

## Resultant Vectors

### Part I.

Calculate the resultant vectors when the following sets of vectors are combined. Show all steps as directed in class and illustrated by this example.

$$\begin{array}{rcl}
 \mathbf{A} = 40 \text{ N @ } 30^\circ \text{ SE} & \mathbf{A}_x = 40 \cos 30^\circ = 34.64 & \mathbf{A}_y = -40 \sin 30^\circ = -20.00 \\
 \mathbf{B} = 60 \text{ N @ } 70^\circ \text{ SW} & \mathbf{B}_x = -60 \cos 70^\circ = -20.52 & \mathbf{B}_y = -60 \sin 70^\circ = -56.38 \\
 & \mathbf{R}_x = \underline{14.12} & \mathbf{R}_y = \underline{-76.38}
 \end{array}$$

$$\mathbf{R}^2 = \mathbf{R}_x^2 + \mathbf{R}_y^2 = (14.12)^2 + (-76.38)^2 = 6033.28, \text{ so } \mathbf{R} = 77.67 \text{ N}$$

$$\mathbf{T} = \tan^{-1} \left| \frac{\mathbf{R}_y}{\mathbf{R}_x} \right| = \tan^{-1} (76.38/14.12) = 79.53^\circ \text{ SE}$$

Solution:  $\mathbf{R} = 77.67 \text{ N @ } 79.53^\circ \text{ SE}$

### Part II.

Using either the "head-to-tail" or "head-to-head" graphical method, construct the resultant vectors when these same sets of vectors are combined. Use a scale of 1.0 cm = 1.0 unit. Measure the magnitude and direction of the resultant and compare with your calculated resultant. Label all vectors as directed in class.

1.  $\mathbf{A} = 35 \text{ N @ } 60^\circ \text{ NE}$ ,  $\mathbf{B} = 50 \text{ N @ } 20^\circ \text{ NW}$
2.  $\mathbf{A} = 70 \text{ m/s @ } 60^\circ \text{ SW}$ ,  $\mathbf{B} = 50 \text{ m/s @ } 70^\circ \text{ NW}$
3.  $\mathbf{A} = 40 \text{ m @ } 60^\circ \text{ SE}$ ,  $\mathbf{B} = 80 \text{ m @ } 30^\circ \text{ NW}$
4.  $\mathbf{A} = 15 \text{ lb @ } 60^\circ \text{ NE}$ ,  $\mathbf{B} = 50 \text{ lb @ } 20^\circ \text{ SE}$
5.  $\mathbf{A} = 35 \text{ N @ } 40^\circ \text{ SW}$ ,  $\mathbf{B} = 65 \text{ N @ } 20^\circ \text{ NW}$ ,  $\mathbf{C} = 65 \text{ N @ } 20^\circ \text{ NE}$
6.  $\mathbf{A} = 75 \text{ N @ } 10^\circ \text{ NE}$ ,  $\mathbf{B} = 50 \text{ N @ } 20^\circ \text{ NW}$ ,  $\mathbf{C} = 65 \text{ N @ } 70^\circ \text{ SE}$