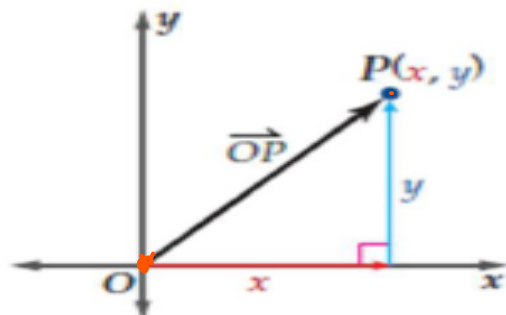


- **Component Form of a Vector** : The component form of a vector $\overrightarrow{OP}$ with initial point $O(x_1, y_1)$ and terminal point $P(x_2, y_2)$ is given by $\langle x_2 - x_1, y_2 - y_1 \rangle$



- **Activity (1):** Find the **component form** of $\overrightarrow{AB}$ with initial point $A(-4,2)$ and terminal point $B(3,-5)$. (جد الصورة المركبة للمتجه)

$$\overrightarrow{AB} = \langle 3 - (-4), -5 - 2 \rangle = \langle 7, -7 \rangle$$

- **Activity (2):** Find the **magnitude** of $\overrightarrow{AB}$ with initial point $A(-4,2)$ and terminal point $B(3,-5)$. (اوجد مقدار المتجه)

$$\overrightarrow{AB} = \langle 7, -7 \rangle \Rightarrow |\overrightarrow{AB}| = \sqrt{(7)^2 + (-7)^2} = 7\sqrt{2}$$

- **Activity (3):** Find each the following for $w = \langle -4, 1 \rangle$, $y = \langle 2, 5 \rangle$ and $z = \langle -3, 0 \rangle$.

a) $w + y = \langle -4, 1 \rangle + \langle 2, 5 \rangle = \langle -2, 6 \rangle$

b) $z + 2y - 4w = \langle -3, 0 \rangle + 2\langle 2, 5 \rangle - 4\langle -4, 1 \rangle$
 $= \langle -3, 0 \rangle + \langle 4, 10 \rangle + \langle 16, -4 \rangle = \langle 17, 6 \rangle$

- **Activity (4):** Find a **unit vector** u (متجه الوحدة) with the same direction as

$v = \langle -2, 3 \rangle$, help: $u = \frac{v}{|v|}$.

$$|v| = \sqrt{(-2)^2 + (3)^2} = \sqrt{13} \Rightarrow u = \left\langle \frac{-2}{\sqrt{13}}, \frac{3}{\sqrt{13}} \right\rangle = \left\langle \frac{-2\sqrt{13}}{13}, \frac{3\sqrt{13}}{13} \right\rangle$$

Teacher : Mohammed Alzzen

- **Activity (5):** Let $\overrightarrow{DE}$ be the vector with initial point $D(-2, 3)$, and terminal point $E(4, 5)$, Write $\overrightarrow{DE}$ as a **linear combination** of the vectors i and j . (اكتب المتجه على صورة توافق خطي)

$$\overrightarrow{DE} = \langle 4 - (-2), 5 - 3 \rangle = \langle 6, 2 \rangle$$

$$\overrightarrow{DE} = 6i + 2j$$

- **Activity (6):** Find the **component form** of the vector v with magnitude 10 and direction angle 120° مقدار

$$v = \langle 10 \cos 120^\circ, 10 \sin 120^\circ \rangle$$

$$x = r \cos \theta$$

$$y = r \sin \theta$$

$$= \langle -5, 5\sqrt{3} \rangle$$

- **Activity (7):** Find the **direction angle** of each vector to the nearest of a degree. (اوحد اتجاه الزاوية للمتجهات التالية)

a) $p = 3i + 7j$
موجب

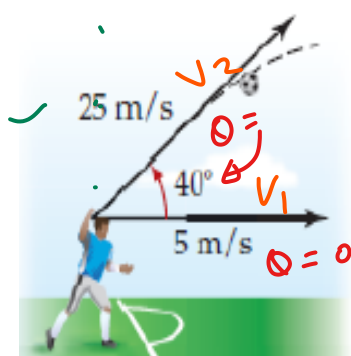
$$\theta = \tan^{-1}\left(\frac{y}{x}\right) \Rightarrow \theta = \tan^{-1}\left(\frac{7}{3}\right) = 66.8^\circ$$

b) $k = \langle -3, 4 \rangle$
بالـ (x) 180°

$$\Rightarrow \theta = \tan^{-1}\left(\frac{4}{-3}\right) + 180^\circ = 126.9^\circ$$

- **Activity (8):** A goalkeeper running forward at 5 meters per second throws a ball with a velocity of 25 meters per second at an angle of 40° with horizontal. what is the resultant speed and direction of the pass?

نشاط (8): يركض حارس المرمى للأمام بسرعة 5m/s و يرمي الكرة بسرعة 25m/s و زاوية 400 مع المركبة الأفقية. ما مقدار السرعة الناتجة للكرة و اتجاهها؟



$$v_1 = \langle 5 \cos 0, 5 \sin 0 \rangle$$

$$v_1 = \langle 5, 0 \rangle$$

$$v_2 = \langle 25 \cos 40^\circ, 25 \sin 40^\circ \rangle = \langle 19.1, 16.1 \rangle$$

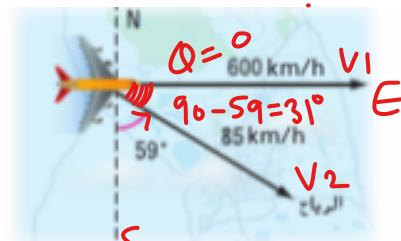
$$v = \langle 24.1, 16.1 \rangle$$

$$\theta = \tan^{-1}\left(\frac{16.1}{24.1}\right)$$

$$= 33.7^\circ$$

Teacher : Mohammed Alzzen

Activity (9) : An airplane is traveling due east with a speed of 600 miles per hour. The wind blows at 85 miles per hour at an angle of $S59^\circ E$.



نشاط (9): تطير طائرة باتجاه الشرق بسرعة 600mile/h ، وتهب الرياح بسرعة 85mile/h و بزاوية 59° باتجاه الجنوب الشرقي .

a. Determine the speed of the airplane's flight.

$$V_1 = \langle 600 \cos 0^\circ, 600 \sin 0^\circ \rangle = \langle 600, 0 \rangle$$

$$V_2 = \langle 85 \cos 31^\circ, 85 \sin 31^\circ \rangle = \langle 73, 44 \rangle$$

b. Determine the angle of the airplane's flight.

$$\theta = \tan^{-1} \left(\frac{44}{673} \right) \approx 4^\circ$$

$$\therefore \theta = S8^\circ E$$

(أ) حدد سرعة الطائرة.

$$V = \langle 673, 44 \rangle$$

$$|V| = \sqrt{(673)^2 + (44)^2} = 674 \text{ km/h}$$

(ب) حدد اتجاه الطائرة (الزاوية).

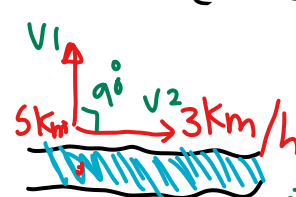
Activity (10) : Hamdah is rowing across a river at a speed of 5 kilometers per hour perpendicular to the shore. The river has a current of 3 kilometers per hour heading downstream.

a. At what speed is she traveling?

نشاط (10): يجدف حمدة عبر النهر بسرعة 5km/h بشكل متعامد على الشاطئ، ويبلغ تيار النهر 3km/h باتجاه التيار.

$$V_1 = \langle 5 \cos 90^\circ, 5 \sin 90^\circ \rangle = \langle 0, 5 \rangle$$

$$V_2 = \langle 3 \cos 0^\circ, 3 \sin 0^\circ \rangle = \langle 3, 0 \rangle$$



$$\Rightarrow V = \langle 3, 5 \rangle \Rightarrow |V| = \sqrt{(3)^2 + (5)^2} = \sqrt{34} = 5.8 \text{ km/h}$$

b. At what angle is she traveling with respect to the shore?

$$\theta = \tan^{-1} \left(\frac{5}{3} \right) = 59^\circ$$

(ب) اوجد زاوية تحركه مع الشاطئ؟

Teacher : Mohammed Alzzen