DPP - 01

KINDS OF VECTORS

1. Consider points A, B, C and D with position vectors $7\hat{\imath} + 4\hat{\jmath} + 7\hat{k}, \hat{\imath} - 6\hat{\jmath} + 10\hat{k}, -\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $5\hat{\imath} - \hat{\jmath} + 5\hat{k}$ respectively. The $ABCD$ is a

(A) square

(B) rhombus

(C) rectangle

(D) none of these

ADDITION & SUBSTRACTION OF VECTORS

2. The vertices of a triangle are A(1,1,2), B(4,3,1) and C(2,3,5). A vector representing the internal bisector of the angle A is

(A) $\hat{\imath} + \hat{\jmath} + 2\hat{k}$

(B) $2\hat{\imath} - 2\hat{\jmath} + \hat{k}$

(C) $2\hat{\imath} + 2\hat{\jmath} - \hat{k}$

(D) $2\hat{\imath} + 2\hat{\jmath} + \hat{k}$

3. The vectors $\overline{AB} = 3\hat{\imath} + 4\hat{k}$ and $\overline{AC} = 5\hat{\imath} - 2\hat{\jmath} + 4\hat{k}$ are the sides of a triangle ABC. The length of the median through A is

(A) $\sqrt{18}$

(B) $\sqrt{72}$

(C) $\sqrt{33}$

(D) $\sqrt{288}$

COLLINEARITY OF THREE POINTS

4. If the vector $\vec{b}$ is collinear with the vector $\vec{a} = (2\sqrt{2},\ -1, 4)$ and $|\vec{b}| = 10$, then

(A) $\vec{a} \pm \vec{b} = 0$

(B) $\vec{a} \pm 2\vec{b} = 0$

(C) $2\vec{a} \pm \vec{b} = 0$

(D) none of these

RELATION BETWEEN TWO PARALLEL VECTORS

5. If $A(-\hat{\imath}+3\hat{\jmath}+2\hat{k}), B(-4\hat{\imath}+2\hat{\jmath}-2\hat{k})$ and $C(5\hat{\imath}+\lambda\hat{\jmath}+\mu\hat{k})$ are collinear then

(A) $\lambda=5, \mu=10$

(B) $\lambda=10, \mu=5$

(C) $\lambda=-5, \mu=10$

(D) $\lambda=5, \mu=-10$

6. The vectors $2\hat{\imath}+3\hat{\jmath}, 5\hat{\imath}+6\hat{\jmath}$ and $8\hat{\jmath}+\lambda\hat{\jmath}$ have their initial points at $(1,1)$. Find the value of λ so that the vectors terminate on one straight line

(A) 9

(B) 8

(C) 7

(D) 6

7. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three non - zero vectors, no two of which are collinear, $\vec{a}+2\vec{b}$ is collinear with $\vec{c}$ and $\vec{b}+3\vec{c}$ is collinear with $\vec{a}$, then find the value of $|\vec{a}+2\vec{b}+6\vec{c}|$,

(A) 0

(B) 1

(C) 2

(D) 3

MIXED PROBLEMS

8. If $\vec{a}, \vec{b}, \vec{c}$ are linearly independent vectors, then which one of the following set of vectors is linearly dependent?

(A) $\vec{a}+\vec{b},\ \vec{b}+\vec{c}, \vec{c}+\vec{a}$

(B) $\vec{a}-\vec{b},\ \vec{b}-\vec{c},\ \vec{c}-\vec{a}$

(C) $\vec{a}\times\vec{b},\ \vec{b}\times\vec{c},\ \vec{c}\times\vec{a}$

(D) none of these

9. If G is the centroid of a trinagle ABC, then $\overrightarrow{GA}+\overrightarrow{GB}+\overrightarrow{GC}$ is equal to

(A) $\vec{0}$

(B) $3\overrightarrow{GA}$

(C) $3\overrightarrow{GB}$

(D) $3\overrightarrow{GC}$

10. If vector $\overrightarrow{AB} = -3\hat{\imath} + 4\hat{k}$ and $\overrightarrow{AC} = 5\hat{\imath} - 2\hat{\jmath} + 4\hat{k}$ are the sides of a $\triangle ABC$, then the length of the median through A is

(A) $\sqrt{14}$

(B) $\sqrt{18}$

(C) $\sqrt{29}$

(D) 5

11. If the vectors $\vec{a}$ and $\vec{b}$ are linearly independent satisfying

$(\sqrt{3}\tan\ \theta + 1)\vec{a} + (\sqrt{3}\sec\ \theta - 2)\vec{b} = 0$, then the most general values of θ are

(A) $n\pi - \frac{\pi}{6}, n \in Z$

(B) $2n\pi \pm \frac{11\pi}{6}, n \in Z$

(C) $n\pi \pm \frac{\pi}{6}, n \in Z$

(D) $2n\pi + \frac{11\pi}{6}, n \in Z$

12. The vectors $\vec{a} = -4\hat{\imath} + 3\hat{k}, \vec{b} = 14\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ are co-initial. The vector $\vec{d}$ which is bisecting the angle between the vectors $\vec{a}$ and $\vec{b}$ and is having the magnitude $\sqrt{6}$, is

(A) $\hat{\imath} + \hat{\jmath} + 2\hat{k}$

(B) $\hat{\imath} - \hat{\jmath} + 2\hat{k}$

(C) $\hat{\imath} + \hat{\jmath} - 2\hat{k}$

(D) none of these

13. The vector $\hat{\imath} + x\hat{\jmath} + 3\hat{k}$ is rotated through an angle of $\cos^{-1}\frac{11}{14}$ and doubled in magnitude, then it becomes $4\hat{\imath} + (4x - 2)\hat{\jmath} + 2\hat{k}$. The value of ' x ' is

(A) $-\frac{2}{3}$

(B) $\frac{2}{3}$

(C) $\frac{1}{3}$

(D) 2

COLLINEARITY OF THREE POINTS

14. If a, b, c are different real numbers and $a\hat{\imath} + b\hat{\jmath} + c\hat{k}, b\hat{\imath} + c\hat{\jmath} + a\hat{k}$ and $c\hat{\imath} + a\hat{\jmath} + b\hat{k}$ are position vectors of three non-collinear points A, B, and C, then

(A) centroid of triangle ABC is $\frac{a+b+c}{3}(\hat{\imath} + \hat{\jmath} + \hat{k})$

(B) $\hat{\imath} + \hat{\jmath} + \hat{k}$ is equally inclined to the three vectors

(C) perpendicular from the origin to the plane of triangle ABC meet at centroid

(D) triangle ABC is an equilateral triangle.

SUBJECTIVE (JEE ADVANCED)

15. The position vector of two points A and B are $6\vec{a} + 2\vec{b}$ and $\vec{a} - 3\vec{b}$. If a point C divides AB in the ratio 3: 2 then show that the position vector of C is $3\vec{a} - \vec{b}$

16. In a $\triangle OAB, E$ is the mid-point of OB and D is a point on AB such that AD: DB = 2: 1. If OD and AE intersect at P, then determine the ratio OP: PD using vector methods.

17. Show that the points $\vec{a} - 2\vec{b} + 3\vec{c}$; $2\vec{a} + 3\vec{b} - 4\vec{c}$ & $-7\vec{b} + 10\vec{c}$ are collinear.

18. If the three successive vertices of a parallelogram have the position vectors as, $A(-3,-2,0)$; $B(3,-3,1)$ and $C(5,0,2)$. Then find

(i) Position vector of the fourth vertex D

(ii) A vector having the same direction as that of $\overrightarrow{AB}$ but magnitude equal to $\overrightarrow{AC}$

(iii) The angle between $\overrightarrow{AC}$ and $\overrightarrow{BD}$

19. Find out whether the following pairs of lines are parallel, non-parallel; & intersecting, or non-parallel & non-intersecting.

(i) $\vec{r}_1 = \hat{\imath} + \hat{\jmath} + 2\hat{k} + \lambda(3\hat{\imath} - 2\hat{\jmath} + 4\hat{k})$

$\vec{r}_2 = 2\hat{\imath} + \hat{\jmath} + 3\hat{k} + \mu(-6\hat{\imath} + 4\hat{\jmath} - 8\hat{k})$

(ii) $\vec{r}_1 = \hat{\imath} - \hat{\jmath} + 3\hat{k} + \lambda(\hat{\imath} - \hat{\jmath} + \hat{k})$

$\vec{r}_2 = 2\hat{\imath} + 4\hat{\jmath} + 6\hat{k} + \mu(2\hat{\imath} + \hat{\jmath} + 3\hat{k})$

(iii) $\vec{r}_1 = \hat{\imath} + \hat{k} + \lambda(\hat{\imath} + 3\hat{\jmath} + 4\hat{k})$

$\vec{r}_2 = 2\hat{\imath} + 3\hat{\jmath} + \mu(4\hat{\imath} - \hat{\jmath} + \hat{k})$

20. Let OACB be parallelogram with O at the origin & OC a diagonal. Let D be the mid point of OA. Using vector method prove that BD & CO intersect in the same ratio. Determine this ratio.

PREVIOUS YEAR (JEE MAIN)

21. If the vectors $\overrightarrow{AB} = 3\hat{\imath} + 4\hat{k}$ and $\overrightarrow{AC} = 5\hat{\imath} - 2\hat{\jmath} + 4\hat{k}$ are the sides of a triangle ABC, then the length of the median through A is : **[JEE-MAIN 2013]**

(A) $\sqrt{33}$ (B) $\sqrt{45}$ (C) $\sqrt{18}$ (D) $\sqrt{72}$

ANSWER KEY

1.	(D)	**2.**	(B)	**3.**	(C)	**4.**	(D)	**5.**	(A)	**6.**	(A)	**7.**	(A)
8.	(B)	**9.**	(A)	**10.**	(B)	**11.**	(D)	**12.**	(A)	**13.**	(D)	**14.**	(ABC)

16. (3:2) **18.** **(i)** $D(-1,1,1)$ **(ii)** $\frac{6}{\sqrt{19}}(6,-1,1)$ **(iii)** $\frac{2\pi}{3}$

19. **(i)** parallel **(ii)** intersecting **(iii)** non-intersecting

20. (2:1) **21.** (A)