A+ Academy – Online Teaching

فيزياء طبية (تحضيري)

Topic: Medical physics

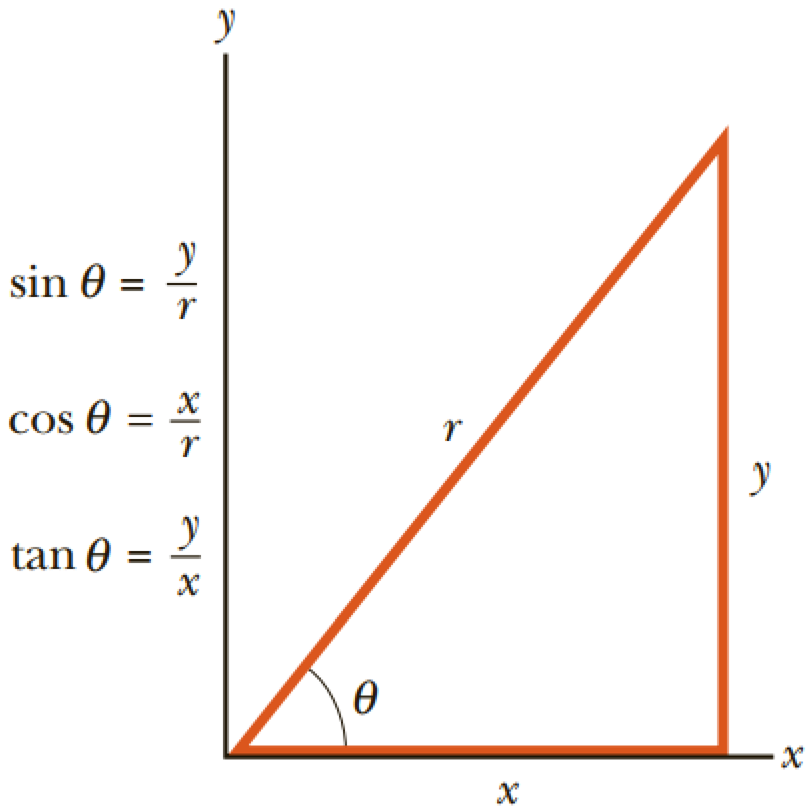
Instructor: Hamza Ahmad

Lecture: (5)

Vectors and motion in two dimension Part (1)

WhatsApp (00962781598320)

- **Trigonometry Review**



Another important relationship

$$\boxed{r^2 = x^2 + y^2}$$

• Vectors

In two quantities:

1. Scalar quantity (only magnitude)

Ex: Time, temperature, mass (kg), work, speed.

2. Vector quantity (magnitude + direction)

Ex: Displacement, velocity, acceleration, force.

Example: Which of the following quantity is not vector?

A) velocity
B) Weight
C) Speed
D) Force

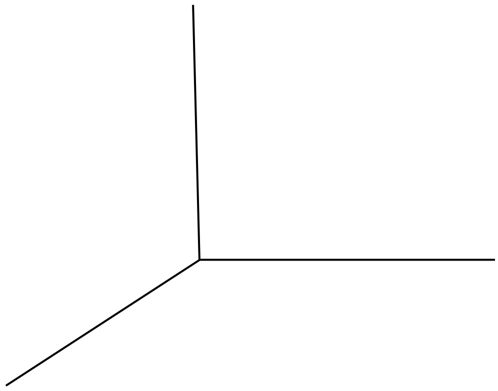
Mass (kg)

Weight (N)
Force (N)

- يمكن التعبير عن المتجهات بحالتين:

1. In 3 – D
   (X, Y, Z)

$\vec{A} = A_x\hat{\imath} + A_y\,\hat{\jmath} + A_z\hat{k}$



$$\boxed{\overrightarrow{A} = A_x\hat{\imath} + A_y\,\hat{\jmath} + A_z\hat{k}}$$

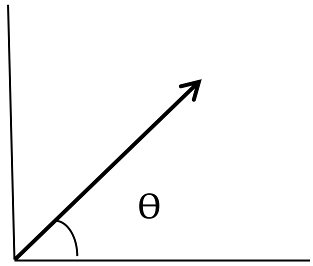
- هذا يتضمن معرفة طول المتجهه (مقدارة)

$$magnitude\ Of\ \overrightarrow{A} = |\,A\,| = \boldsymbol{A}$$

$$|A| = \sqrt{A_x^2 + A_y^2 + A_z^2}$$

Where: $A_x\,, A_y\,, A_z\,,$ *vector component*
$i, j\,, k$ *unit vector*

2. In 2 – D
(X, Y)



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

- هذا يتضمن معرفة:

1. طول المتجهه (مقداره)

$$magnitude\ Of\ \vec{A} = |\,A\,| = \boldsymbol{A}$$

$$|A| = \sqrt{A_x^2 + A_y^2}$$

2. اتجاه المتجهه Direction of $\vec{A}$

$$\theta = \tan^{-1}\frac{A_y}{A_x}$$

Example (1): If $\vec{A} = \hat{\imath} + \hat{\jmath} + \hat{k}$ and $\vec{B} = 2\,\hat{\imath} - 3\hat{k}$, Find

1. The $\overrightarrow{A} + \overrightarrow{B}$.
2. The magnitude of $\overrightarrow{A} + \overrightarrow{B}$
3. The magnitude of $\vec{B} + \overrightarrow{3A}$
4. The x-component of $\overrightarrow{A} + \overrightarrow{B}$
5. The y-component of $\vec{B} + \overrightarrow{3A}$

Example (2): If $\vec{A} = \hat{\imath} + \hat{\jmath}$ and $\vec{B} = 2\,\hat{\imath} + 3\hat{\jmath}$, Find

1. The magnitude and the direction of $\overrightarrow{A} + \overrightarrow{B}$. With respect to the negative x direction.
2. The magnitude and the direction of $\overrightarrow{A} + \overrightarrow{B}$. With respect to the positive y direction.

Ex (3): Find the magnitude and the direction $\vec{D} = -3\,\hat{\imath} + 4\hat{\jmath}$

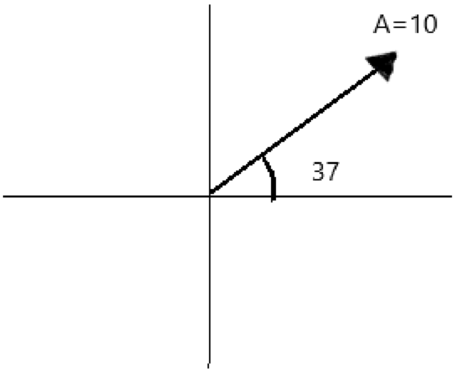
Ex (4): Find the magnitude and the direction $\vec{D} = -3\,\hat{\imath} - 4\hat{\jmath}$

Ex (5): Find the magnitude and the direction $\vec{D} = +3\,\hat{\imath} - 4\hat{\jmath}$

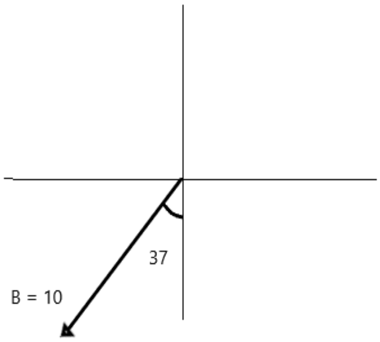
Ex(6): Find the magnitude and the direction $\vec{E} = 5\hat{\jmath}$

- Vector component

Ex (7) : find the component of the vector A

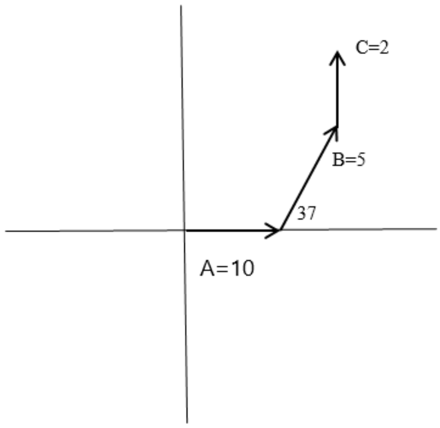


Example (8): In the figure shown find the component of the vector B,

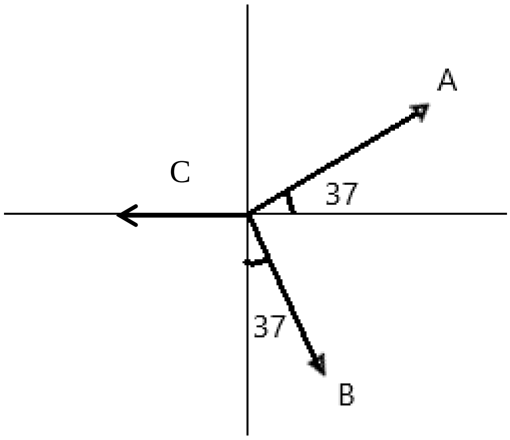


Example (9): In the figure shown if $\overrightarrow{R} = \overrightarrow{A} + \overrightarrow{B} + \overrightarrow{C}$,

1. The $\overrightarrow{R}$.
2. The direction and the magnitude of $\overrightarrow{R}$



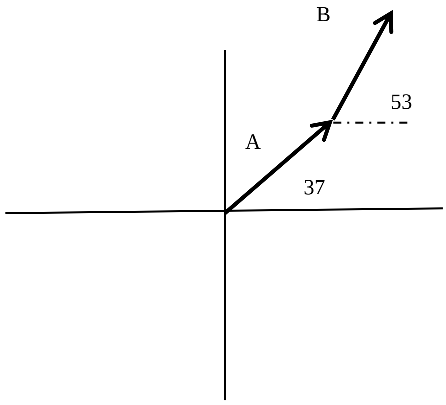
Example (10): If A=10 , B=10 and C= 10 , find the magnitude $\vec{A} - 2\,\vec{B} + 2\,\vec{C}$



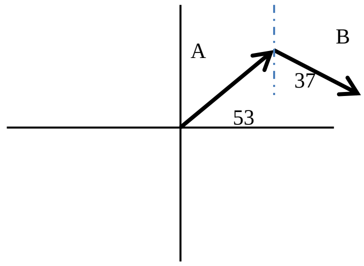
Example (11): If the vector $\overrightarrow{B}$ is added to $\overrightarrow{A}$, the result $6\,\hat{\imath} + \hat{\jmath}$, if $\overrightarrow{B}$ is subtracted from $\overrightarrow{A}$ the result is $= -4\,\hat{\imath} + 7\hat{\jmath}$. find the magnitude $\overrightarrow{A}$.

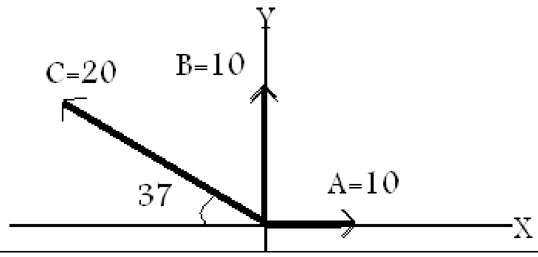
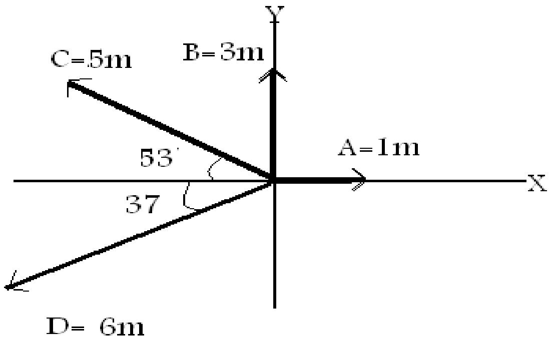
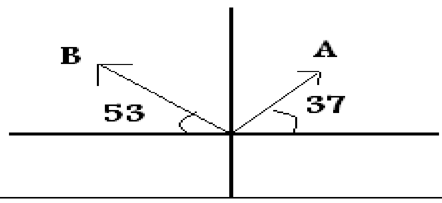
Example (12): In the figure shown, find. A = 10 , B = 5

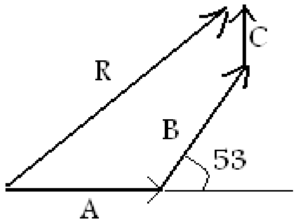
1. The $\overrightarrow{A} + \overrightarrow{B}$.
2. $\overrightarrow{B} + 3\overrightarrow{A}$
3. $2\overrightarrow{B} - 3\overrightarrow{A}$



Example (13): In the figure shown, find the x component of $\overrightarrow{A} + 2\overrightarrow{B}$ .where A=10 unit and B = 10 unit



Q:1	Which one of the following is an example of a vector quantity? A) distance B) velocity C) mass D) area
Q:2	Vector A has magnitude 8.0 m at an angle of 30 degrees below the +x axis. The y component of A is A) 6.9 m B) -6.9 m C) 4.0 m D) -4.0 m
Q:3	Two vectors: $\vec{A} = \hat{\jmath}$ and $\vec{B} = -1\,\hat{\imath} + 3\hat{\jmath}$. What is magnitude of the sum of these two vectors? A) 2.8 B) 3.2 C) 2.3 D) 4.1
Q:4	If vector $\vec{A} = -3\,\hat{\imath} - 4\hat{\jmath}$ and vector $\vec{B} = +3\,\hat{\imath} - 8\hat{\jmath}$, what is the magnitude of vector $\vec{C} = \vec{A} - \vec{B}$ D) 13 D) 16 D) 144 D) 7.2
Q:5	In the figure shown, if A=B=10, C=20 and Ɵ=37. What is the resultant **R=A+B+C**? A) -6i + 2j C) -6i+22j B) 26i + 22j D) 6i+ 22j 
Q:6	In the figure shown, what is the magnitude of E that satisfy the equation **E**=**A**+**B**+**C**+**D**? A) 6.7 C) 5.9 B) 3.6 D) 7.6 
Q:7	In the figure shown, the magnitude of the displacement vector **A**=10 m and **B**=15 m. What is **A**-**B**? A) -2i +18j m B)17i-6j m C) -17i+6j m D) -6i+17j m 
Q:8	A vector in the xy plane has a magnitude of 25 and an x component of 12. The angle it makes with the positive x axis is: A) 61 B) 26 C) 64 D)29
Q:9	If vector **B** is added to vector **A**, the result is (6i+j). If **B** is subtracted from **A**, the result is (-4i+7j). What is the magnitude of **A**? A) 5.1 B) 4.1 C) 6.4 D)5.8

Q:10	In the figure shown. What is the resultant R in units which satisfy the equation **R**=**A**+**B**+**C**? (A= 4 units, B= 5 units, and C= 3 units)  A) 7i+7j C) 9i+7j B) 5i+7j D) 9i+8j
Q:11	The x-component of a vector is 7.2m and the y-component of it is 3.8m. What is the angle that the vector makes with the x-axis. A) 27.8^o B) 62.2^o C) 58.1^o D)31.9^o

1	2	3	4	5	6	7	8	9	10	11
B	D	D	D	C	D	B	A	B	A	A