ARMS
ACADEMY

GENERAL PHYSICS 1

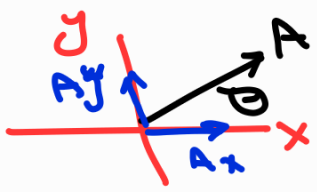
Exercise Ch 1

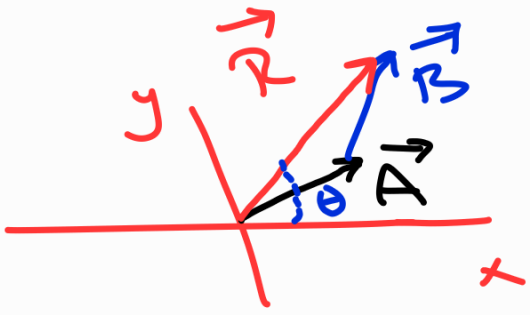
Our Groups

قناة الاكاديمية

Telegram

$$A_x = A\cos\theta$$
$$A_y = A\sin\theta$$





$$R_x = A_x + B_x$$
$$R_y = A_y + B_y$$

$$|\vec{R}| = \sqrt{R_x^2 + R_y^2}$$

$$\tan\theta = \frac{\text{المقابل}}{\text{المجاور}} = \frac{R_y}{R_x}$$

$$\therefore \theta = \tan^{-1}\left(\frac{R_y}{R_x}\right)$$

⇒ dot Product [Scalar Product]

$$\vec{A}\cdot\vec{B} = AB\cos\theta$$

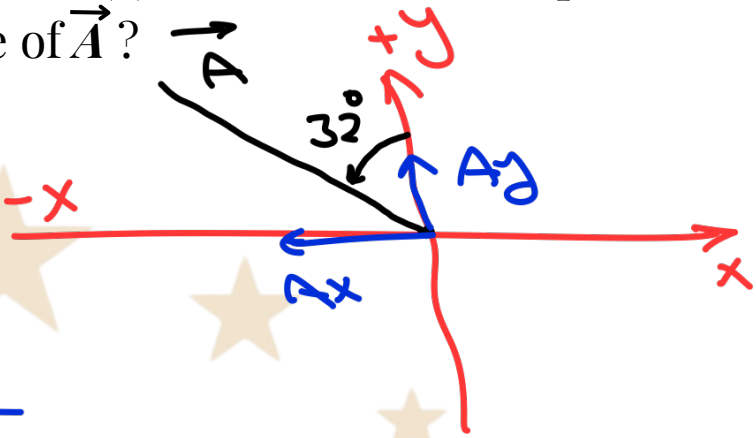
⇒ Cross Product [Vector Product]

$$\vec{A}\times\vec{B} = AB\sin\theta$$

⇒ use Right hand rule

Question one

Vector $\vec{A}$ has y-component A_y = +9.60 m. $\vec{A}$ makes an angle of 32.0° counterclockwise from the +y-axis. (a) What is the x-component of $\vec{A}$? (b) What is the magnitude of $\vec{A}$?



$Ay = 9.6$ m

$Ax = ?$

(a) $\tan\theta = \dfrac{-Ax}{Ay}$

$\tan 32 = \dfrac{-Ax}{9.6}$

$\therefore Ax = -9.6 \tan 32 = -5.99$ m

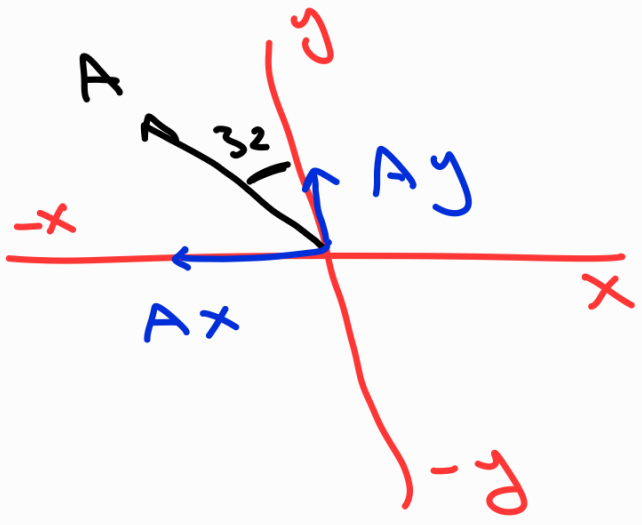
(b) $A = \sqrt{Ax^2 + Ay^2}$

$A = \sqrt{(-5.99)^2 + (9.6)^2}$

$\therefore A = 11.3$ m

$A_x = -A\sin\theta$

$A_y = A\cos\theta$



$A_x = ??$

$A = ?$

$A_y = 9.6$ m

$A_y = A\cos\theta$

$9.6 = A\cos 32$

$\therefore A = \dfrac{9.6}{\cos 32} = 11.3$ m

$A_x = -A\sin\theta$

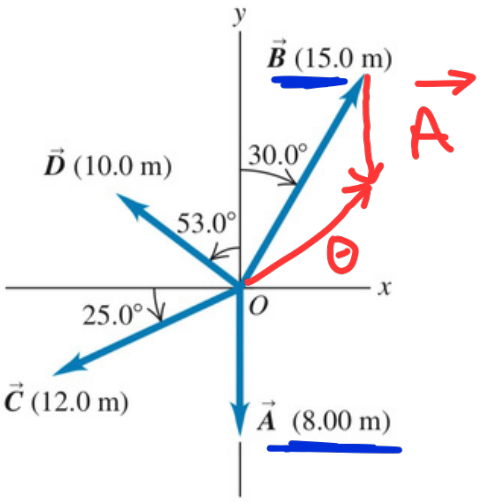
$A_x = -11.3\sin 32$

$\therefore A_x = -5.9$ m

Question two

For the vectors $\vec{A}$ and $\vec{B}$ in Fig. E1.22, use the method of components to find the magnitude and direction of (a) the vector sum $\vec{A}+\vec{B}$; (b) the vector sum $\vec{B}+\vec{A}$; (c) the vector difference $\vec{A}-\vec{B}$; (d) the vector difference $\vec{B}-\vec{A}$.

[a] $\vec{A}+\vec{B}$



$R_x = A_x + B_x$

$\therefore R_x = 0 + 7.5 = 7.5$ m

$R_y = A_y + B_y$

$\therefore R_y = -8 + 12.99 = 4.99$ m

$|\vec{R}| = \sqrt{R_x^2 + R_y^2}$

$\therefore |\vec{R}| = \sqrt{(7.5)^2 + (4.99)^2} = 9.008$ m

$\tan\theta = \frac{R_y}{R_x}$

$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right) = \tan^{-1}\left(\frac{4.99}{7.5}\right)$

$\therefore \theta = 33.6°$

$A_x = A\cos(-90)$

$A_x = 8\cos(-90) = 0$

$A_y = A\sin(-90)$

$A_y = 8\sin(-90) = -8$ m

$B_x = B\sin(30)$

$B_x = 15\sin(30) = 7.5$ m

$B_y = B\cos(30)$

$B_y = 15\cos(30) = 12.99$ m

[b] $\vec{B} + \vec{A}$

$R_x = B_x + A_x = 7.5 + 0 = 7.5\ m$

$R_y = B_y + A_y = 12.99 + (-8) = 4.99\ m$

$|\vec{R}| = \sqrt{R_x^2 + R_y^2}$

$\therefore |\vec{R}| = \sqrt{(7.5)^2 + (4.99)^2} = 9.008\ m$

$$\tan\theta = \frac{R_y}{R_x}$$

$$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right) = \tan^{-1}\left(\frac{4.99}{7.5}\right)$$

$\therefore \theta = 33.6^\circ$

[c] $\vec{A} - \vec{B}$

$R_x = A_x - B_x = 0 - 7.5 = -7.5\ m$

$R_y = A_y - B_y = -8 - 12.99 = -20.99\ m$

$|\vec{R}| = \sqrt{R_x^2 + R_y^2}$

$\therefore |\vec{R}| = \sqrt{(-7.5)^2 + (-20.99)^2} = 22.2\ m$

$$\tan\theta = \frac{R_y}{R_x}$$

$$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right) = \tan^{-1}\left(\frac{-20.99}{-7.5}\right)$$

$$\therefore \theta = 70.3^\circ$$

[0] $\vec{R} - \vec{A}$

$$R_x = B_x - A_x = 7.5 - 0 = 7.5 \text{ m}$$

$$R_y = B_y - A_y = 12.99 - (-8) = 20.99 \text{ m}$$

$$|\vec{R}| = \sqrt{R_x^2 + R_y^2}$$

$$\therefore |\vec{R}| = \sqrt{(7.5)^2 + (20.99)^2} = 22.2 \text{ m}$$

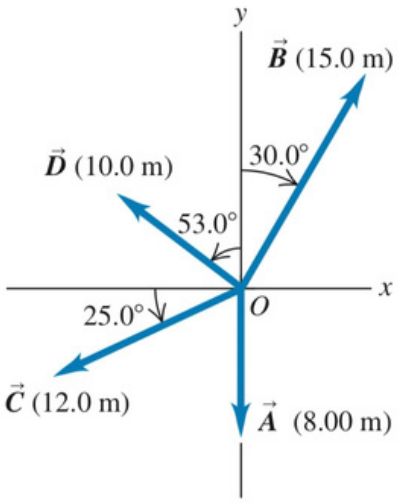
$$\tan\theta = \frac{R_y}{R_x}$$

$$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right) = \tan^{-1}\left(\frac{20.99}{7.5}\right)$$

$$\therefore \theta = 70.3^\circ$$

Question three

For the vectors $\vec{A}$, $\vec{B}$, and $\vec{C}$ in Fig. E1.22, find the scalar products (a) $\vec{A} \cdot \vec{B}$; (b) $\vec{B} \cdot \vec{C}$; (c) $\vec{A} \cdot \vec{C}$.



[a] $\vec{A} \cdot \vec{B}$

$\vec{A} \cdot \vec{B} = AB\cos\theta$

$= (8)(15)\cos(210)$

$= -103.9\ m^2$

[b] $\vec{B} \cdot \vec{C}$

$\vec{B} \cdot \vec{C} = BC\cos\theta$

$= (15)(12)\cos(145)$

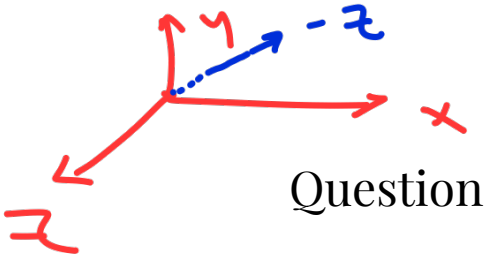
$= -147.4\ m^2$

(c) $\vec{A} \cdot \vec{C}$

$$\vec{A} \cdot \vec{C} = AC \cos\theta$$

$$= (8)(12) \cos(65)$$

$$= 40.5 \ m^2$$



Question four

For the two vectors $\vec{A}$ and $\vec{D}$ in Fig. E1.22, find the magnitude and direction of (a) the vector product $\vec{A} \times \vec{D}$; (b) the vector product $\vec{D} \times \vec{A}$.

cross

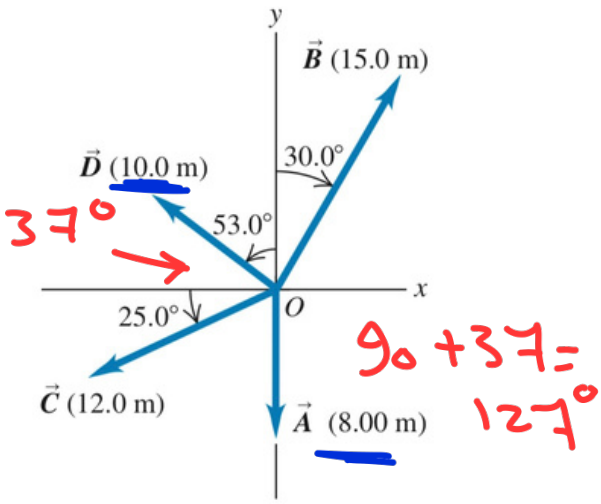
90 - 53 = 37°

[a] $\vec{A} \times \vec{D}$

$\vec{A} \times \vec{D} = A D \sin\theta$

$= (8)(10)\sin(127)$

$= 63.8 \ m^2$



By the right hand rule; the thumb points into the Page which corresponds negative z-direction

[b] $\vec{D} \times \vec{A}$

$$\vec{D} \times \vec{A} = D A \sin\theta$$

$$= (10)(8)\sin(127)$$

$$= 63.8 \text{ m}^2$$

By the right hand rule, the thumb points into positive z direction

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استثمر في تعليمك اليوم ،لتحصد
ثمار ذلك غداً

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