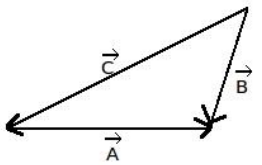
Chapter 3: Vectors

1	Two vectors are given as **a**= **i** +2**j**+2**k** and **b**=2**i**+4**j**+2**k** . Vector **c** which satisfies the relation **a-b+c=3i** is:
	a) i+3j b) –i +j c)) -i+5j **d) 4i+2j**
2	For any two vectors A and B, if A.B =0 then the angle between them is
	a) Zero b) **90 degree** c) 30 degree d) 180 degree
3	For A = 3j - 4k and B = -5j + 4k, B.A is:
	a) **-31** b) 31 c) -15i + 16 j d) 31 j
4	Three vectors A = i -2j+k, B =5i + 2j – 6k and C = 2i + 3j. The value of (A+B).C
	a) 18 b) **12** c) 7 d) 14
5	The sum of two vectors **A + B** is **4i+j**, and their difference **A-B** is **-2i+j**, the magnitude of vector **A** is:
	a) 1.8 b) 2.8 c) 4.1 **d) 1.4**
6	the position vector for a particle in the rectangular coordinate (*x*, *y*, *z*) for the points (5, -6, 3)
	a) r = 5i + 6 j +3k b) **r = 5i -6j +3k** c) r = -6j +3k d) r = -5i-6j+3k
7	In scalar product , which of the following is true ?
	a) $A \cdot B \neq B \cdot A$ b) $A \cdot B = -B \cdot A$ c) $A \cdot B = 2\, B \cdot A$ **d)** $\boldsymbol{A \cdot B = B \cdot A}$
8	The magnitude of $A \times B$ equal to
	a) $A\, B\, cos\theta$ **b)** $\boldsymbol{A\, B\, sin\theta}$ c) $-A\, B\, sin\theta$ d) $A\, B\, tan\theta$
9	A vector B is given by its component $B_x = 2.5$ and $B_y = 7.5$. what the angle does vector B makes with the positive x-axis
	a) 25 b) 18 c) 55 **d) 72**

10	Let's the vector A= 5i + 6j -7k the magnitude of this vector is
	a) **10.5** c) 20 b) 18 d) -10
11	Let the vector A = 3i -5j +4k and B = 7i – 8j – 9k . S = A- B equal
	a) 4i – 3j -13k **b) <u>- 4i + 3j +13k</u>** c) 10i – 12j -13k d) -10i + 12j -13k
12	The vectors **A** and its negative vector have
	a) Same magnitude and direction **b) <u>Same magnitude and opposite direction</u>** c) Same magnitude only d) No correct answer
13	A vector has component x= 6 m and y= 8m what its magnitude and direction
	a) 10 m and 30 degrees b) 14 m and 37 degrees **c) <u>10 m and 53 degrees</u>** d) 14 m and 53 degrees
14	*Referring to the following figure, the correct relation is*: 
	a) A + B = C b) B + C = A c) A + C = B **d) <u>A + B + C = 0</u>**
15	Two vectors are given as follows: A = -2i – 5j + 2k , B = -4i – 2j – 3k . the angle between the vectors is …….
	a) 132 **<u>c) 67</u>** b) 114 d) 41
16	Two vectors are given as follows: A = −3i + 6j −5k and B = −2$\vec{i}$ + 3$\vec{j}$ +k The vector dot product $A \cdot B$ equals:
	a) -12 c) 14 b) **<u>19</u>** d) 30
17	Two vectors are given as follows: A = −2i - 5j +2k and B = −5$\vec{i}$ - 2$\vec{j}$ -3k The vector dot product $A \times B$ equals:
	a) 43 c) 12 b) 18 d) **<u>31</u>**

18	The magnitude of vector *A* is 6m and vector *B* = 2i+j (m). If the angle (θ) between them is 30 their scalar product (A . B) is:
	a) $16.4m^2$ c) **$\underline{11.6m^2}$** b) $2.24m^2$ d) $32.8m^2$
19	Two vectors *A*=*x*i+6j and B=2i+yj. The values of x and y satisfying the relation A + B = 4i+j are:
	a) (-1,-2) c) (1,-4) b) **(2,-5)** d) (0,-3)
20	If two vectors have same magnitude and are parallel to each other, then they are said to be
	a) Same c) negative b) Different **d) equal**
21	Position vector r of point A(3,4,5) is
	a) **7.07** c) 8.18 b) 3.21 d) 6.54
22	Scalar product of two vectors is also known as
	a) vector product c) point product b) **dot product** d) both a and b
23	Unit vectors are normally used to represent other vector's
	a) place c) velocity b) **direction** d) magnitude
24	Dot product of A.B with angle 0 would produce results equal to
	a) A **c) A B** b) B d) zero
25	Cross product of two same vectors is equal to
	a) **Zero** c) i b) 1 d) j

Solved the questions:

[1] Three vectors are given by A=6i, B=9*j*, and C=(3*i*+4*j*).

(a) Find the magnitude and direction of the resultant vector.
(b) What vector must be added to these three to make the resultant vector zero?

A=6i,
B=9j
C=(-3i+4j)

The resultant vector is A + B + C = 3i + 13j

The Magnitude of the resultant vector is 13.34 units

The direction is 77º with respect to the positive x-axis

(b) The vector must be added to these three to make the resultant vector zero is

-3i - 13j

[2] A particle moves from a point in the *xy* plane having cartesian coordinates (-3.00, -5.00) m to a point with coordinates (-1.00, 8.00) m.

(a) Write vector expressions for the position vectors in unit-vector form for these two points.

(b) What is the displacement vector?

The vector position for the first point (-3,-5)m is

A = -3i -5j

The vector position for the first point (-1,8)m is

B = -i + 8j

(b) The displacement vector is

B - A = 2i +3j

[3] Two vectors are given by A= 4i+3j and B= -i+3j.

Find (a) A.B and (b) the angle between A and B.

(a)

$A.B = A_xB_x+A_yB_y$

A.B = -4 + 9 = 5 units

(b)

$\cos \theta = A.B/AB = 1/3.16$

$\theta = 71.6^o$

[4] Vector A has a magnitude of 5 units, and B has a magnitude of 9 units. The two vectors make an angle of 50^o with each other. Find A.B

$A.B = A\ B \cos\ \theta$

$A.B = 5 \times 9 \cos 50^o = 28.9$ unit

[5] For the three vectors A=3i+j-k, B= -i+2j+5k, and C= 2j-3k, find C.(A-B)

A - B = 4i -j -6k
C = 2j - 3k

C.(A-B) = 0 -2 + 16 = 14 unit

[6] The scalar product of vectors A and B is 6 units. The magnitude of each vector is 4 units. Find the angle between the vectors.

A.B = 6 units

A = B = 4 units

cos θ = 6/16

θ = 67.9º

[7] The polar coordinates of a point are *r* = 5.5m and *q* = 240º. What are the cartisian coordinates of this point?

$x = r \cos q = 5.5 \times \cos 240^{o} = -2.75$ m

$y = r \sin q = 5.5 \times \sin 240^{o} = -4.76$ m

[8] A point in the *xy* plane has cartesian coordinates (-3.00, 5.00) m. What are the polar coordinates of this point?

المراد من السؤال هو التحويل من الاحداثيات الكارتيزية إلى القطبية.

$$r = \sqrt{9 + 25} = 5.8m$$

$$\theta = \tan^{-1}\frac{5}{-3} = -59^{o}$$

-59 with respect to the negative x-axis

θ = 121º with respect to the positive x-axis

(-3,5)m = (5.8m, 121º)

[9] A point is located in polar coordinate system by the coordinates r = 2.5m and q =35º. Find the x and y coordinates of this point, assuming the two coordinate system have the same origin.

r = 2.5 , θ = 35º

x = r cos 35 = 2

y = r sin 35 = 1.4

[10] Find the magnitude and direction of the resultant of three displacements having components (3,2) m, (-5, 3) m and (6, 1) m.

نحول كل نقطة من النقاط الثلاثة في السؤال إلى الصورة المتجهة كما يلي:

A = 3i + 2j

B = -5i + 3j

C = 6i + j

نوجد المحصلة بالجمع الإتجاهي

A + B + C = 4i

[11] Obtain expressions for the position vectors with polar coordinates (a) 12.8m, 150º; (b) 3.3cm, 60 º; (c) 22cm, 215 º.

(a) 12.8m, 150º

x = r cos θ = 12.8 cos 150 = -11.1m

y = r sin θ = 12.8 sin 150 = -17.5 m

A = -11.1i – 17.5j

استخدم نفس الطريقة لباقي النقاط لإيجاد متجه الموضع