<A Vector Problem>

350 km @ 30° East-of-North

125 km @ 30° East-of-South

500 km @ 30° South-of-West

$L_{1x} = L_1 \sin\theta = 175$ km

$L_{1y} = L_1 \cos\theta = 303.1$ km

$L_{2x} = L_2 \sin\theta = 62.5$ km

$L_{2y} = L_2 \cos\theta = 108.3$ km

$L_{3x} = L_3 \sin\theta = 433.0$ km

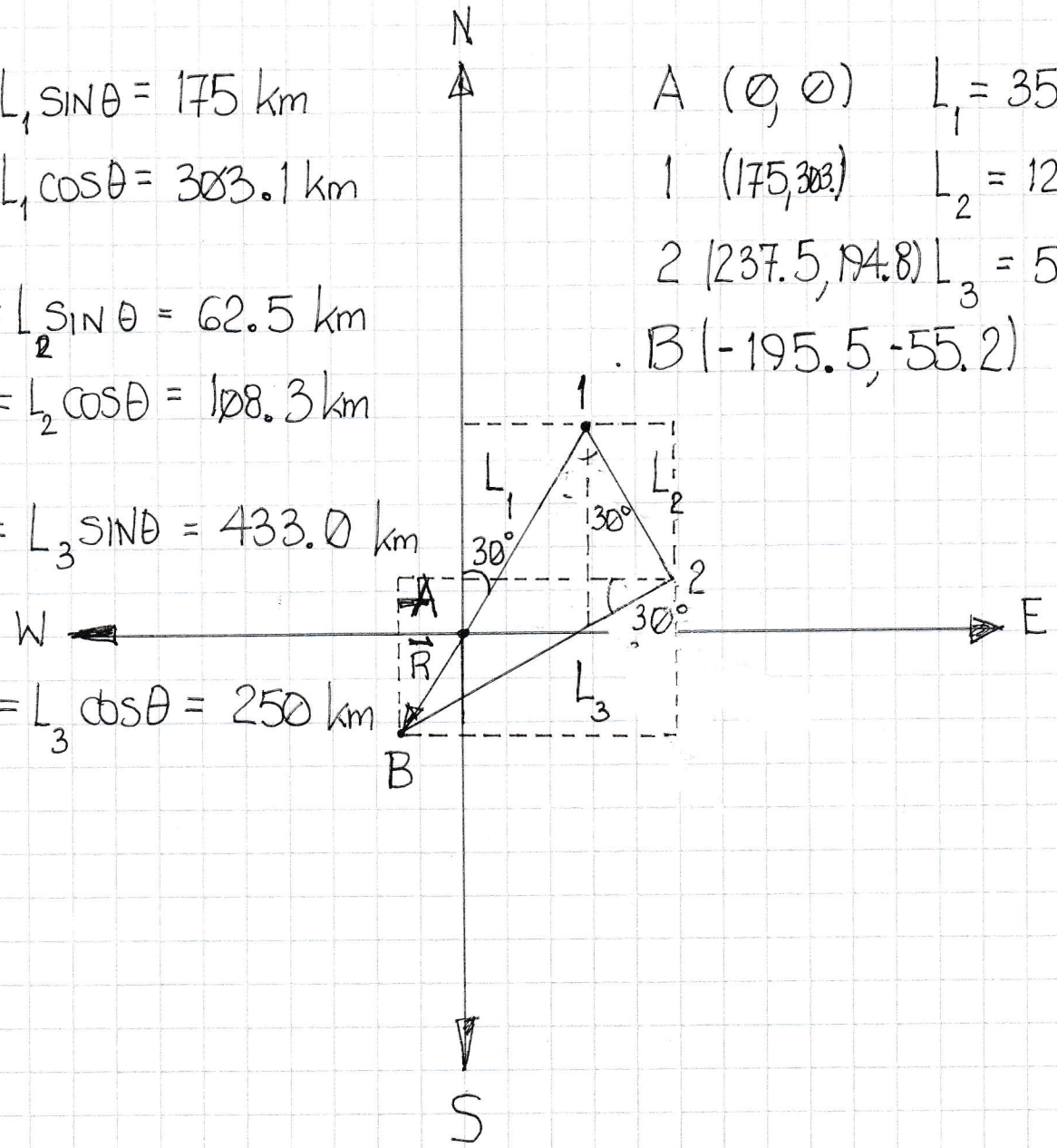
$L_{3y} = L_3 \cos\theta = 250$ km

A (0, 0) $L_1 = 350$ km

1 (175, 303.1) $L_2 = 125$ km

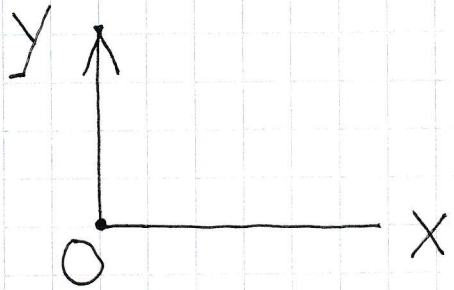
2 (237.5, 194.8) $L_3 = 500$ km

B (-195.5, -55.2)



<Due-North>

NE



$\theta = \varnothing^\circ$

$X = r\sin\theta = \varnothing$

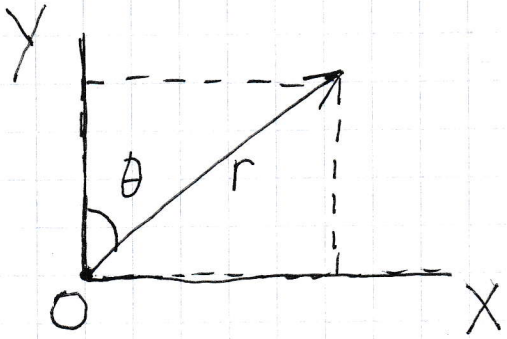
$y = r\cos\theta = r$

$$\begin{bmatrix} x : + \\ y : + \end{bmatrix}$$

<East-of-North>

NNE

$$\begin{bmatrix} x : + \\ y : + \end{bmatrix}$$

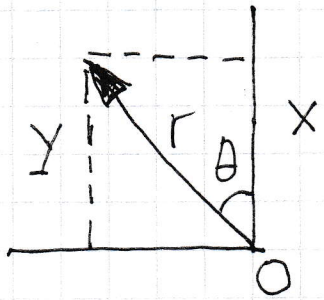


$\sin\theta = \frac{x}{r}$ $\quad X = r\sin\theta$

$\cos\theta = \frac{y}{r}$ $\quad y = r\cos\theta$

<West-of-North>

NNW



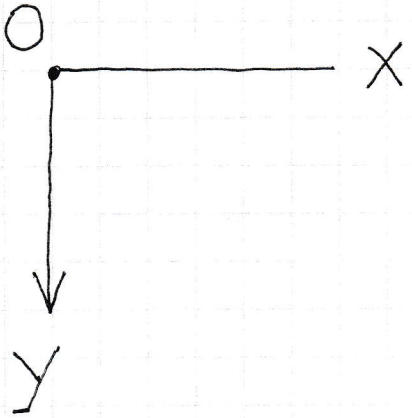
$\sin\theta = \frac{X}{r}$; $X = r\sin\theta$

$\cos\theta = \frac{Y}{r}$; $y = r\cos\theta$

$$\begin{bmatrix} x: & + \\ y: & - \end{bmatrix}$$

<Due-South>

SE



$\theta = 0^\circ$

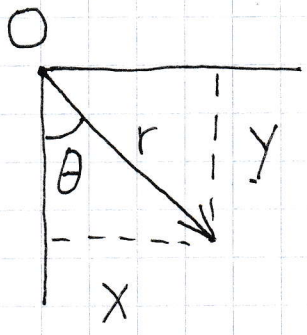
$X = r\sin 0^\circ = 0$

$y = r\cos 0^\circ = r$

$$\begin{bmatrix} x: & + \\ y: & - \end{bmatrix}$$

< East-of-South >

SES



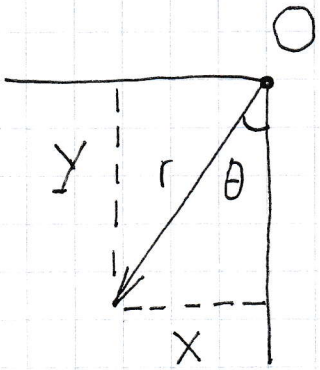
$$\sin\theta = \frac{x}{r} \;;\; x = r\sin\theta$$

$$\cos\theta = \frac{y}{r} \;;\; y = r\cos\theta$$

$$\begin{bmatrix} x : + \\ y : - \end{bmatrix}$$

< West-of-South >

SWS



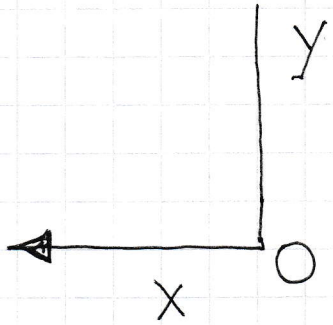
$$\sin\theta = \frac{x}{r} \;;\; x = r\sin\theta$$

$$\cos\theta = \frac{y}{r} \;;\; y = r\cos\theta$$

$$\begin{bmatrix} x : - \\ y : - \end{bmatrix}$$

<Due-West>

WS



$\theta = 90^\circ$

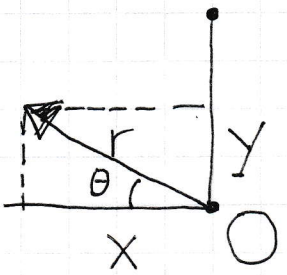
$x = r \cdot \sin\theta = r$

$y = r\cos\theta = 0$

$$\begin{bmatrix} x : - \\ y : + \end{bmatrix}$$

<North-of-West>

WNW



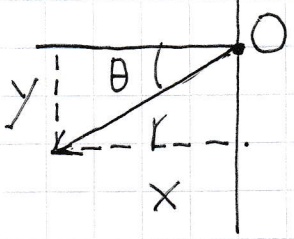
$\sin\theta = \frac{y}{r}$; $y = r\sin\theta$

$\cos\theta = \frac{x}{r}$; $x = r\cos\theta$

$$\begin{bmatrix} x : - \\ y : + \end{bmatrix}$$

<South-of-West>

WSW



$\sin\theta = \frac{y}{r}$; $y = r\sin\theta$

$\cos\theta = \frac{x}{r}$; $x = r\cos\theta$

$$\begin{bmatrix} x : - \\ y : - \end{bmatrix}$$

Summary :

NE ; $x = r\sin 0^\circ = 0$ $\quad x : +$

$y = r\cos 0^\circ = r$ $\quad y : +$

NNE ; $x = r\sin\theta$ $\quad x : +$

$y = r\cos\theta$ $\quad y : +$

NNW ; $x = r\sin\theta$ $\quad x : +$

$y = r\cos\theta$ $\quad y : -$

Summary :

SE ; $x = r\sin\theta^\circ = 0$ $\quad$ $\begin{bmatrix} x : + \\ y : - \end{bmatrix}$

$y = r\cos\theta^\circ = r$

SES ; $x = r\sin\theta$ $\quad$ $\begin{bmatrix} x : + \\ y : - \end{bmatrix}$

$y = r\cos\theta$

SWS ; $\sin\theta = \frac{x}{r}$; $x = r\sin\theta$

$\cos\theta = \frac{y}{r}$; $y = r\cos\theta$

$\begin{bmatrix} x : - \\ y : - \end{bmatrix}$

WS ; $\theta = 90^\circ$ $\quad$ $\begin{bmatrix} x : - \\ y : + \end{bmatrix}$

$x = r\sin 90^\circ = r$

$y = r\cos 90^\circ = 0$

〈Summary :〉

WNW $x = r\cos\theta$ $\begin{bmatrix} x : - \\ y : + \end{bmatrix}$

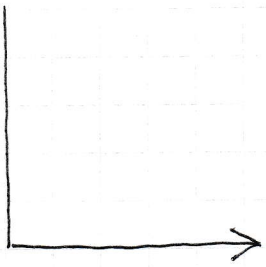
$y = r\sin\theta$

WSW $x = r\cos\theta$ $\begin{bmatrix} x : - \\ y : - \end{bmatrix}$

$y = r\sin\theta$

〈Due-East〉

ES

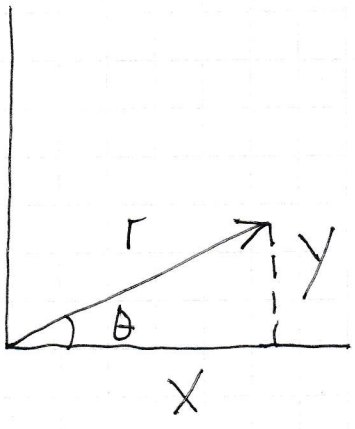


$x = r$ $\begin{bmatrix} x : + \\ y : + \end{bmatrix}$

$y = 0$

〈North-of-East〉

ENE



$\sin\theta = \frac{y}{r}$; $y = r\sin\theta$

$x = r\sin\theta$

$\begin{bmatrix} x : + \\ y : + \end{bmatrix}$

Summary:

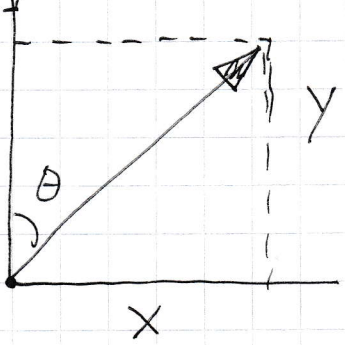
WSW: $x = r\cos\theta$ $\quad \begin{bmatrix} x : - \\ y : - \end{bmatrix}$

$y = r\sin\theta$

Sample : L_1 : 350, 30°, East-of-North (NNE)

$L_{1X} = 350 * \sin 30^\circ = 175$

$L_{1Y} = 350 * \cos 30^\circ = 303$



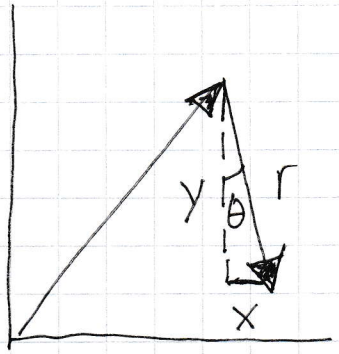
$\cos\theta = \frac{Y}{r}$; $y = r\cos\theta$

$\sin\theta = \frac{X}{r}$; $x = r\sin\theta$

L_2 : 125, 30°, SES ; East-of-South

$L_{2X} = 125 * \sin 30^\circ = 62.5$

$L_{2Y} = 125 * \cos 30^\circ = 108.3$



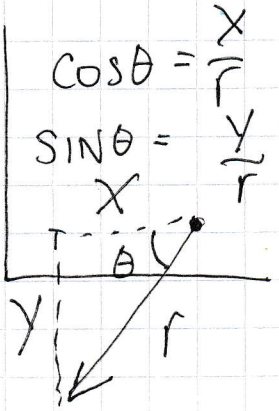
$\cos\theta = \frac{y}{r}$; $y = r\cos\theta$

$x = r\sin\theta$

L_3 : 500, 30°, South-of-West (WSW)

$L_{3X} = 500 * \cos 30^\circ = 433.0$

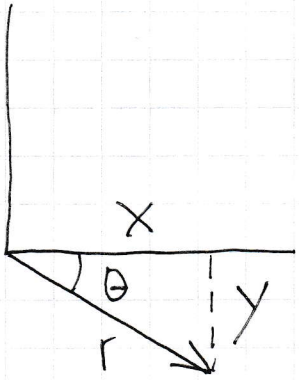
$L_{3y} = 500 * \sin 30^\circ = 250$



$$\sum L_x = 175 + 62.5 - 433 = -195.5$$

$$\sum L_y = 300 - 108.3 - 250 = -55.3$$

7.1 <South-of-East> ESE



$\sin\theta = \frac{y}{r}$; $y = r\sin\theta$

$x = r\cos\theta$

$$\begin{bmatrix} x : + \\ y : - \end{bmatrix}$$