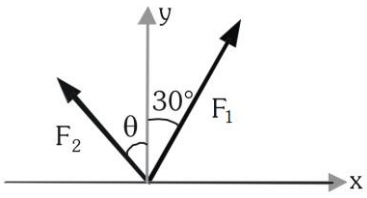
DPP - 01

VECTOR

Q.1 A bird is at a point $P(4,-1,-5)$ and sees two points $P_1(-1,-1,0)$ and $P_2(3,-1,-3)$. At time $t = 0$, it starts flying with a constant speed of 10 m/s to be in line with points P_1 and P_2 in minimum possible time t. Find t, if all coordinates are in kilometers.

Q.2 In the figure, F_1 and F_2, the two unknown forces give a resultant force of $80\sqrt{3}$ N along the y-axis. It is required that F_2 must have minimum magnitude. Find the magnitudes of F_1 and F_2.



Q.3 A particle is displaced from $A \equiv (2,2,4)$ to $B \equiv (5,-3,-1)$. A constant force of 34 N acts in the direction of $\vec{AP}$, where $P \equiv (10,2,-11)$. (Coordinates are in m).

(i) Find the $\vec{F}$. (ii) Find the work done by the force to cause the displacement.

Q.4 Three concurrent forces of the same magnitude are in equilibrium. What is the angle between the force?

Also name the triangle formed by the force as sides :-

(A) 60° equilateral triangle (B) 120° equilateral triangle

(C) 120°, 30°, 30° an isosceles triangle (D) 120° an obtuse angled triangle

Q.5 The resultant of two forces, one double the other in magnitude is perpendicular to the smaller of the two forces. The angle between two forces is :-

(A) 150° (B) 90° (C) 60° (D) 120°

Q.6 The resultant of two forces acting at an angle of 120° is 10 kgwt and is perpendicular to one of the forces. That force is :

(A) $10\sqrt{3}$ kgwt (B) $20\sqrt{3}$ kgwt (C) 10 kgwt (D) $\frac{10}{\sqrt{3}}$ kgwt

Q.7 If the resultant of two forces of magnitudes P and Q acting at a point at an angle of 60° is $\sqrt{7}Q$, then P/Q is :-

(A) 1 (B) $\frac{3}{2}$ (C) 2 (D) 4

Q.8 A body placed in free space, is simultaneously acted upon by three forces $\vec{F}_1, \vec{F}_2$ and $\vec{F}_3$. The body is in equilibrium and the forces $\vec{F}_1$ and $\vec{F}_2$ are known to be 36 N due north and 27 N due east respectively. Which of the following best describes the force $\vec{F}_3$?

(A) 36 N due south. (B) 53 N due 60° south of east

(C) 45 N due 53° south of west (D) 45 N due 37° north of west

Q.9 Find the resultant of the following two vectors $\vec{A}$ and $\vec{B}$. $\vec{A}$: 40 units due east and ; $\vec{B}$: 25 units 37 ° north of west

(A) 25 units 37° north of west (B) 25 units 37° north of east

(C) 40 units 53° north of west (D) 40 units 53° north of east

Q.10 Two vectors $\vec{a}$ and $\vec{b}$ add to give a resultant $\vec{c} = \vec{a} + \vec{b}$. In which of these cases angle between $\vec{a}$ and $\vec{b}$ is maximum: (a, b, c represent the magnitudes of respective vectors)

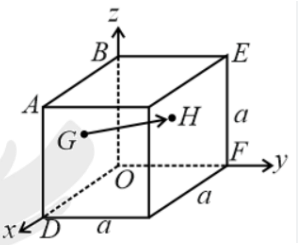
(A) $c = a + b$ (B) $c^2 = a^2 + b^2$

(C) $c = a - b$ (D) can not be determined

Q.11 Let $|\vec{A}_1| = 3, |\vec{A}_2| = 5$ and $|\vec{A}_1 + \vec{A}_2| = 5$. The value of $(2\vec{A}_1 + 3\vec{A}_2) \cdot (3\vec{A}_1 - 2\vec{A}_2)$ is

(A) -106.5 (B) -118.5 (C) -99.5 (D) -112.5

Q.12 In the cube of side a shown in the figure, the vector from the central point of the face ABOD to the central point of the face BEFO will be



(A) $\frac{1}{2}a(\hat{j} - \hat{i})$ (B) $\frac{1}{2}a(\hat{i} - \hat{k})$

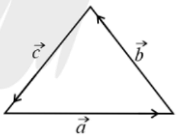
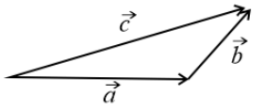
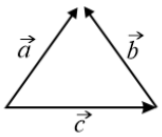
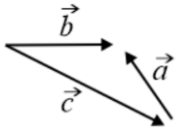
(C) $\frac{1}{2}a(\hat{j} - \hat{k})$ (D) $\frac{1}{2}a(\hat{k} - \hat{i})$

Q.13 Two vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes. The magnitude of $(\vec{A} + \vec{B})$ is n times the magnitude of $(\vec{A} - \vec{B})$. The angle between $\vec{A}$ and $\vec{B}$ is

(A) $\cos^{-1}\left(\frac{n-1}{n+1}\right)$ (B) $\cos^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

(C) $\sin^{-1}\left(\frac{n-1}{n+1}\right)$ (D) $\sin^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

Q.14 COLUMN-I contains vector diagram of three vectors $\vec{a}, \vec{b}, \vec{c}$ and COLUMN-II contains vector equation. Match them

	Column- I		Column- II
(A)		(p)	$\vec{a} - (\vec{b} + \vec{c}) = 0$
(B)		(q)	$\vec{b} - \vec{c} = \vec{a}$
(C)		(r)	$\vec{a} + \vec{b} = -\vec{c}$
(D)		(s)	$\vec{a} + \vec{b} = \vec{c}$

ANSWER KEY

1.	(100 s)	**2.**	(120 N, $40\sqrt{3}$ N)	**3.**	($16\hat{i} - 30\hat{k}$, 198 J)	**4.**	(B)
5.	(D)	**6.**	(D)	**7.**	(C)	**8.**	(C)
9.	(B)	**10.**	(C)	**11.**	(B)	**12.**	(A)
13.	(B)	**14.**	A → r; B → s; C → p; D → q				