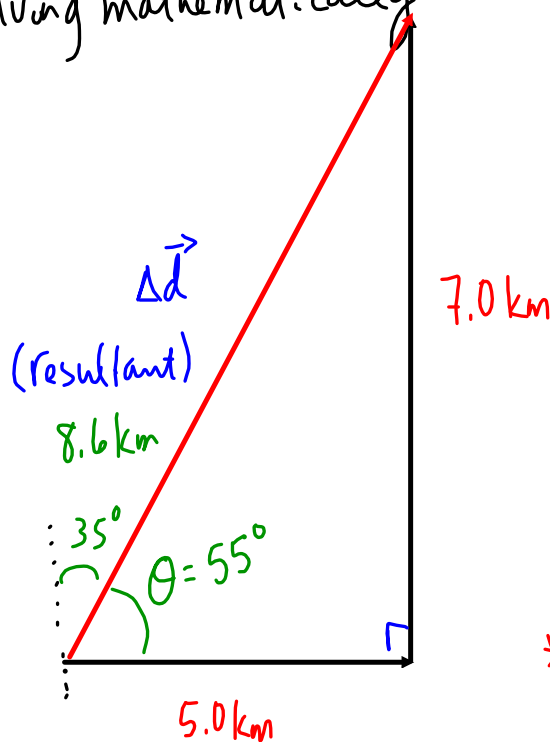


BACKGROUND for CHAPTER 10

Displacement + Velocity as Vector Quantities

• Vector problems can be solved by using a scale diagram OR be solved mathematically. A good diagram is essential even when solving mathematically.

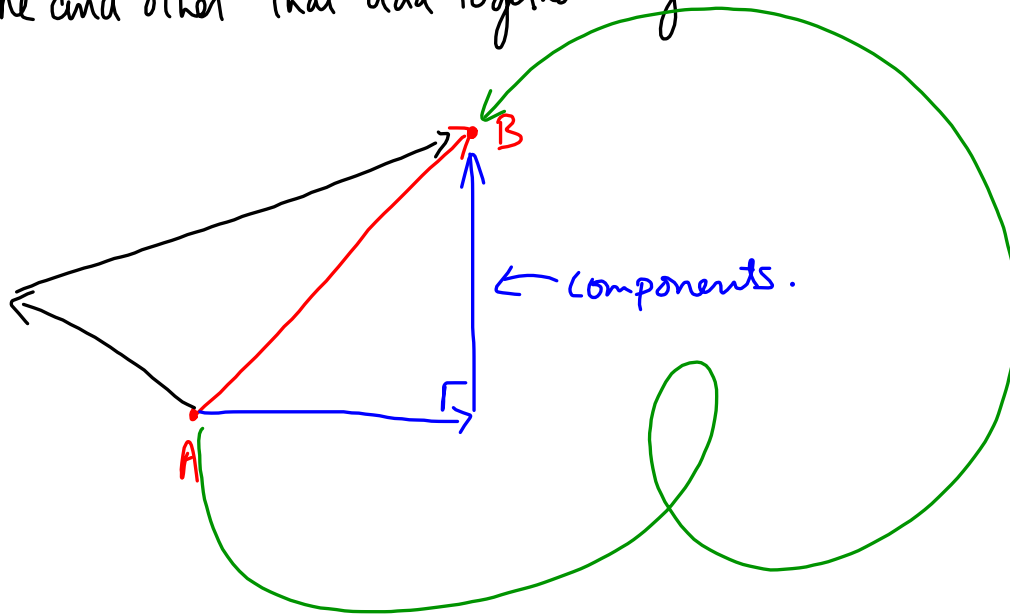
SP
N
↑
+
|cm = 1km



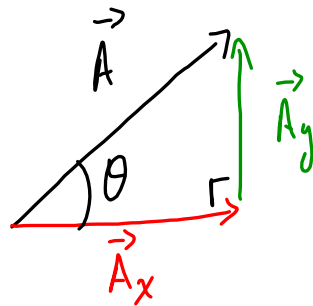
* $\vec{\Delta d} = 8.6 \text{ km [E } 55^\circ \text{ N]}$
 $\vec{\Delta d} = 8.6 \text{ km [} 55^\circ \text{ N of E]}$
 * $\vec{\Delta d} = 8.6 \text{ km [N } 35^\circ \text{ E]}$
 $\vec{\Delta d} = 8.6 \text{ km [} 35^\circ \text{ E of N]}$

Components of Vectors

Components of vectors are two vectors that are perpendicular to one and other that add together to get the desired vector.



Consider vector \vec{A} :



$$\vec{A}_x + \vec{A}_y = \vec{A}$$

SOH|CAH|TOA

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos \theta = \frac{A_x}{A}$$

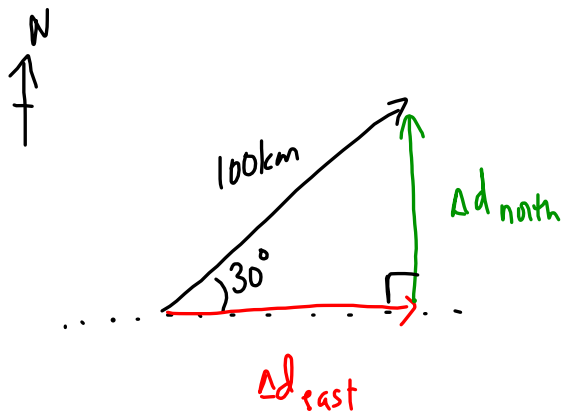
$$\sin \theta = \frac{A_y}{A}$$

$$A_x = A \cos \theta$$

$$A_y = A \sin \theta$$

SP

The displacement of an airplane from its starting point is 100km [E30°N]. Determine the components of its displacement in the easterly and northerly directions.



Easterly Component:

$$\cos 30^\circ = \frac{\Delta_{\text{east}}}{100\text{km}}$$

$$\Delta_{\text{east}} = (100\text{km}) \cos 30^\circ$$

$$\Delta_{\text{east}} = 87\text{km}$$

Northerly component

$$\sin 30^\circ = \frac{\Delta_{\text{north}}}{100\text{km}}$$

$$\Delta_{\text{north}} = (100\text{km}) \sin 30^\circ$$

$$\Delta_{\text{north}} = 50\text{km}$$