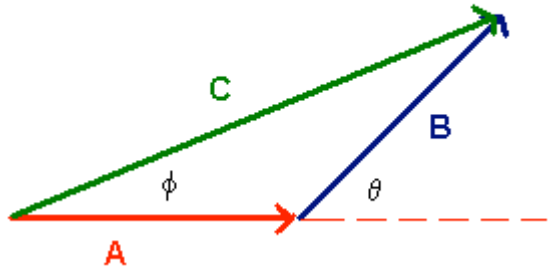
ESERCIZIO N.4

Un aeroplano viaggia per 200 Km verso Est, quindi per 300 Km in direzione Nord-Est inclinata di 60° rispetto ad Est. Determinare lo spostamento finale **C**.

Dati: A = 200 km = $200 \cdot 10^3$ m ; B = 300 km = $300 \cdot 10^3$ m ; $\vartheta = \pi/3$

Soluzione: Determinare C = |**C**| e φ

Risoluzione con metodo grafico (o geometrico)



Teorema del coseno o di Carnot

$C^2 = A^2 + B^2 - 2 \cdot A \cdot B \cdot \cos(\pi - \vartheta)$

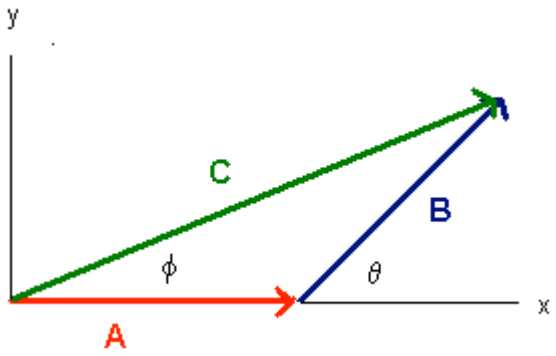
$$C = \sqrt{A^2 + B^2 - 2 \cdot A \cdot B \cos(\pi - \vartheta)} = \\ = \sqrt{200^2 + 300^2 - 2 \times 200 \times 300 \times \cos(2\pi/3)} = 436 \text{ km}$$

Teorema dei seni:

$$\frac{\sin(\phi)}{B} = \frac{\sin(\pi - \theta)}{C}$$

$$\phi = \arcsin\left(\frac{B}{C}\sin(\theta)\right) = \arcsin\left(\frac{300}{436}\sin(\pi/3)\right) = 0.64 \text{ rad}$$

Risoluzione con metodo analitico



$\mathbf{A} = A_x\,\hat{\imath} + A_y\,\hat{\jmath}$

$\mathbf{B} = B_x\,\hat{\imath} + B_y\,\hat{\jmath}$

$\mathbf{C} = C_x\,\hat{\imath} + C_y\,\hat{\jmath}$

$$\mathbf{C} = \mathbf{A} + \mathbf{B} \Rightarrow C_x = A_x + B_x \;;\; C_y = A_y + B_y$$

$A_x = A = 200$ km, $A_y = 0$

$B_x = B\cdot\cos(\theta) = 300\cdot\cos(\pi/3) = 150$ km; $B_y = B\cdot\sin(\theta) = 300\cdot\sin(\pi/3) = 260$ km

$C_x = 200 + 150 = 350$ km ; $C_y = 0 + 260 = 260$ km

$$C = \sqrt{C_x^2 + C_y^2} = \sqrt{350^2 + 260^2} = 436\,\text{km}$$

$$\text{tg}(\phi) = \frac{C_y}{C_x} \Rightarrow$$

$$\phi = \arctan\left(\frac{260}{350}\right) = 36.6°$$