Warm - Up

Entry Card, clear your desk.

SWBAT add vectors and find the components of vectors.

Agenda:
- Quiz
- Vector addition
- Unit vectors
- Exit Card

HW - Book Page 511 #5 - 41 odd, 50 and 52

Any two arrows with the same length and pointing in the same direction represent the same vector.

Head Minus Tail Rule

If an arrow has inital point (x_1, y_1) and terminal point (x_2, y_2), it represents the vector

$$\langle x_2 - x_1, y_2 - y_1 \rangle$$

Example:

Show that the arrow from A = (-4,2) to B = (-1,6) is equivalent to the arrow from X = (2,-1) to Y = (5,3)

Magnitude:
If **v** is represented by the arrow from (x_1, y_1) to (x_2, y_2), then

$$|v| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Example:

Find the magnitude of the vector **v** represneted by PQ, where P = (-3,4) and Q = (-5,2)

Vector Addition and Scalar Multiplication:

Let **u** = <u_1,u_2> and **v** = <v_1,v_2> be vectors and let k be a real number (**scalar**). the sum of the vectors u and v is the vector:

u + v = <$u_1 + v_1$, $u_2 + v_2$>

The product of the scalar k and the vector u is:

ku = k<u_1,u_2> = <ku_1,ku_2>

Example:
Let **u** = <-1,3> and **v** = <4,7>. Find the component form of the following vectors:

(a) **u** + **v**

-1+4, 3+7

<3,10>

(b) 3**u**

3<-1,3>

<-3,9>

(c) 2**u** + -1**v**

<-2,6>+<-4,-7>

<-6,-1>

Unit Vector:

A vector **u** with a length |**u**| = 1 is a **unit vector**.
If **v** is not the zero vector then the vector

$$\mathbf{u} = \frac{v}{|v|} = \frac{1}{|v|}v$$

is a **unit vector** in the direction of **v**

Example:
Find a unit vector in the direction of **v** = $\langle -3, 2\rangle$ and verify that it has length 1.

Standard unit vectors:
i = $\langle 1,0\rangle$ and **j** = $\langle 0,1\rangle$

Any vector **v can** written as an expression in terms ofthe standard unit vectors

$$\begin{aligned}\mathbf{v} &= \langle a, b\rangle \\ &= \langle a,0\rangle + \langle 0,b\rangle \\ &= a\langle 1,0\rangle + b\langle 0,1\rangle \\ &= a\mathbf{i} + b\mathbf{j}\end{aligned}$$

Direction angle is the angle θ that **v** makes with the positive x - axis.

Resolving the Vector:
if **v** has direction angle θ, the components of **v** can be computed using the formula

$$\mathbf{v} = \langle |v|\cos\theta, |v|\sin\theta\rangle$$

Example:
Find the components of the vector **v** with direction angle 105° and magnitude of 6.

Example:
Find the magnitude and direction angle of:
u = <3,2>

Quick Note:
The **velocity** of a moving object is a vector because velocity has both magnitude and direction. The magnitude of velocity is **speed**

Example:
A DC - 10 jet aircraft is flying on a bearing of 65° at 500mph. Find the component form of the velocity of the airplane.

Exit Card

Let P = (-2, 2) and Q = (3, 4). Find the component form and magnitude of the vector QP

$$|v| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$