Chapter 3 – Reminder

1- The vector quantity has **magnitude** plus **direction**. (e.g. displacement, velocity, acceleration, force, etc.)
2- The scalar quantity has only **magnitude**. (e.g. mass, temperature, energy, etc.)
3- Hand writing of vector and scalar:

vector : $\mathbf{A}, \vec{A}, \overrightarrow{AB}, \underline{A}, \vec{a}, \overrightarrow{ab}, \underline{a}, \mathbf{a}$ scalar: A, a

4- Representing the vector on plan (paper):
   a- The length is proportional to the magnitude of the vector
   b- The arrow directed to the direction of the vector.

5- The vector sum (resultant): $\vec{C} = \vec{A} + \vec{B}$

6- The resultant of a group of vectors: $\vec{D} = \vec{A} + \vec{B} + \vec{C}$

7- Properties of vector:

a- $\vec{a} + \vec{b} = \vec{b} + \vec{a}$ (commutative law)

b- $\left(\vec{a} + \vec{b}\right) + \vec{c} = \vec{a} + \left(\vec{b} + \vec{c}\right)$ (associative law)

8- Subtraction of vector: $\vec{a} - \vec{b} = \vec{a} + (-\vec{b})$

9- Component of vector: $a_x = a\cos\theta$, $a_y = a\sin\theta$, $a = \sqrt{a_x^2 + b_y^2}$, $\tan\alpha = \dfrac{a_y}{a_x}$

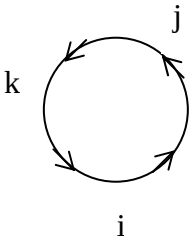
10- Unit vectors: i, j, k, they have **direction on the positive** respectively X axis, Y axis, and Z axis, but **unit magnitude**.

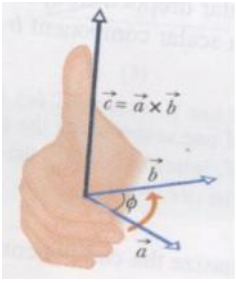
11- Vector in three dimension: $\vec{A} = a_x i + a_y\, j + a_z\, k$

12- Dot product: $\vec{a} \bullet \vec{b} = a\,b\cos\theta$, $\vec{a} \bullet \vec{b} = a_x b_x + a_y b_y + a_z b_z$

13- Vector product: $\vec{a} \times \vec{b} = a\,b\sin\theta\ \vec{n}$

According to the right hand rule: $\vec{a} \times \vec{b} = \begin{vmatrix} i & j & k \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix}$





14- Notice: $\vec{a} \times \vec{b} = -(\vec{b} \times \vec{a})$, but $\vec{a} \bullet \vec{b} = \vec{b} \bullet \vec{a}$