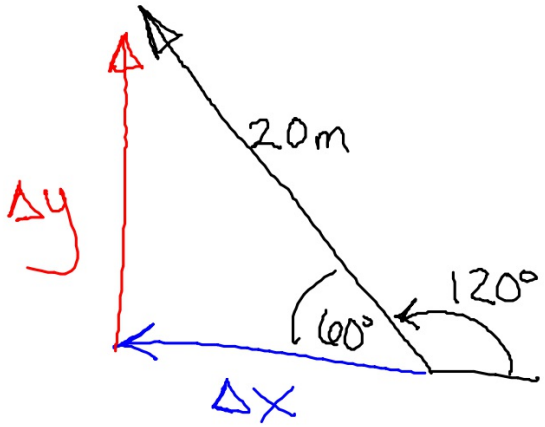
$\Delta r = 20m, 120°$ (polar form)

? in comp. form



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

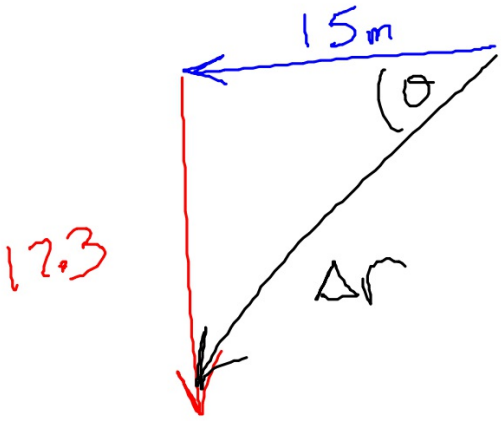
$\cos 60° = \frac{\Delta x}{20}$ $\Delta x = 10m$

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

$\sin 60 = \frac{\Delta y}{20}$ $\Delta y = 17.3m$

$\Delta r = (-10\hat{i} + 17.3\hat{j})m$

$\Delta r = (-15\hat{i} - 17.3\hat{j})\,m \longrightarrow$ polar ?



$(15)^2 + (17.3)^2 = \Delta r^2$

$\Delta r = 22.3\,m$

$\tan\theta = \frac{17.3}{15}$

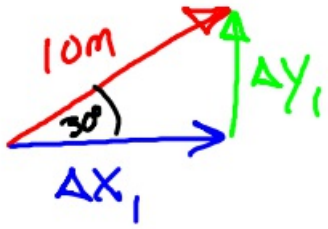
$\theta = 49°$

$\Delta r = 22.3m, 229°$

•Ex1: During practice, Ryan marches 10m,30° and then 10m, 150°. What is his total displacement?

• $\Delta r_{total} = ?$ $\Delta r_1 = 10m\ 30°$

$\Delta r_2 = 10m\ 150°$



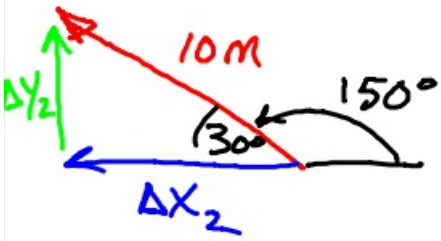
$\cos 30° = \frac{\Delta X_1}{10m}$

$\Delta X_1 = 8.66m$

$\sin 30° = \frac{\Delta Y_1}{10m}$

$\Delta Y_1 = 5m$

$\Delta r_1 = 8.66m\hat{i} + 5m\hat{j}$



$\Delta r_2 = -8.66m\hat{i} + 5.0m\hat{j}$

$\Delta r_1 = 8.66\hat{i} + 5\hat{j}$

$+\Delta r_2 = -8.66\hat{i} + 5\hat{j}$

$\Delta r_{total} = 0\hat{i} + 10\hat{j}$

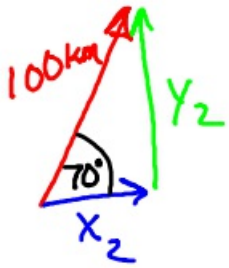
$\Delta r = 10m, 90°$

Ex2: A radar station tracks a satellite that moves from r_1= 160km,28° to r_2=100 km70°. What is the satellite's displacement?

$\Delta r = ?$ $r_1 = 160\text{km}, 28°$

$r_2 = 100\text{km}, 70°$

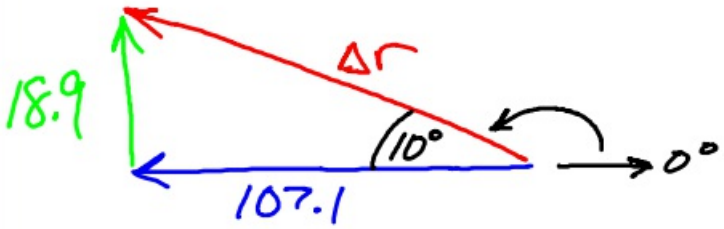
$x_1 = 141.3\text{km}$ $y_1 = 75.1\text{km}$



$x_2 = 34.2\text{km}$

$y_2 = 94.0\text{km}$

$$r_2 = 34.2\hat{i} + 94.0\hat{j}$$
$$-r_1 = 141.3\hat{i} + 75.1\hat{j}$$
$$\Delta r = -107.1\hat{i} + 18.9\hat{j}$$



$\Delta r = 109\text{km}, 170°$