

**6.1 Vectors in the Plane (continued)**

Target 8A: Perform vector operations: scalar multiple and sums and represent them graphically  
Target 8B: Perform vector operations: magnitude, direction angle, and unit vector

**Unit Vector**

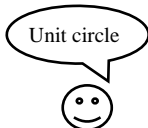
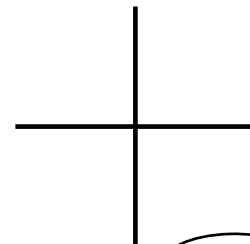
**Unit Vector** – A vector,  $\mathbf{u}$ , with a length of \_\_\_\_\_.

$$|\mathbf{u}| = \underline{\hspace{2cm}}$$

If  $\mathbf{v}$  is not the zero vector, then the unit vector in the direction of  $\mathbf{v}$  is:

$$\mathbf{u} = \frac{\mathbf{v}}{|\mathbf{v}|} =$$

Note:  $\mathbf{u} = \langle$



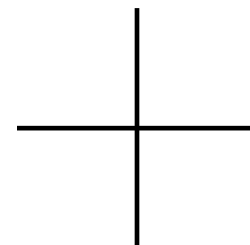
The **Standard Unit Vectors** are  $\mathbf{i} = \langle 1, 0 \rangle$  and  $\mathbf{j} = \langle 0, 1 \rangle$ .

So, any vector  $\mathbf{v} = \langle a, b \rangle$  can be expressed as

the linear combination \_\_\_\_\_ of  $\mathbf{i}$  and  $\mathbf{j}$ ,

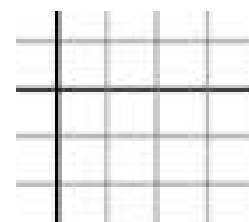
where the scalar  $a$  is the \_\_\_\_\_ component  
and  $b$  is the \_\_\_\_\_ component

of vector  $\mathbf{v}$ .



*Example*

Find a unit vector in the direction of  $\mathbf{v} = \langle 3, -2 \rangle$ . Write the unit vector as a linear combination of the standard unit vector.



A vector's **Direction Angle** is the angle  $\theta$  that  $\mathbf{v}$  makes with the positive  $x$ -axis. (*This is a precise way to describe direction of a vector.*)

$$\sin \theta =$$

$$\cos \theta =$$

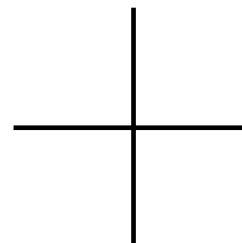
$$\text{So, } b =$$

$$\text{So, } a =$$

The horizontal component is \_\_\_\_\_.

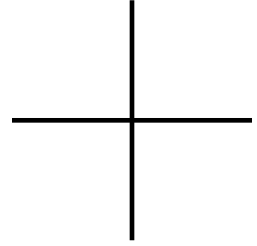
The vertical component is \_\_\_\_\_.

$$\therefore, \mathbf{v} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \langle \hspace{2cm} \rangle$$



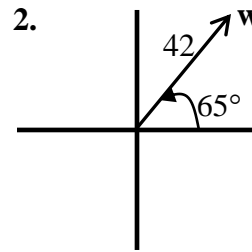
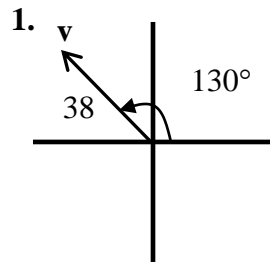
*Example*

Find the components of vector  $\mathbf{v}$  with direction angle of  $125^\circ$  and magnitude of 8.



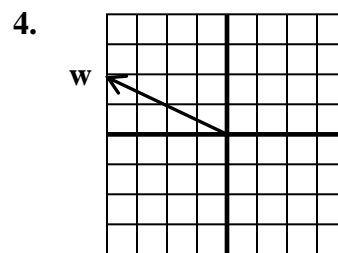
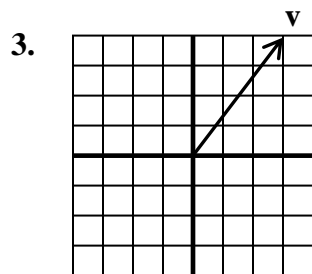
**Practice**

For #1 & 2, find the component form of the vector.



For #3-6, find:

- a) the unit vector in the direction of the given vector,
- b) the direction angle of the vector,
- c) and the component form of the vector.



5.  $\mathbf{v} = \langle -2, 3 \rangle$

6.  $\mathbf{w} = 5\mathbf{i} - 2\mathbf{j}$

**More Practice****Unit Vectors**<https://www.khanacademy.org/math/precalculus/vectors-prec calc#unit-vectors><https://www.mathsisfun.com/algebra/vector-unit.html>[http://www.algebralab.org/lessons/lesson.aspx?file=Trigonometry\\_TrigVectorUnits.xml](http://www.algebralab.org/lessons/lesson.aspx?file=Trigonometry_TrigVectorUnits.xml)[http://www.softschools.com/formulas/physics/unit\\_vector\\_formula/83/](http://www.softschools.com/formulas/physics/unit_vector_formula/83/)[https://youtu.be/6o\\_S7u7Ddx4](https://youtu.be/6o_S7u7Ddx4)<https://youtu.be/iAeKl5h2SJM>**Magnitude and Direction Angle of Vectors**<https://braingenie.ck12.org/skills/108146><https://www.khanacademy.org/math/precalculus/vectors-prec calc#magnitude-direction>[https://www.varsitytutors.com/hotmath/hotmath\\_help/topics/magnitude-and-direction-of-vectors](https://www.varsitytutors.com/hotmath/hotmath_help/topics/magnitude-and-direction-of-vectors)[http://www.softschools.com/math/pre\\_calculus/direction\\_angles\\_of\\_vectors/](http://www.softschools.com/math/pre_calculus/direction_angles_of_vectors/)<https://youtu.be/WxWJorOVIj8><https://youtu.be/8Eur16foTMw>[https://youtu.be/82nu\\_sAPmmo](https://youtu.be/82nu_sAPmmo)**Component Form of Vectors**<https://www.khanacademy.org/math/precalculus/vectors-prec calc#component-form-of-vectors><https://www.math10.com/en/geometry/vectors-operations/vectors-operations.html><https://www.varsitytutors.com/precalculus-help/express-a-vector-in-component-form><https://youtu.be/GxBUbiNL1eE><https://youtu.be/WZ3xzVHT0mc>**Homework Assignment**

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