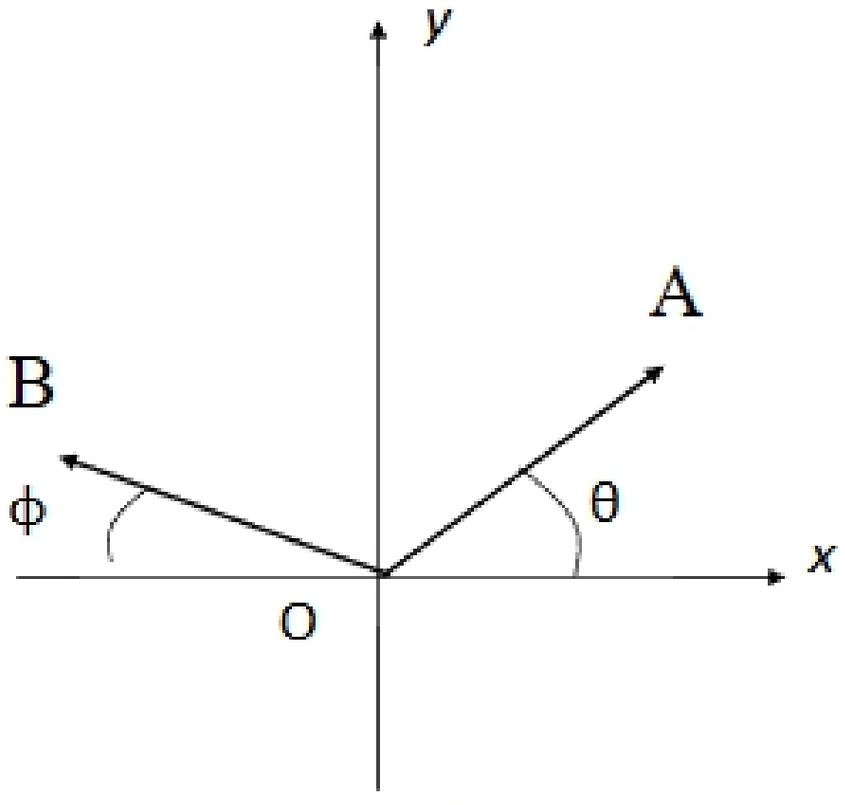
a. (8) Write $\vec{A}$ and $\vec{B}$ in unit vector notation.

b.(4) Calculate $\vec{A}+\vec{B}$ in unit vector notation.

c.(5) Calculate the scalar product $\vec{A}\cdot\vec{B}$

d. (8) Calculate the vector product $\vec{A}\times\vec{B}$

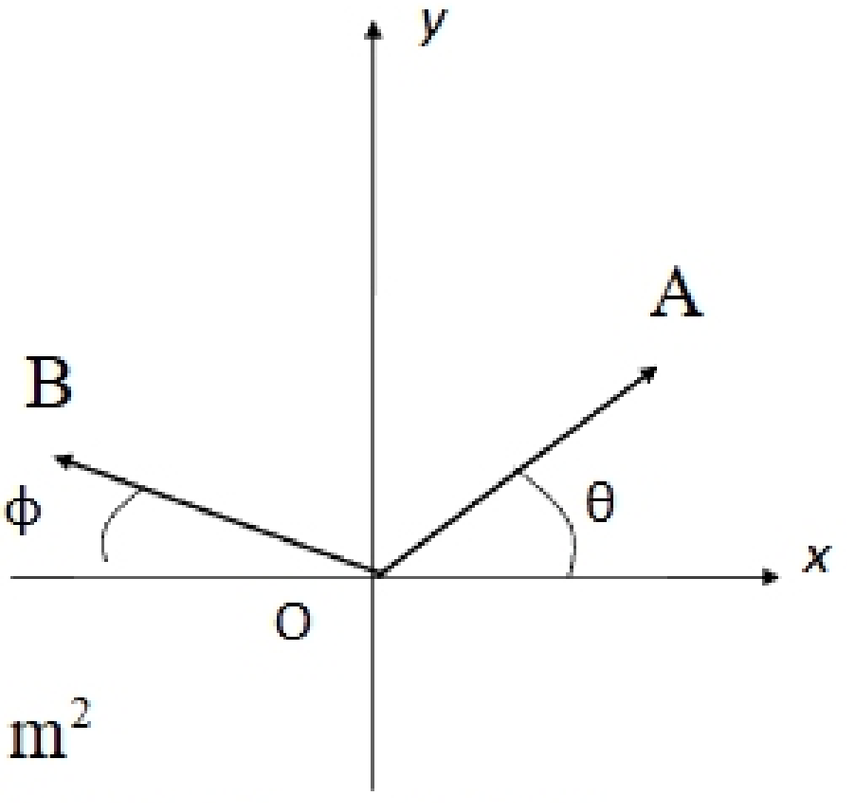




a. $\vec{A} = 8.5 \times \cos 45 \hat{i} + 8.5 \times \sin 45 \hat{j} = \left(6.01\hat{i} + 6.01\hat{j}\right)$ m

$\vec{B} = 8.5 \times \cos(180 - 35)\hat{i} + 8.5 \times \sin(180 - 35)\hat{j} = \left(-6.96\hat{i} + 4.87\hat{j}\right)$ m

b. $\vec{A} + \vec{B} = (6.01 - 6.96)\hat{i} + (6.01 + 4.87)\hat{j} = \left(-0.952\hat{i} + 10.9\hat{j}\right)$ m



$\vec{A} = \left(6.01\hat{i} + 6.01\hat{j}\right)\ \text{m}$

$\vec{B} = \left(-6.96\hat{i} + 4.87\hat{j}\right)\ \text{m}$

c. $\vec{A}\cdot\vec{B} = -6.01\times 6.96 + 6.01\times 4.87 = -12.6\ \text{m}^2$

Or: $\vec{A}\cdot\vec{B} = A\times B\times\cos\left(180-45-35\right) = 8.499\times 8.495\times\cos 100°$

$\vec{A}\cdot\vec{B} = -12.6\ \text{m}^2$

d. $\vec{A}\times\vec{B} = \left(6.01\hat{i} + 6.01\hat{j}\right)\times\left(-0.952\hat{i} + 10.9\hat{j}\right)$

$\vec{A}\times\vec{B} = -41.8\left(\hat{i}\times\hat{i}\right) + 29.3\left(\hat{i}\times\hat{j}\right) - 41.8\left(\hat{j}\times\hat{i}\right) - 29.3\left(\hat{j}\times\hat{j}\right)$

$\left(\hat{i}\times\hat{i}\right) = \left(\hat{j}\times\hat{j}\right) = 0 \qquad \left(\hat{i}\times\hat{j}\right) = \hat{k} \qquad \left(\hat{j}\times\hat{i}\right) = -\hat{k}$

$\vec{A}\times\vec{B} = 71.1\,\hat{k}\ \text{m}^2$