Vector Applications

Direction Angles

> If you know the direction angle, θ, and the magnitude of vector, **v**, then
>
> **v** =   (component form)
>
> **v** =   (linear combination form)

Example 1: Find the component form of the vector that represents the velocity of an airplane descending at a speed of 100 miles per hour at an angle of 30 degrees below the horizontal, as shown in the figure.
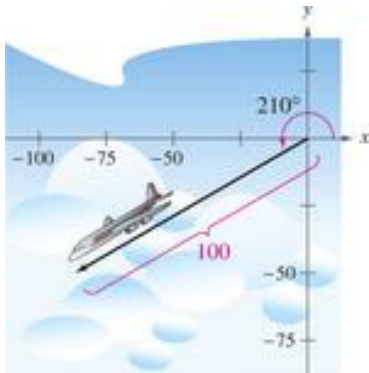
Practice Problem 1: Find the component form of the vector that represents the velocity of an airplane descending at a speed of 100 miles per hour at an angle of 45 degrees below the horizontal.

Practice Problem 2: A ball is thrown with an initial velocity of 70 feet per second, at an angle of 40 degrees with the horizontal (see figure). Find the component form of the velocity vector.
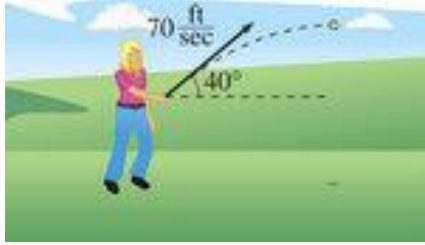
Example 2: An airplane is traveling at a speed of 500 miles per hour with a bearing of N 30° W. As the airplane reaches a certain point, it encounters a wind blowing with a velocity of 70 miles per hour in the direction N 45° E. What are the resultant speed and direction of the airplane?

Example 3: An airplane is traveling at a speed of 724 km per hour at a bearing of N 30° E. If the wind velocity is 32 km per hour from the west, find the resultant speed and direction of the plane.

Practice Problem 3: An airplane is flying at a speed of 860 km per hour at a bearing of S 32° E. If the wind has a velocity of 130.35 km per hour at a bearing of N 26.67° E, find the resultant speed and direction of the plane.

Class Work

1. A commercial jet is flying from Miami to Seattle. The jet's velocity with respect to the air is 580 miles per hour with a bearing of N 28° W. The wind has a velocity of 60 miles per hour and a bearing of N 45° E.

    a) Write the velocity of the wind as a vector in component form.

    b) Write the velocity of the jet as a vector in component form.

    c) Write the resultant velocity of the jet in component form.

    d) What is the resultant speed of the jet?

    e) What is the resultant bearing of the jet?

2. The initial and terminal points of a vector, **v**, are (3, -4) and (9, 1) respectively.

    a) Write **v** in component form.

    b) Write **v** in linear combination form.

    c) Sketch **v** with its initial point at the origin.

    d) Find the magnitude of **v**.