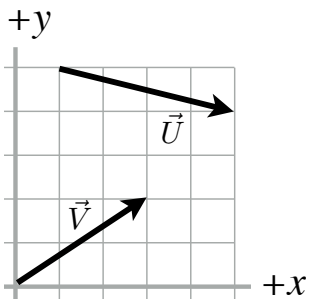
Trigonometry and Vector Decomposition

1. Two position vectors, ***U*** and ***V***, are superimposed on a grid. Each square is one meter long and one meter wide. Write each vector as a coordinate pair $\boldsymbol{A} = (A_x, A_y)$, using +/– signs for direction.



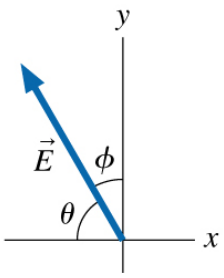
$\vec{U} =$

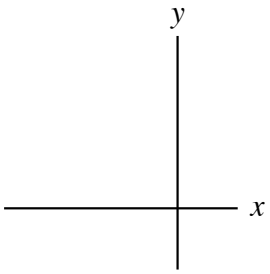
$\vec{V} =$

$\vec{U} + \vec{V} =$

$\vec{U} - \vec{V} =$

2. The vector ***E*** in the figure has a magnitude of 10 m, and the angle $\theta = 60°$.
   a. Draw a triangle using E as the hypotenuse and θ as one of the angles. Then, sketch the component vectors $\boldsymbol{E}_x$ and $\boldsymbol{E}_y$.

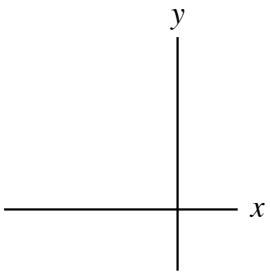




   b. What is the magnitude (size or amount) of $\boldsymbol{E}_x$? **First** write it in terms of E and a function of the angle θ, **then** calculate the value. Include units at every step of the calculation.

   c. What is the magnitude (size or amount) of $\boldsymbol{E}_y$? **First** write it in terms of E and a function of the angle θ, **then** calculate the value. Include units at every step of the calculation.

d. Draw a triangle using E as the hypotenuse and ϕ as one of the angles. Then, sketch the component vectors $\boldsymbol{E}_x$ and $\boldsymbol{E}_y$.



e. What is the magnitude (size or amount) of $\boldsymbol{E}_x$? **First** write it in terms of E and a function of the angle ϕ, **then** calculate the value. Include units at every step of the calculation.

f. What is the magnitude (size or amount) of $\boldsymbol{E}_y$? **First** write it in terms of E and a function of the angle ϕ, **then** calculate the value. Include units at every step of the calculation.

g. How does the value of E_x in part b compare with the value of E_x in part e?

h. How does the value of E_y in part c compare with the value of E_y in part f?