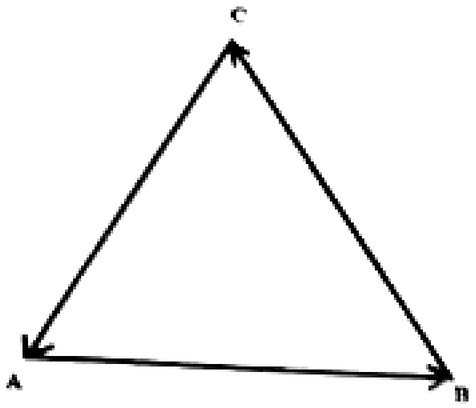
4. VECTORS

1. In a triangle ABC (shown in the figure below), state whether the following are true or false



i) $\overline{AB}+\overline{BC}+\overline{CA}=\vec{0}$

ii) $\overline{AB}+\overline{BC}-\overline{AC}=\vec{0}$

iii) $\overline{AB}-\overline{CB}+\overline{CA}=\vec{0}$

iv) $\overline{AB}+\overline{BC}-\overline{CA}=\vec{0}$

[AP EAMCET 17-09-20_Shift-2]

1. (i)–true, (ii) –True, (iii) –True, (iv) -False
2. (i)-True, (ii)-False, (iii)-True, (iv)-False
3. (i)-False, (ii)-False, (iii)-True, (iv)-True
4. (i)-False, (ii)-True, (iii)-False, (iv)-False

2. Length of the perpendicular from the origin to the plane passing through three non collinear points with position vectors $\vec{a},\vec{b}$ and $\vec{c}$ is **[AP EAMCET 17-09-20_Shift-2]**

1. $\left|\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]\right|$
2. $\left|2\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]\right|$
3. $\left|\dfrac{2\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]}{|\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}|}\right|$
4. $\left|\dfrac{\left[\vec{a}\ \ \vec{b}\ \ \vec{c}\right]}{|\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}|}\right|$

3. If the vectors $a\hat{i}+\hat{j}+\hat{k}, \hat{i}+b\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+c\hat{k}$ are coplanar, where $(a,b,c\neq 1)$ then the value of $\dfrac{1}{1-a}+\dfrac{1}{1-b}+\dfrac{1}{1-c}=$

[AP EAMCET 17-09-20_Shift-2]

1. 2
2. 0
3. -1
4. 1

4. Let u,v and w be three vectors in R^3. Then any vector $Z\in R^3$ can be written as $z=au+bv+cw$ for some scalars a,b and c if and only if **[AP EAMCET 17-09-20_Shift-2]**

1. Each pair of u,v and W are not parallel
2. Each of u,v and W can be written as a linear combination of the other two
3. All have different magnitude and directions
4. None of the options are correct

5. If $\overline{PO}+\overline{OQ}=\overline{QO}+\overline{OR}$ then _____

[AP EAMCET 17-09-20_Shift-2]

1. Q is the midpoint of $\overline{PR}$
2. Q divides $\overline{PR}$ in 2:1
3. Q divides $\overline{PR}$ in 1:2
4. Q divides $\overline{PR}$ in -1:2

6. If $\vec{a},\vec{b},\vec{c}$ and $\vec{r}$ are vectors such that $\vec{a}$ is not perpendicular to $\vec{b}$, $\vec{r}\times\vec{b}=\vec{c}\times\vec{b}$ and $\vec{r}.\vec{a}=0$ then $\vec{r}=$ **[AP EAMCET 17-09-20_Shift-2]**

1. $\vec{c}+\dfrac{(\vec{c}.\vec{a})}{(\vec{b}.\vec{a})}\vec{b}$
2. $\vec{b}-\dfrac{(\vec{c}.\vec{a})}{(\vec{b}.\vec{a})}\vec{c}$
3. $\vec{c}-\dfrac{(\vec{c}.\vec{a})}{(\vec{b}.\vec{a})}\vec{b}$
4. $\vec{b}+\dfrac{(\vec{c}.\vec{a})}{(\vec{b}.\vec{a})}\vec{c}$

7. If $\bar{a}=2\bar{i}+\bar{j}-3\bar{k}$ and $\bar{b}=3\bar{i}-\bar{j}+2\bar{k}$, then find the angle between the vectors $2\bar{a}+\bar{b}$ and $\bar{a}+2\bar{b}$

[AP EAMCET 18-09-20_Shift-1]

1. $\cos^{-1}\left(\dfrac{36}{\sqrt{42\times 35}}\right)$
2. $\cos^{-1}\left(\dfrac{72}{\sqrt{24\times 32}}\right)$
3. $\cos^{-1}\left(\dfrac{52}{\sqrt{74\times 65}}\right)$
4. $\cos^{-1}\left(\dfrac{24}{\sqrt{18\times 32}}\right)$

8. Equation of the perpendicular bisector of the line joining the points whose position vectors are $\bar{a}$ and $\bar{b}$ respectively is

[AP EAMCET 18-09-20_Shift-1]

1. $(2\vec{r}-\vec{a}-\vec{b}).(\vec{a}-\vec{b})=0$
2. $(2\vec{r}-\vec{a}-\vec{b}).(\vec{a}+\vec{b})=0$
3. $(2\vec{r}+\vec{a}+\vec{b}).(\vec{a}-\vec{b})=0$
4. $(2\vec{r}-\vec{a}+\vec{b}).(\vec{a}+\vec{b})=0$

9. If α is the angle between two vectors $\bar{p}=3\bar{i}+4\bar{j}-\bar{k}$ and $\bar{q}=2\bar{i}-\bar{j}+\bar{k}$ then, $\sin(\alpha)=$

[AP EAMCET 18-09-20_Shift-1]

1. $\sqrt{\frac{145}{156}}$
2. $\sqrt{\frac{135}{156}}$
3. $\sqrt{\frac{155}{156}}$
4. $\sqrt{\frac{165}{156}}$

10. Let u,v and w be vectors such that u+v+w=0, $|u|=3, |v|=5$ and $|w|=7$. Then the angle between u and v is **[AP EAMCET 18-09-20_Shift-1]**

1. 60°
2. 70°
3. 80°
4. 90°

11. Let ABC be a triangle. Let $u=\overline{AB}$ and $v=\overline{AC}$. If D is a middle point of BC, then $\overline{AD}$

[AP EAMCET 18-09-20_Shift-1]

1. $\frac{u-v}{2}$
2. $\frac{v-u}{2}$
3. $\frac{u+v}{2}$
4. $u+v$

12. Let u and v be two non-zero vectors. Then the magnitude of the cross product $u\times v$ is always.

[AP EAMCET 18-09-20_Shift-1]

1. $\leq |u||v|$
2. $=|u||v|$
3. $>|u||v|$
4. $=0$

13. If the magnitude of the vector product of the vector $\hat{i}+\hat{j}+\hat{k}$ with a unit vector along the sum of the vectors $2\hat{i}+4\hat{j}-5\hat{k}$ and $\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to $\sqrt{2}$, then the value of 'λ' is **[AP EAMCET 18-09-20_Shift-2]**

1. -1
2. 1
3. 0
4. 2

14. Find 'λ' if $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors such that

$\left[4\vec{a}+3\vec{b}-\vec{c} \quad 4\vec{a}+3\vec{b}+2\vec{c} \quad \vec{a}-4\vec{b}-\vec{c}\right]=$

$(\lambda^2+\lambda+1)\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

[AP EAMCET 18-09-20_Shift-2]

1. -7,8
2. -7,-6
3. 7,-8
4. -7,-8

15. In a regular hexagon $ABCDEF, \overline{AD}+\overline{EB}+\overline{FC}=(3\lambda-8)\overline{AB}.$ then λ = **[AP EAMCET 18-09-20_Shift-2]**

1. 3
2. 4
3. 5
4. 6

16. Two $\bar{u}$ and $\bar{v}$ are parallel if and only if

[AP EAMCET 18-09-20_Shift-2]

1. $\bar{u}$ and $\bar{v}$ have the same direction
2. $\bar{u}$ and $\bar{v}$ have the opposite direction
3. one of them is a scalar multiple of the other
4. the dot product of $\bar{u}$ and $\bar{v}$ are zero

17. Let u and v be two nonzero vectors. If $|\bar{u}+\bar{v}|=|\bar{u}-\bar{v}|$ then

[AP EAMCET 18-09-20_Shift-2]

1. $\bar{u}$ and $\bar{v}$ have the same direction
2. $\bar{u}$ and $\bar{v}$ are perpendicular
3. $\bar{u}$ and $\bar{v}$ have the opposite direction
4. Data insufficient

18. The unit vectors orthogonal to $3\hat{i}+2\hat{j}+6\hat{k}$ and coplanar with $2\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}-\hat{j}+\hat{k}$ are

[AP EAMCET 18-09-20_Shift-2]

1. $\pm\frac{1}{\sqrt{5}}(2\hat{i}-\hat{k})$
2. $\pm\frac{1}{\sqrt{10}}(3\hat{j}-\hat{k})$
3. $\pm\frac{1}{\sqrt{13}}(2\hat{i}-3\hat{j})$
4. $\pm\frac{1}{17}(2\hat{i}+3\hat{j}-2\hat{k})$

19. Let $\vec{u}=\hat{i}-2\hat{j}$ and $\vec{v}=-3\hat{i}+5\hat{j}$. Consider three points P,Q and R having position vectors $\frac{-1}{7}\hat{i},\frac{-1}{4}\hat{j}$ and $-2\hat{i}+3\hat{j}$ respectively Among these, the points in the line segment passing through $\vec{u}$ and $\vec{v}$ are **[AP EAMCET 21-09-20_Shift-1]**

1. Only P and Q
2. Only P and R
3. Only Q and R
4. All P,Q and R

20. Let $\vec{u}=-2\hat{i}+2\hat{j}+\hat{k}$ and $\vec{v}=\hat{i}-2\hat{j}+2\hat{k}$. Then angle between $\vec{u}$ and $\vec{v}$ is___

[AP EAMCET 21-09-20_Shift-1]

1. $\cos^{-1}(\frac{4}{9})$
2. $\cos^{-1}(\frac{-4}{3})$
3. $\cos^{-1}(\frac{4}{3})$
4. $\sin^{-1}(\frac{-4}{9})$

21. If $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a}+\vec{b}$ is also a unit vector, then the angle between $\vec{a}$ and $\vec{b}$ is ___ **[AP EAMCET 21-09-20_Shift-1]**

1. 60^0
2. 90^0
3. 30^0
4. 120^0

22. Let u and v be two vectors in a plane. Then any vector w in the plane can be written as w=au+bv for some scalars 'a' and 'b' if and only if

[AP EAMCET 21-09-20_Shift-1]

1. None of u and v is a scalar multiple of the other
2. None of $|u|$ and $|v|$ is a scalar multiple of the other
3. u and v have different direction
4. u and v are perpendicular to each other

23. If $\vec{a}=2\hat{i}-3\hat{j}-4\hat{k}$, $\vec{b}=\hat{i}+4\hat{j}-2\hat{k}$, $\vec{c}=3\hat{i}-\hat{j}+4\hat{k}$ then $\left[\vec{a}\times\vec{b}\quad \vec{b}\times\vec{c}\quad \vec{c}\times\vec{a}\right]=$

[AP EAMCET 21-09-20_Shift-1]

1. 4900
2. 6400
3. 8100
4. 12100

24. Let ABCDEF be a regular hexagon with the vertices A,B,C,D,E,F counterclockwise. then the vector $\overline{AB}+\overline{AF}+\overline{CD}+\overline{EF}$ IS equal to

[AP EAMCET 21-09-20_Shift-2]

1. $\overline{DE}+\overline{FA}$
2. $\overline{CB}+\overline{ED}$
3. $\overline{BC}+\overline{FA}$
4. $\overline{BC}+\overline{DE}$

25. In quadrilateral ABCD, $\overline{AB}=a$, $\overline{BC}=b$, $\overline{AD}=b-a$ if M is a midpoint of BC and N is a point on DM Such that DN=$\left(\frac{4}{5}\right)DM$, Then $5\overline{AN}=$

[AP EAMCET 21-09-20_Shift-2]

1. $\overline{AC}$
2. $2\overline{AC}$
3. $3\overline{AC}$
4. $4\overline{AC}$

26. The image of the point with position vector $\bar{i}+3\bar{j}+4\bar{k}$, in the plane $r.\left(2\bar{i}-\bar{j}+\bar{k}\right)+3=0$ is

[AP EAMCET 21-09-20_Shift-2]

1. $(3,5,2)$
2. $(3,5,-2)$
3. $(-3,-5,2)$
4. $(-3,5,2)$

27. Let $u=-2\hat{i}+2\hat{j}+\hat{k}$ and $v=\hat{i}-2\hat{j}+2\hat{k}$ then the component of $\bar{v}$ on $\bar{u}$ is

[AP EAMCET 21-09-20_Shift-2]

1. $\frac{4}{3}$
2. $\frac{-4}{3}$
3. $\frac{-2}{3}$
4. $\frac{2}{3}$

28. If $\vec{P}=3\hat{i}+5\hat{j}-\hat{k}$ and $\vec{Q}=\hat{i}+2\hat{j}+3\hat{k}$ are two sides of a triangle ,then its area is equal to _____sq.units

[AP EAMCET 21-09-20_Shift-2]

1. $\frac{\sqrt{390}}{4}$
2. $\sqrt{390}$
3. $\frac{\sqrt{390}}{2}$
4. $\frac{\sqrt{390}}{8}$

29. Given ΔABC such that A is $2\hat{i}-\hat{j}+\hat{k}$, B is $\hat{i}-3\hat{j}-5\hat{k}$ and C is $3\hat{i}-4\hat{j}-4\hat{k}$ then ΔABC is

[AP EAMCET 21-09-20_Shift-2]

1. An equilateral triangle
2. A right-angled triangle
3. An isosceles triangle
4. A scalene triangle

30. If P divides the line segment joining the points A and B in the ratio 2:1 and the position vectors of A and B are $\bar{i}-2\bar{j}$ and $-3\bar{i}+5\bar{j}$ respectively, then the position vector of P is

[AP EAMCET 22-09-20_Shift-1]

1. $\frac{5\bar{i}-8\bar{j}}{3}$ 2. $\frac{-5\bar{i}+8\bar{j}}{3}$
3. $\frac{5\bar{i}+8\bar{j}}{3}$ 4. $\frac{-5\bar{i}-8\bar{j}}{3}$

31. If $\bar{a}$ and $\bar{b}$ are unit vectors and θ is the angle between them, then the unit vector along the angular bisector of $\bar{a}$ and $\bar{b}$ is given by

[AP EAMCET 22-09-20_Shift-1]

1. $\frac{\bar{a}+\bar{b}}{2\sin\left(\frac{\theta}{2}\right)}$ 2. $\frac{\bar{a}+\bar{b}}{2\cos\left(\frac{\theta}{2}\right)}$
3. $\frac{\bar{a}-\bar{b}}{2\cos\left(\frac{\theta}{2}\right)}$ 4. $\frac{\bar{a}+\bar{b}}{\cos\left(\frac{\theta}{2}\right)}$

32. If $\vec{a},\vec{b}$ and $\vec{c}$ are three vectors such that $\vec{a}\times\vec{b}=\vec{c}$, $\vec{b}\times\vec{c}=\vec{a}$ and $\vec{a},\vec{b},\vec{c}$ are mutually perpendicular to each other, then $|\vec{b}|$ is equal to **[AP EAMCET 22-09-20_Shift-1]**

1. -1 only 2. 0 only
3. 1 only 4. ±1

33. The Cartesian equation of a line is $2x-3=3y+1=5-6x$. The vector equation of the line passing through the point (7, -5, 0) and parallel to the given line is

[AP EAMCET 22-09-20_Shift-1]

1. $\vec{r}=(5\hat{i}-7\hat{j})+\lambda(3\hat{i}+2\hat{j}-\hat{k})$
2. $\vec{r}=(7\hat{i}+5\hat{j})+\lambda(3\hat{i}-2\hat{j}+\hat{k})$
3. $\vec{r}=(7\hat{i}-5\hat{j})+\lambda(3\hat{i}+2\hat{j}-\hat{k})$
4. $\vec{r}=(-5\hat{i}+7\hat{j})+\lambda(-3\hat{i}-2\hat{j}-\hat{k})$

34. If O is any point $\overline{OA}+\overline{OB}+\overline{OC}+\overline{OD}=x\overline{OE}$, then find x, given that ABCD is quadrilateral, E is the point of intersection of the line joining the mid-points of opposite sides.

[AP EAMCET 22-09-20_Shift-2]

1. 4 2. 3
3. 5 4. 9

35. If $\bar{u}$ and $\bar{v}$ be two vectors in R^2. If $|\bar{u}+\bar{v}|^2=2\left(|\bar{u}|^2+|\bar{v}|^2\right)$, then____

[AP EAMCET 22-09-20_Shift-2]

1. $\bar{u}=\bar{v}$
2. $\bar{u}$ and $\bar{v}$ need not be same but they have same direction
3. $\bar{u}$ and $\bar{v}$ need not be same but they have the opposite direction
4. $\bar{u}=2\bar{v}$

36. If $\vec{a},\vec{b},$ and $\vec{c}$ are position vectors of the vertices of triangle ABC, then

$\frac{(\vec{a}-\vec{c})\times(\vec{b}-\vec{a})}{(\vec{b}-\vec{a}).(\vec{c}-\vec{a})}=$

[AP EAMCET 22-09-20_Shift-2]

1. cotC 2. tanA
3. tanC 4. -tanA

37. For parallelogram ABCD, if L and M are midpoints of BC and CD then $\overline{AL}+\overline{AM}=$
[AP EAMCET 22-09-20_Shift-2]

1. $\frac{2}{3}\overline{AC}$
2. $\frac{3}{2}\overline{AC}$
3. $\frac{5}{2}\overline{AC}$
4. $3\overline{AC}$

38. If $\vec{p}\times\vec{q}=\vec{p}\times\vec{r}$ and $\vec{p}.\vec{q}=\vec{p}.\vec{r}$, then____
[AP EAMCET 22-09-20_Shift-2]

1. $\vec{p}=\vec{r}$
2. $\vec{q}=\vec{r}$
3. $\vec{p}=\vec{q}$
4. $\vec{p}+\vec{q}=0$

39. Find the angle between the diagonals of parallelogram PQRS if $\overline{PQ}=3\hat{i}-2\hat{j}+2\hat{k}$ and $\overline{PS}=\hat{i}-2\hat{k}$ **[AP EAMCET 22-09-20_Shift-2]**

1. Only $\cos\theta=-\sqrt{\frac{3}{10}}$
2. Both $\cos\theta=\pm\sqrt{\frac{3}{10}}$
3. $\cos\theta=-\sqrt{\frac{3}{10}}$
4. $\tan\theta=-\sqrt{\frac{11}{10}}$

40. Let u and v be two vectors. Then $|u-v|=||u|-|v||$ if and only if
[AP EAMCET 23-09-20_Shift-1]

1. $|u|=|v|$
2. u and v have the opposite direction
3. u and v have the same direction
4. u and v are perpendicular to each other

41. The area of the parallelogram, whose diagonals are $2\hat{i}-\hat{j}+\hat{k}$ and $\hat{i}+3\hat{j}-\hat{k}$, is equal to ______ sq. units **[AP EAMCET 23-09-20_Shift-1]**

1. $\frac{\sqrt{26}}{2}$
2. $\frac{2}{\sqrt{26}}$
3. $\frac{\sqrt{62}}{2}$
4. $\frac{2}{\sqrt{62}}$

42. Number of unit vectors of the form $a\hat{i}+b\hat{j}+c\hat{k}$, where a,b,c $\in W$ is___
[AP EAMCET 23-09-20_Shift-1]

1. 2
2. 4
3. 3
4. 6

43. The scalar product of the vector $\vec{a}=\hat{i}+\hat{j}+\hat{k}$ with a unit vector along the sum of the vectors $\vec{b}=2\hat{i}+4\hat{j}-5\hat{k}$ and $\vec{c}=\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to one. Then, $\lambda=$
[AP EAMCET 23-09-20_Shift-1]

1. -1
2. 1
3. -2
4. 2

44. If PQRST is a pentagon, then the resultant of forces $\overline{PQ},\overline{PT},\overline{QR},+\overline{TS}$ and $\overline{PS}$ is
[AP EAMCET 23-09-20_Shift-1]

1. $3\overline{PT}$
2. $3\overline{PQ}$
3. $3\overline{PS}$
4. $\bar{0}$

45. Let $\overline{U},\overline{V}$ & $\overline{W}$ and be non-coplanar vectors. Then the points corresponding to which of the following vectors are collinear.

1. $u-2v+3w, 2u+3v-4w, u-7v+10w$
2. $u-2v+3w, 2u+3v-4w, -7v+10w$
3. $3u-4v+3w, -4u+5v-6w, 4u-7v+10w$
4. $3u-4v+3w, -4u+5v-6w, -7v+10w$

46. Let ABC be a triangle. Let $u=\overline{AB}$ and $v=\overline{AC}$. If D is a middle point of BC, then the median of ΔABD through vertex B has the length

1. $\frac{|u-v|}{2}$
2. $\frac{|v-3u|}{2}$
3. $\frac{|u-3v|}{4}$
4. $\frac{|v-3u|}{4}$

47. A vector in the direction of $v=2\hat{i}+3\hat{j}+\hat{k}$ with magnitude $\sqrt{7}$ is

1. $\frac{2}{\sqrt{3}}\hat{i}+\frac{3}{\sqrt{3}}\hat{j}+\frac{1}{\sqrt{3}}\hat{k}$
2. $\hat{i}+\frac{3}{2}\hat{j}+\frac{1}{2}\hat{k}$
3. $\frac{2}{\sqrt{2}}\hat{i}+\frac{3}{\sqrt{2}}\hat{j}+\frac{1}{\sqrt{2}}\hat{k}$
4. $\frac{2}{\sqrt{7}}\hat{i}+\frac{3}{\sqrt{7}}\hat{j}+\frac{1}{\sqrt{7}}\hat{k}$

48. If $\vec{a},\vec{b},\vec{c}$ are unit vectors such that $\vec{a}.\vec{b} = \vec{a}.\vec{c} = 0$ and the angle between $\vec{b}$ an $\vec{c}$ is $\frac{\pi}{3}$, then $\vec{a}$ is equal to_____

1. $2(\vec{b}\times\vec{c})$ only
2. $-2(\vec{b}\times\vec{c})$ only
3. $\pm\frac{2}{\sqrt{3}}(\vec{b}\times\vec{c})$
4. $\pm 2(\vec{b}\times\vec{c})$

49. If $\vec{a},\vec{b},\vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\sqrt{3}\vec{c}=\vec{0}$, then the angle between $\vec{a}$ and $\vec{b}$ is

1. $\frac{\pi}{4}$
2. $\frac{\pi}{2}$
3. $\frac{\pi}{3}$
4. $\frac{\pi}{6}$

50. $A(\overline{a}),B(\overline{b}),C(\overline{c}),D(\overline{d})$ are four concyclic points, such that $x\overline{a}+y\overline{b}+z\overline{c}+t\overline{d}=\overline{0}$, $x+y+z+t=0$ where x ,y, z ,t are constants not all zero . If the chords AB and CD intersect at P, then

[TS EAMCET 09-09-20_Shift-1]

1. $|x\,y||\overline{a}+\overline{c}|^2 = |zt||\overline{b}+\overline{d}|^2$
2. $|x\,y||\overline{a}-\overline{b}|^2 = |zt||\overline{c}-\overline{d}|^2$
3. $|x\,t||\overline{a}-\overline{c}|^2 = |yz||\overline{b}-\overline{c}|^2$
4. $|x\,z||\overline{b}+\overline{d}|^2 = |y\,t||\overline{a}+\overline{c}|^2$

51. If $\overline{a}$ and $\overline{b}$ are two non collinear vectors ,then $\frac{\overline{a}\times(\overline{b}\times\overline{a})}{|\overline{a}|^2}$ represent

[TS EAMCET 09-09-20_Shift-1]

1. a vector perpendicular to the plane of $\overline{a},\overline{b}$
2. projection of $\overline{b}$ along a vector perpendicular to the vector $\overline{a}$
3. projection of $\overline{a}$ along the vector perpendicular to $\overline{b}$
4. a vector on the plane of $\overline{a},\overline{b}$ whose magnitude is equal to $|\overline{a}|+|\overline{b}|$

52. If $A(1,2,3),B(3,7,-2),C(6,7,7)$ and $D(-1,0,-1)$ are points in a plane ,then the vector equation of the line passing through the centroids of ΔABD and ΔACD is

[TS EAMCET 09-09-20_Shift-1]

1. $\overline{r}=2\overline{i}+3\overline{j}+3\overline{k}+t(\overline{i}+3\overline{j})$
2. $\overline{r}=(1+t)\overline{i}+3\overline{j}+3t\overline{k}$
3. $\overline{r}=\overline{i}+\overline{j}+\overline{k}+t(2\overline{i}-\overline{j})$
4. $\overline{r}=2\overline{i}-\overline{j}+t(\overline{j}+4\overline{k})$

53. If $\overline{a}=\overline{i}+(\tan\theta)\overline{j}+\left(\frac{3}{\sqrt{\sin\frac{\theta}{2}}}\right)\overline{k}$ and $\overline{b}=\tan\theta(\overline{j}-\overline{i})-\left(2\sqrt{\sin\frac{\theta}{2}}\right)\overline{k}$ are orthogonal vectors and $\overline{c}=(\sin 2\theta)\overline{i}-2\overline{j}+2\overline{k}$ makes an obtuse angle with X- axis,then θ

[TS EAMCET 09-09-20_Shift-1]

1. $(2n+1)\pi+\tan^{-1}2, n\in Z$
2. $n\pi-\tan^{-1}2, n\in Z$
3. $(2n+1)\pi-\tan^{-1}3, n\in Z$
4. $(2n+1)\pi+\tan^{-1}3, n\in Z$

54. If $\overline{a},\overline{b}$ and $\overline{c}$ be three non-coplanar vectors and $\overline{p},\overline{q}$ and $\overline{r}$ be defined by

$$\overline{p}=\frac{\overline{b}\times\overline{c}}{a.(\overline{b}\times\overline{c})}, q=\frac{\overline{c}\times\overline{a}}{b.(\overline{c}\times\overline{a})}, \overline{r}=\frac{\overline{a}\times\overline{b}}{c.(\overline{a}\times\overline{b})}$$

Such that

$$\alpha=(\overline{a}+\overline{b}).\overline{p}+(\overline{b}+\overline{c}).\overline{q}+(\overline{c}+\overline{a}).\overline{r}$$

and $\beta=\frac{(\overline{a}\times\overline{b}).(\overline{b}+\overline{c})\times(\overline{a}+\overline{b}+\overline{c})}{\overline{b}.(\overline{a}\times\overline{c})}$, then

$\alpha+\beta=$ **[TS EAMCET 09-09-20_Shift-1]**

1. 2
2. 3
3. 4
4. 0

55. If $\bar{a}+l\bar{b}+l^2\bar{c}=\bar{0}$ and $\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}=3(\bar{b}\times\bar{c})$. Then the minimum value of such l is

[TS EAMCET 09-09-20_Shift-1]

1. 1
2. -2
3. $\frac{-9}{4}$
4. 0

56. In ΔABC, the points P,Q,R divide BC,CA,AB in the ratio 3:4,2:5,9:5, respectively and the point D divides BC in the ratio 2:3. If $\overline{AP}+\overline{BQ}+\overline{CR}=k\overline{AD}$, then $(14k+1):(14k-1)=$

[TS EAMCET 09-09-20_Shift-2]

1. 7:5
2. 4:3
3. 4:5
4. 3:2

57. If $A(1,1,2), B(4,2,1)$ and $C(2,3,5)$ are the vertices of a triangle ,then a vector representing the median of the triangle through A is

[TS EAMCET 09-09-20_Shift-2]

1. $3\bar{i}+4\bar{j}+5\bar{k}$
2. $(1+2t)\bar{i}+\left(1+\frac{3t}{2}\right)\bar{j}+(2+t)\bar{k}$
3. $2t\bar{i}+(7t-1)\bar{j}+5t^2\bar{k}$
4. $7t^2\bar{i}+6\bar{j}+4\bar{k}$

58. If the shortest distance between the lines $\bar{r}=(3\bar{i}+4\bar{j}-2\bar{k})+t(-\bar{i}+2\bar{j}+\bar{k})$ and $\bar{r}=(\bar{i}-7\bar{j}-2\bar{k})+s(\bar{i}+3\bar{j}+2\bar{k})$ is equivalent to projection of $\bar{P}=-2\bar{i}+11\bar{j}$ on $\bar{Q}$,then a possible vector $\bar{Q}$ is

[TS EAMCET 09-09-20_Shift-2]

1. $\bar{i}+5\bar{j}-3\bar{k}$
2. $5\bar{i}-\bar{j}+3\bar{k}$
3. $-\bar{i}+3\bar{j}+5\bar{k}$
4. $3\bar{i}+5\bar{j}-\bar{k}$

59. The vector equation of the plane containing the lines $\bar{r}=(\bar{i}+\bar{j})+t(\bar{i}+2\bar{j}-\bar{k})$ and $\bar{r}=(\bar{i}+\bar{j})+s(-\bar{i}+\bar{j}-2\bar{k})$ is

[TS EAMCET 09-09-20_Shift-2]

1. $\bar{r}.\bar{n}=3$, where $\bar{n}=\bar{i}-3\bar{j}-2\bar{k}$
2. $\bar{r}.\bar{n}=1$, where $\bar{n}=\bar{i}-\bar{j}+2\bar{k}$
3. $\bar{r}.\bar{n}=0$, where $\bar{n}=\bar{i}-\bar{j}-\bar{k}$
4. $\bar{r}.\bar{n}=2$, where $\bar{n}=\bar{i}-\bar{j}-\bar{k}$

60. Let $\bar{a}=\bar{i}-2\bar{j}+3\bar{k}$ and $\bar{b}=2\bar{i}+\bar{j}+\bar{k}$. If $\bar{c}$ is a unit vector such that $[\bar{a}\ \bar{b}\ \bar{c}]$ is maximum, then $\bar{c}=$

[TS EAMCET 09-09-20_Shift-2]

1. $\frac{-\bar{i}+\bar{j}+\bar{k}}{\sqrt{3}}$
2. $\frac{2\bar{i}-\bar{j}-\bar{k}}{\sqrt{6}}$
3. $\frac{2\bar{i}-\bar{j}+3\bar{k}}{\sqrt{14}}$
4. $\frac{\bar{i}-\bar{j}-2\bar{k}}{\sqrt{6}}$

61. The shortest distance between the skew lines $\frac{x-2}{1}=\frac{y-3}{-2}=\frac{z+5}{1}$ and $\frac{x-1}{-1}=\frac{y+2}{3}=\frac{z-4}{2}$ is

[TS EAMCET 09-09-20_Shift-2]

1. $\frac{22}{\sqrt{59}}$
2. $\frac{21}{\sqrt{59}}$
3. $\frac{31}{\sqrt{59}}$
4. $31\sqrt{59}$

62. Let $\overline{OA}=\bar{a}, \overline{OB}=\bar{b}$ be two non collinear vectors, $\overline{OP}=x_1\bar{a}+y_1\bar{b}$, $\overline{OQ}=x_2\bar{a}+y_2\bar{b}$ and $\overline{A'O}=\overline{OA}, \overline{B'O}=\overline{OB}$.

if $x_1=\frac{-3}{4}, x_2=\frac{1}{3}, y_1=\frac{7}{4}, y_2=\frac{5}{3}$ then

[TS EAMCET 10-09-20_Shift-1]

1. P lies inside the $\Delta A'OB$ and Q lies outside the ΔAOB
2. P lies outside the $\Delta AOB'$ and Q lies on the $\Delta A'OB'$
3. P lies inside the ΔAOB and Q lies outside the $\Delta AOB'$
4. P lies on the $\Delta A'OB$ and Q lies outside the ΔAOB

63. The position vector of a point P is $2\bar{i}+\bar{j}+3\bar{k}$ and $\bar{a}=-\bar{i}-2\bar{k}, b=\bar{i}+\bar{j}+2\bar{k}$ are two vectors which determine a plane π. .The equation of a line through P normal to $\bar{b}$ and lying on the plane π is **[TS EAMCET 10-09-20_Shift-1]**

1. $\bar{r}=2\vec{i}+\vec{j}+3\vec{k}+\lambda\left(-\vec{i}+5\vec{j}-2\vec{k}\right)$

2. $\bar{r}=2\vec{i}+\vec{j}+3\vec{k}+\lambda\left(\vec{i}+\vec{j}+\vec{k}\right)$

3. $\bar{r}=2\vec{i}+\vec{j}+3\vec{k}+\lambda\left(-2\vec{i}-\vec{j}+3\vec{k}\right)$

4. $\bar{r}=2\vec{i}+\vec{j}+3\vec{k}+\lambda\left(-3\vec{i}+4\vec{j}-5\vec{k}\right)$

64. In a quadrilateral ABCD, the point P divides DC in the ratio 1:3 internally and Q is the midpoint of AC. If $\overline{AB}+\overline{AD}+\overline{BC}-2\overline{DC}=\lambda\overline{PQ}$ then the value of λ is

[TS EAMCET 10-09-20_Shift-1]

1. –2   2. 2
3. 4   4. –4

65. $\bar{p}=2\vec{i}-3\vec{j}+\vec{k}, \bar{q}=\vec{i}+\vec{j}-\vec{k}$. if the vectors $\bar{a}$ and $\bar{b}$ are the orthogonal projections of $\bar{p}$ on $\bar{q}$ and $\bar{q}$ on $\bar{p}$ respectively, then $\frac{\bar{a}\times\bar{b}}{\bar{a}.\bar{b}}=$

[TS EAMCET 10-09-20_Shift-1]

1. $\frac{2\vec{i}+3\vec{j}+5\vec{k}}{19\sqrt{2}}$ 2. $\frac{2\vec{i}+3\vec{j}+5\vec{k}}{\sqrt{38}}$

3. $\frac{2\vec{i}+3\vec{j}+5\vec{k}}{2}$ 4. $\frac{3\vec{i}-2\vec{j}}{13}$

66. Let $\bar{a}=2\vec{i}-3\vec{j}+4\vec{k}$, $\bar{b}=7\vec{i}+2\vec{j}-3\vec{k}$ $\bar{c}=\bar{i}+\bar{j}+\bar{k}$. The vector $\bar{x}$ such that $\bar{x}.\bar{c}=60$ and perpendicular to both $\bar{a},\bar{b}$ is

[TS EAMCET 10-09-20_Shift-1]

1. $14\vec{i}-6\vec{j}-12\vec{k}$ 2. $\vec{i}+34\vec{j}+25\vec{k}$

3. $4\vec{i}-21\vec{j}-12\vec{k}$ 4. $6\vec{i}-6\vec{j}+28\vec{k}$

67. The shortest distance between the line $\bar{r}=2\bar{i}-2\bar{j}+3\vec{k}+\lambda\left(\bar{i}-\bar{j}+4\vec{k}\right)$ and the plane $\bar{r}.\left(\bar{i}+5\bar{j}+\vec{k}\right)=5$ is

[TS EAMCET 10-09-20_Shift-1]

1. $\frac{1}{3\sqrt{3}}$ 2. $\frac{5}{3\sqrt{3}}$

3. $\frac{10}{3\sqrt{3}}$ 4. $\frac{11}{3\sqrt{3}}$

68. If $12\vec{i}-12\vec{j}-18\vec{k}, -3\vec{i}-6\vec{j}-9\vec{k}$ and $3\vec{i}+3\vec{j}-24\vec{k}$ be the position vectors of the vertices A,B and C respectively of ΔABC ,then the position vector of the incentre of ΔABC is

[TS EAMCET 10-09-20_Shift-2]

1. $12\vec{i}-15\vec{j}-51\vec{k}$ 2. $6\vec{i}-\frac{15}{2}\vec{j}-\frac{51}{2}\vec{k}$

3. $\frac{4}{3}\vec{i}-\frac{5}{3}\vec{j}-17\vec{k}$ 4. $4\vec{i}-5\vec{j}-17\vec{k}$

69. Let Π be a plane containing the points $(0,-5,-1),(1,-2,5),(-3,5,0)$ and L be a line passing through the point (0,-5, -1) and parallel to the vector $\vec{i}+5\vec{j}-6\vec{k}$. Then the length of the projection of the unit normal vector to the plane Π on the line L is

[TS EAMCET 10-09-20_Shift-2]

1. $\frac{133\sqrt{2}}{\sqrt{31}}$ 2. $\frac{14}{\sqrt{682}}$

3. $\frac{133}{\sqrt{31}}$ 4. $\frac{268}{2\sqrt{32}}$

70. For non-coplanar vectors $\bar{a},\bar{b}$ and $\bar{c}$, if the point of intersection of the line $\bar{r}=\bar{a}+t\left(\bar{b}-\bar{c}\right)$ and the plane $\bar{r}=\bar{b}+\bar{c}+x\left(\bar{a}-\bar{b}\right)+y\left(\bar{c}+\bar{a}\right)$ is $l\bar{a}+m\bar{b}+n\bar{c}$, then $3l+4m+2n=$

[TS EAMCET 10-09-20_Shift-2]

1. 0   2. $\frac{1}{2}$

3. 2   4. 1

71. If the orthocentre of the triangle whose vertices are $2\bar{i}+3\bar{j}+5\bar{k}, 5\bar{i}+2\bar{j}+3\bar{k}$ and $3\bar{i}+5\bar{j}+2\bar{k}$ is $x\vec{i}+y\vec{j}+z\vec{k}$ then **[TS EAMCET 10-09-20_Shift-2]**

1. $x=2y=z$ 2. $x=y=2z$

3. $x=y=-z$ 4. $x=y=z$

72. If the vectors $\overline{AB} = p\vec{i} + q\vec{j} + r\vec{k}$, $\overline{AC} = s\vec{i} + 3\vec{j} + 4\vec{k}, \overline{CB} = 3\vec{i} + \vec{j} - 2\vec{k}$ from ΔABC ,then the values of p,q,r and s such that the area of that ΔABC is $5\sqrt{6}$ are

[TS EAMCET 10-09-20_Shift-2]

1. $p = 11, q = 4, r = -2, s = 8$
2. $p = 8, q = 4, r = 2, s = 5$
3. $p = -5, q = 4, r = 2, s = -8$
4. $p = 14, q = 4, r = 2, s = 11$

73. Let $\vec{a}, \vec{b}, and \vec{c}$ be three unit vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{1}{\sqrt{2}}(\vec{b} + \vec{c})$ and $\vec{b}$ is not parallel to $\vec{c}$. If α and β are the angles between $\vec{a}, \vec{b}$ and $\vec{a}, \vec{c}$ respectively then $\alpha - \beta =$

[TS EAMCET 10-09-20_Shift-2]

1. $\frac{3\pi}{4}$ 2. $\frac{\pi}{4}$
3. $\frac{\pi}{2}$ 4. 0

74. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of the points A,B,C respectively, then match the items of list-I with those of list-II

$List - I$	$List - II$
$A) \vec{a} = 2\vec{i} + 3\vec{j} + 4\vec{k}, \vec{b} = 3\vec{i} + 4\vec{j} + 2\vec{k}. \vec{c} = 4\vec{i} + 2\vec{j} + 3\vec{k}$	$I)$ A,B,C are collinear
$B) \vec{a} = \vec{i} + 2\vec{j} + 3\vec{k}, \vec{b} = 3\vec{i} + 4\vec{j} + 7\vec{k}, \vec{c} = -3\vec{i} - 2\vec{j} - 5\vec{k}$	$II) \Delta ABC$ is an isosceles triangle
$C) \vec{a} = 2\vec{i} - \vec{j} + \vec{k}, \vec{b} = \vec{i} - 3\vec{j} - 5\vec{k}, \vec{c} = -3\vec{i} - 4\vec{j} - 4\vec{k}$	$III) \Delta ABC$ is a right-angled triangle
$D) \vec{a} = \vec{i} + \vec{j} + \vec{k}, \vec{b} = \vec{i} + 2\vec{j} + 3k, \vec{c} = 2\vec{i} - \vec{j} + \vec{k}$	$IV) \Delta ABC$ is a right-angled isosceles triangle.
	$V) \Delta ABC$ is an equilateral triangle

[TS EAMCET 11-09-20_Shift-1]

1. A B C D — I IV III II
2. A B C D — I II III IV
3. A B C D — V I IV II
4. A B C D — V I III II

75. If the point of intersection of the lines $\vec{r} = \vec{i} + 6\vec{j} + (p\sec\alpha)\vec{k} + t(\vec{i} + 2\vec{j} + \vec{k})$ and $\vec{r} = 4\vec{j} + \vec{k} + \lambda(2\vec{i} + (p\tan\alpha)\vec{j} + 2\vec{k})$ is $8\vec{i} + 8\vec{j} + 9\vec{k}$,(where $0 < \alpha < \frac{\pi}{2}$), then p

[TS EAMCET 11-09-20_Shift-1]

1. $\sqrt{5}$ 2. $\sqrt{3}$
3. $\sqrt{2}$ 4. 0

76. $\vec{l}, \vec{m}, \vec{n}$ are three unit vectors in a right handed system and L is a line through the points A,B,C whose position vectors are $p\vec{l} + 7\vec{m} - 6\vec{n}, 2\vec{l} + 5\vec{m} - 4\vec{n}$ and $\vec{l} + 4\vec{m} - 3\vec{n}$ respectively. if the equation of the plane containing L and the point $(-p, p, p+1)$ is $ax + by + cz = 1$, then $p(a+b+c) =$

[TS EAMCET 11-09-20_Shift-1]

1. 0 2. $\frac{-40}{19}$
3. $\frac{40}{19}$ 4. -6

77. Let $\overline{a} = \vec{i} + 2\vec{j} - 2\vec{k}$ and $\overline{b} = 2\vec{i} - \vec{j} - 2\vec{k}$ .if the orthogonal projection vector of $\bar{a}$ on $\bar{b}$ be $\bar{x}$ and the orthogonal projection vector of $\bar{b}$ on $\bar{a}$ be, $\bar{y}$ then, $|\overline{x} - \overline{y}| =$

[TS EAMCET 11-09-20_Shift-1]

1. $\frac{4}{9}\sqrt{26}$ 2. $\frac{8}{9}\sqrt{10}$
3. $\frac{4}{9}\sqrt{10}$ 4. $\frac{8}{9}\sqrt{26}$

78. Let $\overline{p}, \overline{q}, \overline{r}$ be three non-coplanar vectors and $[\overline{p}\ \overline{q}\ \overline{r}]\overline{a} = \overline{q} \times \overline{r}, [\overline{p}\ \overline{q}\ \overline{r}]\overline{b} = \overline{r} \times \overline{q}$,$[\overline{p}\ \overline{q}\ \overline{r}]\overline{c} = \overline{p} \times \overline{q}$. if $\overline{a}, \overline{b}, \overline{c}$ denote the coterminous edges of a parallelepiped, then its height with the base having $\bar{a}$ and $\bar{c}$ is

[TS EAMCET 11-09-20_Shift-1]

1. $|\bar{p}|$
2. $\frac{1}{|\bar{a}|}$
3. $\frac{1}{|\bar{b}|}$
4. $\frac{1}{|\bar{q}|}$

79. If $\bar{b},\bar{c}$ are non collinear vectors, $|\bar{c}|\neq 0$, $\bar{a}\times(\bar{b}\times\bar{c})+(\bar{a}.\bar{b})\bar{b}=(4-2\beta-\sin\alpha)\bar{b}$ $+(\beta^2-1)\bar{c}$ *and* $(\bar{c}.\bar{c})\bar{a}=\bar{c}$, then the scalars α *and* β are **[TS EAMCET 11-09-20_Shift-1]**

1. $\alpha=\frac{\pi}{2}+\frac{n\pi}{3}, n\in Z;\beta=1$
2. $\alpha=\frac{\pi}{2}+2n\pi, n\in Z;\beta=1$
3. $\alpha=\frac{\pi}{2}+(2n+1)\frac{\pi}{2}, n\in Z,\beta=2$
4. $\alpha=(2n+1)\frac{\pi}{2}, n\in Z,\beta=\frac{3}{2}$

80. For scalars λ,μ if the vector equation of a plane is $\bar{r}=(2+3\lambda-\mu)\bar{i}+(1-2\lambda+3\mu)\bar{j}+(-2+2\lambda+\mu)\bar{k}$, then its Cartesian equation is **[TS EAMCET 11-09-20_Shift-2]**

1. $8x-5y-7z+35=0$
2. $8x-5y+7z-35=0$
3. $8x+5y-7z+35=0$
4. $8x+5y-7z-35=0$

81. The equation of the plane in normal from passing through the point $A(\bar{a})$, parallel to a vector $\bar{b}$ and containing a vector $\bar{c}$ is **[TS EAMCET 11-09-20_Shift-2]**

1. $r.\frac{\bar{c}\times\bar{a}}{|\bar{c}\times\bar{a}|}=\frac{|\bar{a}\times\bar{b}|}{|\bar{a}\times\bar{c}|}$
2. $\bar{r}.\frac{\bar{a}\times\bar{b}}{|\bar{a}\times\bar{b}|}=\frac{[\bar{a}\ \ \bar{b}\ \ \bar{c}]}{|\bar{b}\times\bar{c}|}$
3. $\bar{r}.\frac{\bar{b}\times\bar{c}}{|\bar{b}\times\bar{c}|}=\frac{[\bar{a}\ \ \bar{b}\ \ \bar{c}]}{|\bar{b}\times\bar{c}|}$
4. $\bar{r}.[\bar{a}\ \ \bar{b}\ \ \bar{c}]\bar{a}=\frac{|\bar{b}\times\bar{c}|}{|\bar{a}\times\bar{c}|}$

82. The position vectors of the points A and B are respectively $\bar{i}+2\bar{j}$ and $2\bar{i}+\bar{j}+\bar{k}$. If the points P and Q are respectively the orthogonal projections of A and B on the plane $x+y+z=3$, then PQ= **[TS EAMCET 11-09-20_Shift-2]**

1. $\frac{2\sqrt{2}}{\sqrt{3}}$
2. $\frac{\sqrt{3}}{2}$
3. $\frac{\sqrt{5}}{7}$
4. $\frac{\sqrt{7}}{2}$

83. $\bar{x},\bar{y},\bar{z}$ are three vectors each of magnitude $\sqrt{2}$ and each making an angle 60^0 with one another. If $\bar{a}=\bar{x}\times(\bar{y}\times\bar{z}),\bar{b}=\bar{y}\times(\bar{z}\times\bar{x}),\bar{c}=\bar{x}\times\bar{y}$, then $\bar{x}=$ **[TS EAMCET 11-09-20_Shift-2]**

1. $\frac{1}{2}\left[(\bar{a}+\bar{b})\times\bar{c}-(\bar{a}+\bar{b})\right]$
2. $\frac{1}{2}\left[\bar{c}+\bar{a}-\bar{b}\right]$
3. $\frac{1}{2}\left[(\bar{a}+\bar{b})\times\bar{c}+(\bar{a}+\bar{b})\right]$
4. $\frac{1}{2}\left[(\bar{a}\times\bar{b})\times\bar{c}-\bar{a}+\bar{b}\right]$

84. Let $\bar{a}=2\bar{i}-2\bar{j}+\bar{k},\bar{b}=-\bar{j}+\bar{k}$. If $\bar{c}$ is a vector such that $\bar{a}.\bar{c}=|\bar{c}|,|\bar{c}-\bar{a}|=2\sqrt{2}$ and the angle between $\bar{a}\times\bar{b}$ and $\bar{c}$ is $\frac{\pi}{3}$, then $|(\bar{a}\times\bar{b})\times\bar{c}|=$ **[TS EAMCET 11-09-20_Shift-2]**

1. $3\sqrt{3}$
2. $\frac{3}{2}$
3. $\frac{3\sqrt{3}}{2}$
4. 0

85. A vector makes equal angles α with x and y axes and 90^0 with z- axis. Then $\alpha=$ **[AP EAMCET 19-08-2021_Shift-1]**

1. 60^0 *or* 120^0
2. 30^0 *or* 150^0
3. 45^0 *or* 135^0
4. 90^0

86. Angle made by the position vector of the point $(5,-4,-3)$ with the positive direction of X- axis is__ **[AP EAMCET 19-08-2021_Shift-1]**

1. $\frac{\pi}{2}$
2. $\frac{\pi}{6}$
3. $\frac{\pi}{4}$
4. $\frac{\pi}{3}$

87. If D,E and F are respectively midpoints of AB, AC and BC in ΔABC, then $\overline{BE}+\overline{AF}=$ **[AP EAMCET 19-08-2021_Shift-1]**

1. $\overline{DC}$
2. $\frac{3}{2}\overline{BF}$
3. $\frac{1}{2}\overline{BF}$
4. $\frac{1}{2}\overline{DC}$

88. If $\vec{a}=\frac{3}{2}\hat{k},\vec{b}=\frac{2\hat{i}+2\hat{j}-\hat{k}}{2}$, then angle between $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ is

[AP EAMCET 19-08-2021_Shift-1]

1. 45^0
2. 90^0
3. 30^0
4. 60^0

89. Let $\vec{a}=\hat{i}+\hat{j}+\hat{k},\vec{b}=\hat{i}+3\hat{j}+5\hat{k}$ and $\vec{c}=7\hat{i}+9\hat{j}+11\hat{k}$ then the area of parallelogram having diagonals $\vec{a}+\vec{b}$ and $\vec{b}+\vec{c}$ is

[AP EAMCET 19-08-2021_Shift-1]

1. $4\sqrt{6}$ sq.units
2. $2\sqrt{6}$ sq.units
3. $\sqrt{6}$ sq.units
4. $6\sqrt{6}$ sq.units

90. If $\vec{a}=2\hat{i}+\hat{j}+3\hat{k},\vec{b}=\hat{i}+3\hat{j}-\hat{k}$ and $\vec{c}=3\hat{i}-\hat{j}-2\hat{k}$ then the value of

$$\begin{vmatrix} \vec{a}.\vec{a} & \vec{a}.\vec{b} & \vec{a}.\vec{c} \\ \vec{b}.\vec{a} & \vec{b}.\vec{b} & \vec{b}.\vec{c} \\ \vec{c}.\vec{a} & \vec{c}.\vec{b} & \vec{c}.\vec{c} \end{vmatrix}=$$

[AP EAMCET 19-08-2021_Shift-1]

1. 2020
2. 2025
3. 2030
4. 1849

91. If $\vec{a}$ and $\vec{b}$ are two vectors such that $|\vec{a}|=2,|\vec{b}|=3$ and $\vec{a}+t\vec{b}$ and $\vec{a}-t\vec{b}$ are perpendicular , where 't' is a positive scalar, then **[AP EAMCET 19-08-2021_Shift-1]**

1. $t=\pm\frac{2}{3}$
2. $t=\frac{4}{9}$
3. $t=\frac{2}{3}$
4. $t=\frac{2}{9}$

92. Which of the following vector is equally inclined with the coordinate axes?

[AP EAMCET 19-08-2021_Shift-2]

1. $\hat{i}+2\hat{j}+3\hat{k}$
2. $2\hat{i}-2\hat{j}+\hat{k}$
3. $3\hat{i}+3\hat{j}-3\hat{k}$
4. $4\hat{i}+4\hat{j}+4\hat{k}$

93. If $\hat{i}+4\hat{j}+3\hat{k},\hat{i}+2\hat{j}+3\hat{k},3\hat{i}+2\hat{j}+\hat{k}$ are position vectors of A,B,C respectively and if D,E are mid points of sides BC and AC. then $\overline{DE}$ is equal to **[AP EAMCET 19-08-2021_Shift-2]**

1. $\hat{i}+\hat{j}+\hat{k}$
2. $\hat{i}+\hat{j}$
3. $\hat{j}$
4. $\hat{j}+\hat{k}$

94. If $\vec{a}$ and $\vec{b}$ are two vectors such that $\frac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|}<0$ and $|\vec{a}.\vec{b}|=|\vec{a}\times\vec{b}|$ then the angle between the vectors $\vec{a}$ and $\vec{b}$ is____

[AP EAMCET 19-08-2021_Shift-2]

1. $\frac{\pi}{4}$
2. $\mathrm{Sec}^{-1}\left(-\sqrt{2}\right)$
3. $\mathrm{Tan}^{-1}\left(\frac{-1}{2}\right)$
4. $\mathrm{Sin}^{-1}\left(\frac{1}{2}\right)$

95. Let $L_1(resp.L_2)$ be the line passing through $2i-k$ $(resp.2i+j-3k)$ and parallel to $3i-j+2k$ $(resp.i-2j+k)$. Then the shortest distance between the lines L_1 and L_2 is equal to

[AP EAMCET 19-08-2021_Shift-2]

1. $\frac{10}{\sqrt{35}}$
2. $\frac{8}{\sqrt{35}}$
3. $\frac{11}{\sqrt{35}}$
4. $\frac{9}{\sqrt{35}}$

96. Let $\vec{a},\vec{b},\vec{c}$ be the three unit vectors and $\vec{a}.\vec{b}=\vec{a}.\vec{c}=0$. If the angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{3}$, then $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2=$ **[AP EAMCET 19-08-2021_Shift-2]**

1. $\frac{3}{2}$
2. $\frac{3}{4}$
3. $\frac{2}{3}$
4. $\frac{4}{3}$

97. Let x,y are real numbers. If $\vec{a}=(\sin x)\hat{i}+(\sin y)\hat{j}$ and $\vec{b}=(\cos x)\hat{i}+(\cos y)\hat{j}$, then $|\vec{a}\times\vec{b}|$ is

[AP EAMCET 19-08-2021_Shift-2]

1. 0
2. Greater than 1
3. Less than or equal to 1
4. Less than 1

98. The position vectors of the points 'A' and 'B' with respect to 'O' are $2\hat{i}+2\hat{j}+\hat{k}$ and $2\hat{i}+4\hat{j}+4\hat{k}$. The length of the internal bisector of $\angle BOA$ of ΔAOB is_______(take proportionality Constant is 2)

[AP EAMCET 20-08-2021_Shift-1]

1. $\frac{\sqrt{136}}{9}$
2. $\frac{\sqrt{136}}{3}$
3. $\frac{20}{3}$
4. $\frac{25}{3}$

99. Let $u=2\hat{i}+3\hat{j}+\hat{k}, v=-3\hat{i}+2\hat{j}$ and $w=\hat{i}-\hat{j}+4\hat{k}$, then which of the following statement is true?

[AP EAMCET 20-08-2021_Shift-1]

1. u is perpendicular to v but not w
2. v is perpendicular to w but not u
3. w is perpendicular to u but not v
4. u is perpendicular to both v and w

100. If $\vec{a}=(1,1,0), \vec{b}=(1,1,1)$, then unit vector in the plane of $\vec{a}$ and $\vec{b}$ and perpendicular to $\vec{a}$ is

[AP EAMCET 20-08-2021_Shift-1]

1. $(0,1,0)$
2. $(1,-1,0)$
3. $\vec{k}$
4. $(1,0,1)$

101. The line passing through $(1,1,-1)$ and parallel to the vector $\hat{i}+2\hat{j}-\hat{k}$ meets the line $\frac{x-3}{-1}=\frac{y+2}{5}=\frac{z-2}{-4}$ at A and the plane $2x-y+2z+7=0$ at B. Then $AB=$

[AP EAMCET 20-08-2021_Shift-1]

1. $\sqrt{6}$
2. $2\sqrt{6}$
3. $3\sqrt{6}$
4. $4\sqrt{6}$

102. Let $\vec{a}=\hat{i}$ and $\vec{b}=\hat{j}$, the point of intersection of the lines $\vec{r}\times\vec{a}=\vec{b}\times\vec{a}$ and $\vec{r}\times\vec{b}=\vec{a}\times\vec{b}$ is

[AP EAMCET 20-08-2021_Shift-1]

1. $\vec{r}=\hat{i}+\hat{j}$
2. $\vec{r}=\hat{i}-\hat{j}$
3. $\vec{r}=\hat{k}$
4. $\vec{r}=2\hat{i}+\hat{j}$

103. If $\vec{a}=\hat{i}+\hat{j}+\hat{k}, \vec{b}=\hat{i}-\hat{j}+2\hat{k}$ & $\vec{c}=x\hat{i}+(x-2)\hat{j}-\hat{k}$ and if the vector $\vec{c}$ lies in the plane of vectors $\vec{a}$ & $\vec{b}$ and then x equals

[AP EAMCET 20-08-2021_Shift-2]

1. 0
2. 1
3. 2
4. -2

104. Let $u=2i+j$ & $v=3i-5j$. Consider three points P,Q and R having the position vectors $\left(\frac{5}{2}\right)i-2j, \left(\frac{7}{3}\right)i-j$ & $\left(\frac{9}{4}\right)i$ respectively.
Among these, the points in the line passing through u and v are

[AP EAMCET 20-08-2021_Shift-2]

1. Only P and Q
2. Only P and R
3. Only Q and R
4. All P,Q and R

105. The point of intersection of the lines joining points $\hat{i}+2\hat{j}, 2\hat{i}-\hat{j}$ & $-\hat{i}, 2\hat{i}$ is

[AP EAMCET 20-08-2021_Shift-2]

1. $\frac{5}{3}\hat{i}$
2. $\frac{3\hat{i}+\hat{j}}{5}$
3. $\frac{-3}{5}\hat{i}$
4. $\frac{2}{5}\hat{j}$

106. The value of $\frac{|\vec{a}\times\vec{b}|^2+|\vec{a}.\vec{b}|^2}{2|\vec{a}|^2|\vec{b}|^2}=$

[AP EAMCET 20-08-2021_Shift-2]

1. 0
2. 1
3. 1/2
4. 1/4

107. Let $\vec{a}=\hat{i}-\hat{j}, \vec{b}=\hat{j}-\hat{k}$ & $\vec{c}=\hat{k}-\hat{i}$. If $\vec{d}$ is a unit vector such $\vec{a}.\vec{b}=0=\left[\vec{b}\quad\vec{c}\quad\vec{d}\right]$ then $\vec{d}$ is

[AP EAMCET 20-08-2021_Shift-2]

1. $\pm\frac{\hat{i}+\hat{j}-\hat{k}}{\sqrt{3}}$
2. $\pm\frac{\hat{i}+\hat{j}-2\hat{k}}{\sqrt{6}}$
3. $\pm\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$
4. $\pm\frac{\hat{i}+\hat{j}+2\hat{k}}{\sqrt{6}}$

108. Let u and v be two nonzero vectors in R^3 with the intermediate angle 45^0. Then $|u\times v|=$

[AP EAMCET 20-08-2021_Shift-2]

1. $|u||v|$ 2. $2|u||v|$

3. u.v 4. $|u|+|v|$

109. The equation of the plane passing through $3i+2j+6k$ and parallel to the vectors $2i+j+k$ and $i-j+k$ is

[AP EAMCET 20-08-2021_Shift-2]

1. $x+y+z=11$ 2. $2x-y-3z=-14$
3. $2x-y+z=10$ 4. $x-2y+3z=17$

110. Given $\vec{a}=3\hat{i}-\hat{j}, \vec{b}=2\hat{i}+\hat{j}-3\hat{k}$ & $\vec{b}=\overrightarrow{b_1}+\overrightarrow{b_2}$ where $\overrightarrow{b_1}$ is parallel to $\vec{a}$ & $\overrightarrow{b_2}$ is perpendicular to $\vec{a}$ then $\overrightarrow{b_2}$ is equal to

[AP EAMCET 20-08-2021_Shift-2]

1. $\frac{1}{2}\hat{i}+\frac{3}{2}\hat{j}-3\hat{k}$ 2. $\frac{1}{2}\hat{i}-\frac{3}{2}\hat{j}+3\hat{k}$
3. $\frac{1}{2}\hat{i}+\frac{3}{2}\hat{j}+3\hat{k}$ 4. $\frac{1}{2}\hat{i}-\frac{3}{2}\hat{j}-3\hat{k}$

111. Let u and v be two vectors. Then $|u-v|=||u|-|v||$ if and only if

[AP EAMCET 23-08-2021_Shift-1]

1. $|u|=|v|$
2. u and v have the same direction
3. u and v have the opposite direction
4. u = v

112. In ΔOAC, if B is the midpoint of side AC and $\overrightarrow{OA}=\vec{a}, \overrightarrow{OB}=\vec{b}$ then $\overrightarrow{OC}=$

[AP EAMCET 23-08-2021_Shift-1]

1. $2\vec{b}-\vec{a}$ 2. $\vec{b}-2\vec{a}$
3. $\vec{a}-2\vec{b}$ 4. $\vec{a}-\vec{b}$

113. Let ABCDEF be a regular hexagon with the vertices A,B,C,D,E,F counterclockwise. Then the vector $\overrightarrow{AB}+\overrightarrow{BC}$ is equal/ parallel to

[AP EAMCET 23-08-2021_Shift-1]

1. $\overrightarrow{BC}+\overrightarrow{CD}$ 2. $\overrightarrow{CD}+\overrightarrow{DE}$

3. $\overrightarrow{AF}+\overrightarrow{FE}$ 4. $\overrightarrow{FE}+\overrightarrow{ED}$

114. If $35\hat{i}+14\hat{j}-77\hat{k}, 2\hat{i}+7\hat{j}+5\hat{k}$ & $5\hat{i}+2\hat{j}+\lambda\hat{k}$ are coplanar, then $\lambda=$

[AP EAMCET 23-08-2021_Shift-1]

1. 11 2. -11
3. -10 4. 10

115. If $\vec{a},\vec{b},\vec{c},\vec{d}$ are vectors in which $|\vec{d}|=1$ and given $\vec{a}+\vec{b}+\vec{c}=s\vec{d}, \vec{b}+\vec{c}+\vec{d}=\vec{a}, \vec{a}.\vec{d}=4$, then 's' is equal to

[AP EAMCET 23-08-2021_Shift-1]

1. 7 2. 8
3. -1 4. 4

116. Let $x\in R$ & $\log_2 x>0$. Then the vectors $\vec{A}=(2,\log_2 x,s), \vec{B}=(\log_2 x,s,\log_2 x)$ include an acute angle if

[AP EAMCET 23-08-2021_Shift-1]

1. $s>1$ 2. $s>-1$
3. $s=-1$ 4. $s<-1$

117. The figure formed by the four points $(\hat{i}+\hat{j}-\hat{k}), (2\hat{i}+3\hat{j}), (5\hat{j}-2\hat{k})$ and $(\hat{k}-\hat{j})$ is

[AP EAMCET 23-08-2021_Shift-2]

1. Trapezium 2. Rectangle
3. Parallelogram 4. Quadrilateral

118. Let $\vec{A}=\hat{i}+2\hat{j}$. If $\vec{B}$ is a vector in XY plane such that $(\vec{A}+\vec{B}).\vec{B}=15$ and $\vec{A}.\vec{B}=6$, then $|\vec{B}|$ is

[AP EAMCET 23-08-2021_Shift-2]

1. 6 2. 9
3. 15 4. 3

119. The area of parallelogram for which the vectors $i+j+2k$ and $3i-2j+k$ are adjacent sides is equal to

[AP EAMCET 23-08-2021_Shift-2]

1. $3\sqrt{5}$ 2. $5\sqrt{3}$
3. $2\sqrt{5}$ 4. $5\sqrt{6}$

120. Let $\vec{a},\vec{b},\vec{c}$ be unit vectors such that $\vec{a}.\vec{b}=0=\vec{a}.\vec{c}$ and the acute angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{3}$ then $|\vec{a}\times\vec{b}-\vec{a}\times\vec{c}|=$

[AP EAMCET 23-08-2021_Shift-2]

1. 1
2. $\frac{1}{2}$
3. 2
4. $\frac{3}{2}$

121. The plane passing through (2, 1, −3) and perpendicular to $3i - j + 2k$ contains points

[AP EAMCET 23-08-2021_Shift-2]

1. $(1,5,1)\&(3,0,-5)$
2. $\left(\frac{1}{3},3,\frac{1}{2}\right)\&\left(1,5,\frac{1}{2}\right)$
3. $(3,1,-5)\&\left(\frac{1}{3},3,\frac{1}{2}\right)$
4. $(1,5,3)\&(3,0,1)$

122. Let $\vec{u}$ and $\vec{v}$ are unit vectors such that $\vec{u}.\vec{v}=0$. If $\vec{r}$ is any vector coplanar with $\vec{u}$ and $\vec{v}$ then the magnitude of the vector $\vec{r}\times(\vec{u}\times\vec{v})$ is

[AP EAMCET 23-08-2021_Shift-2]

1. 0
2. 1
3. $|\vec{r}|$
4. $2|\vec{r}|$

123. ABCD is a parallelogram such that L is midpoint of BC, then $\overline{AL}$ is equal to

[AP EAMCET 24-08-2021_Shift-1]

1. $\overline{DC}+\frac{1}{2}\overline{AD}$
2. $\frac{1}{2}\overline{AD}+\overline{BC}$
3. $\frac{1}{2}\overline{AD}+\overline{DL}$
4. $\frac{1}{2}\overline{AD}+\overline{BL}$

124. The number of values of $m\in R$ for which the vectors $i+2j+mk$ and $1+mj+2k$ are collinear is **[AP EAMCET 24-08-2021_Shift-1]**

1. 2
2. 3
3. 1
4. Infinite

125. If ABCDEF is a regular hexagon, where two adjacent sides $\overline{AB}$ and $\overline{BC}$ are $\vec{a}$ and $\vec{b}$ respectively. Then $\overline{CD}$ is **[AP EAMCET 24-08-2021_Shift-1]**

1. $\vec{b}-\vec{a}$
2. $\vec{a}+\vec{b}$
3. $\vec{a}-\vec{b}$
4. $\vec{a}+2\vec{b}$

126. If $\vec{a},\vec{b},\vec{c}$ are three vectors such that $|\vec{a}|=3,|\vec{b}|=4,|\vec{c}|=5$ and $\vec{a}+\vec{b}+\vec{c}=0$ then $\vec{a}.\vec{b}$ is equal to

[AP EAMCET 24-08-2021_Shift-1]

1. 12
2. 0
3. $\frac{12}{5}$
4. 6

127. Let $\vec{a},\vec{b}$ and $\vec{c}$ be non zero vectors such that $(\vec{a}\times\vec{b})\times\vec{c}=\frac{1}{3}|\vec{b}||\vec{c}|\vec{a}$. if θ is the acute angle between the vectors $\vec{b}$ and $\vec{c}$ then $\sin\theta=$

[AP EAMCET 24-08-2021_Shift-1]

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{\sqrt{2}}{3}$
4. $\frac{2\sqrt{2}}{3}$

128. If $\vec{a}=x^2\hat{i}+x\hat{j}+3\hat{k}$ and $\vec{b}=x\hat{i}-4\hat{j}+2\hat{k}$ and $\vec{a}.\vec{b}>6$ then ______

[AP EAMCET 24-08-2021_Shift-1]

1. $x\in R^-$
2. $x\in(-\infty,0)\cup(1,\infty)$
3. $x\in(-\infty,-2)\cup(2,\infty)$
4. $x\in(-2,0)\cup(2,\infty)$

129. If $\vec{a},\vec{b},\vec{c}$ be 3 non–planar vectors and $(\vec{a}-\lambda\vec{b}).(\vec{b}-2\vec{c})\times(\vec{c}+2\vec{a})=0$ then $\lambda=$

[AP EAMCET 24-08-2021_Shift-1]

1. 1
2. $\frac{1}{4}$
3. 0
4. $\frac{-1}{4}$

130. ABCDEF is a regular hexagon. The sum of the vectors $\overline{BE},\overline{BC},\overline{EF},\overline{BA},\overline{CF},\overline{AF}$

[AP EAMCET 24-08-2021_Shift-2]

1. $\overline{BF}$
2. $2\overline{BF}$
3. $\overline{FB}$
4. $3\overline{BF}$

131. If ABCDEF is a regular hexagon with $\overrightarrow{AB}=\vec{a}$ and $\overrightarrow{BC}=\vec{b}$ then $\overrightarrow{CE}$ equals

[AP EAMCET 24-08-2021_Shift-2]

1. $\vec{b}-\vec{a}$
2. $-\vec{b}$
3. $\vec{b}-2\vec{a}$
4. $\vec{a}-2\vec{b}$

132. R divides the line joining two points P and Q whose position vectors are $\hat{i}+2\hat{j}-\hat{k}$ and $-\hat{i}+\hat{j}+\hat{k}$ respectively in the ratio 2: 1 externally. S divides PQ internally in the ratio 2 : 1. Then the position vector of the midpoint of the line joining R and S is _____

[AP EAMCET 24-08-2021_Shift-2]

1. $\frac{-5}{3}\hat{i}-\frac{2}{3}\hat{j}-\frac{5}{3}\hat{k}$
2. $\frac{-5}{3}\hat{i}+\frac{2}{3}\hat{j}+\frac{5}{3}\hat{k}$
3. $\frac{5}{3}\hat{i}-\frac{2}{3}\hat{j}-\frac{5}{3}\hat{k}$
4. $\frac{5}{3}\hat{i}+\frac{2}{3}\hat{j}+\frac{5}{3}\hat{k}$

133. If $\vec{a}$ is a vector of magnitude 7, $\vec{b}$ is a vector of magnitude 8. Then the maximum value of $|\vec{a}.\vec{b}|$ is **[AP EAMCET 24-08-2021_Shift-2]**

1. 5 and $\left(\vec{a}.\vec{b}\right)=\frac{\pi}{6}$
2. 28 and $\left(\vec{a}.\vec{b}\right)=\frac{\pi}{3}$
3. 56 and $\left(\vec{a}.\vec{b}\right)=\frac{\pi}{2}$
4. 56 and $\left(\vec{a}.\vec{b}\right)=\pi$

134. The number of vectors of unit length perpendicular to the two vectors $\vec{a}=(1,1,0)$ and $\vec{b}=(0,1,1)$ is **[AP EAMCET 24-08-2021_Shift-2]**

1. 1
2. 2
3. 3
4. Inifinte

135. If the vectors $\vec{a}=\hat{i}-\hat{j}+2\hat{k}, \vec{b}=2\hat{i}+4\hat{j}+\hat{k}$ and $\vec{c}=\lambda\hat{i}+\hat{j}+\mu\hat{k}$ are mutually orthogonal then (λ,μ) is equal to

[AP EAMCET 24-08-2021_Shift-2]

1. $(-3,2)$
2. $(2,-3)$
3. $(-2,3)$
4. $(3,-2)$

136. Let $\vec{a},\vec{b}$ and $\vec{c}$ be the three vectors. If $|\vec{a}|=1,|\vec{b}|=17,|\vec{c}|=8$ and the angle between $\vec{a}$ and $\vec{b}$ is θ and $\vec{a}\times(\vec{a}\times\vec{b})-\vec{c}=0$, then $\cos\theta+\operatorname{cosec}\theta=$

[AP EAMCET 24-08-2021_Shift-2]

1. $\frac{409}{136}$
2. $\frac{309}{136}$
3. $\frac{419}{126}$
4. $\frac{409}{126}$

137. If $\vec{a}=t^2\hat{i}+e^t\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}+t^2\hat{j}+\log t\hat{k}$ and $f(t)=\vec{a}.\vec{b}$, then $f'(1)=$

[AP EAMCET 24-08-2021_Shift-2]

1. $3+5e$
2. $5+3e$
3. $3+3e$
4. $4+3e$

138. If $\overline{PQ}+\overline{QR}=(2\lambda^2-5)\overline{RP}$ then $\lambda=$

[AP EAMCET 25-08-2021_Shift-1]

1. ±1
2. $\pm\sqrt{2}$
3. $\pm\sqrt{3}$
4. 0

139. If 'C' is the midpoint of line segment AB and 'P' is any point not on the line AB, then

[AP EAMCET 25-08-2021_Shift-1]

1. $\overline{PA}+\overline{PB}+\overline{PC}=0$
2. $\overline{PA}+\overline{PB}+2\overline{PC}=0$
3. $\overline{PA}-\overline{PC}=\overline{PC}-\overline{PB}$
4. $\overline{PA}+\overline{PB}-\overline{PC}=0$

140. If 'θ' is the angle between the unit vectors $\vec{a}$ and $\vec{b}$, then $\sin\frac{\theta}{2}$ is equal to

[AP EAMCET 25-08-2021_Shift-1]

1. $\left|\frac{\vec{a}-\vec{b}}{\vec{a}+\vec{b}}\right|$
2. $|\vec{a}+\vec{b}|$
3. $|\vec{a}-\vec{b}|$
4. $\frac{1}{2}|\vec{a}-\vec{b}|$

141. The vector $\vec{a}$ lies in the plane of vectors $\vec{b}$ and $\vec{c}$, then **[AP EAMCET 25-08-2021_Shift-1]**

1. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$
2. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]=\vec{b}\ \vec{c}$
3. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]=0$
4. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]=-1$

142. $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a}+2\vec{b}$ is also a unit vector. If θ is the angle between $\vec{a}$ and $\vec{b}$, then $\sin\theta+\cos^3\theta+\tan^5\theta=$

[AP EAMCET 25-08-2021_Shift-1]

1. 3
2. 5
3. $\frac{3}{\sqrt{2}}+1$
4. -1

143. If $\vec{a},\vec{b},\vec{c}$ are non–zero vectors such $\vec{a}\times\vec{b}=\vec{c}$ and $\vec{b}\times\vec{c}=\vec{a}$, then $\vec{a}\times\vec{c}$ is

[AP EAMCET 25-08-2021_Shift-1]

1. Equal to $\vec{b}$
2. Parallel to $\vec{b}$
3. Perpendicular to $\vec{b}$
4. Parallel to $\vec{a}$

144. Consider the vectors

$$u=ai+bj+ck,$$
$$v=a^2i+b^2j+c^2k,$$
$$w=a^3i+b^3j+c^3k$$

These vectors are coplanar if and only if

[AP EAMCET 25-08-2021_Shift-1]

1. All a, b and c are equal
2. One of a, b and c is zero
3. Any two of a, b and c are equal
4. Either one of a, b and c is zero, or any two of a, b and c are equal

145. The position vectors of A and B are $(\hat{i}+\hat{j}+\hat{k})$ and $\left(\frac{1}{3}\hat{j}+\frac{1}{3}\hat{k}\right)$. If 'B' divides the line AC in the ratio 2 : 1, then position vector of 'C' is **[AP EAMCET 25-08-2021_Shift-2]**

1. $\left(\frac{1}{2},0,0\right)$
2. $\left(0,\frac{1}{3},0\right)$
3. $\left(\frac{-1}{2},\frac{-1}{2},0\right)$
4. $\left(\frac{-1}{2},0,0\right)$

146. Let $\vec{a},\vec{b}$ and $\vec{c}$ are 3 non zero vectors such that no 2 of these are collinear. If vector $\vec{a}+2\vec{b}$ is collinear with $\vec{c}$ and $\vec{b}+3\vec{c}$ is collinear with $\vec{a}$(λ being some non–zero scalar) then $\vec{a}+2\vec{b}+6\vec{c}$ equals

[AP EAMCET 25-08-2021_Shift-2]

1. $\lambda\vec{a}$
2. $\lambda\vec{b}$
3. $\lambda\vec{c}$
4. $\vec{0}$

147. Which of the following points lie on the plane passing through $2i+3j-k, 3i+2j+k$ and $i+j+4k$?

[AP EAMCET 25-08-2021_Shift-2]

1. $2i-3j+12k$ & $2i+j+\frac{5}{2}k$
2. $2i-3j+13k$ & $2i+j+6k$
3. $2i-3j+13k$ & $2i+\frac{3}{2}j+\frac{5}{2}k$
4. $2i+6k$ & $2i+\frac{3}{2}j+3k$

148. If $\vec{a},\vec{b},\vec{c}$ are three vectors such that $|\vec{a}|=|\vec{b}|=2$, $\vec{a}.\vec{b}=2$ and $\vec{a}+\vec{b}+\vec{c}=0$, then $|\vec{c}|$ is equal to

[AP EAMCET 25-08-2021_Shift-2]

1. 2
2. $2\sqrt{3}$
3. $\sqrt{3}$
4. 3

149. Let u, v and w are non – coplanar vectors, then the value of

$\frac{(u+2v-w).[(u-v)\times(u-v-w)]}{[u\ v\ w]}$ is equal to

[AP EAMCET 25-08-2021_Shift-2]

1. 1
2. 3
3. 4
4. 2

150. Let u and v be two non–zero vectors in R^3. Then $|u\times v|^2+|u.v|^2$ is equal to

[AP EAMCET 25-08-2021_Shift-2]

1. $|u|^2+|v|^2$ 2. $2|u||v|$
3. $|u|^2|v|^2$ 4. $(|u|+|v|)^2$

151. Let u and v be non–collinear vectors in R^2. Let w be the orthogonal projection vector of u on v.
Consider two statements:
i) Any vector in R^2 can be written as a linear combination of u and v
ii) w can be written as a linear combination of u and v as $w=au+bv$ where both a and b are nonzero real numbers.

[AP EAMCET 25-08-2021_Shift-2]

1. Both (i) and (ii) are true
2. Only (i) is true, but (ii) is false
3. Only (ii) is true, but (i) is false
4. Both (i) and (ii) are false

152. The vector in the direction of the sum of the vectors $\bar{a}=2\bar{i}-2\bar{j}+5\bar{k}$ and $\bar{b}=-2\bar{i}+5\bar{j}-3\bar{k}$ is **[TS EAMCET 04-08-2021_Shift-2]**
1. Perpendicular to ZX-plane
2. Parallel to ZX-plane
3. Parallel to YZ-plane
4. Perpendicular to YZ-plane

153. Consider the vectors

$\bar{a}=2\bar{i}+3\bar{j}-6\bar{k}, \bar{b}=6\bar{i}-2\bar{j}+3\bar{k}$ and

$\bar{c}=3\bar{i}-6\bar{j}-2\bar{k}.$

Assertion (A): The three vectors do not form a triangle
Reason (R): The three vectors are non-coplanar
The correct option among the following is
1. (A) is true, (R) is true and (R)is the correct explanation for (A)
2. (A) is true, (R) is true but (R)is not the correct explanation for (A)
3. (A) is true but (R) is false
4. (A) is false but (R) is true

[TS EAMCET 04-08-2021_Shift-2]

154. If a plane is at a distance of 6 units from the origin and the vector $2\bar{i}+6\bar{j}-3\bar{k}$ is its normal, then the equation of the plane in Cartesian from is **[TS EAMCET 04-08-2021_Shift-2]**
1. $2x+3y-6z-35=0$ 2. $2x+6y-3z-42=0$
3. $2x+6y-3z-35=0$ 4. $2x-6y+3z-42=0$

155. The unit vector perpendicular to the vector $\bar{i}-2\bar{j}+3\bar{k}$ and coplanar with the vectors $\bar{i}+\bar{j}+\bar{k}$ and $2\bar{i}-\bar{j}-\bar{k}$ is

[TS EAMCET 04-08-2021_Shift-2]

1. $\pm\frac{1}{\sqrt{5}}(2\bar{i}+\bar{j})$ 2. $\pm\frac{1}{4\sqrt{5}}(3\bar{i}-6\bar{j}-5\bar{k})$
3. $\pm\frac{1}{\sqrt{6}}(\bar{i}+2\bar{j}+\bar{k})$ 4. $\pm\frac{1}{\sqrt{3}}(\bar{i}-\bar{j}-\bar{k})$

156. Let $\bar{a}=2\bar{i}-\bar{j}+\bar{k}, \bar{b}=2\bar{j}-3\bar{k}$. if $\bar{b}=\bar{c}-\bar{d}, \bar{a}$ is parallel to $\bar{c}$ and perpendicular to $\bar{d}$, then $\bar{c}+\bar{d}=$ **[TS EAMCET 04-08-2021_Shift-2]**
1. $\frac{-1}{6}(2\bar{a}+5\bar{b})$ 2. $\frac{1}{3}(3\bar{a}+5\bar{b})$
3. $\frac{1}{6}(5\bar{a}+2\bar{b})$ 4. $\frac{-1}{3}(5\bar{a}+3\bar{b})$

157. Let $\bar{a},\bar{b},\bar{c},\bar{d}$ four vectors such that $\bar{a}$ is perpendicular only to $\bar{c}$. the vector $\bar{b}$ is parallel to $(\bar{c}-\bar{d})$ then $\bar{c}=$

[TS EAMCET 04-08-2021_Shift-2]

1. $\bar{b}-\left(\frac{\bar{a}.\bar{d}}{\bar{a}.\bar{b}}\right)\bar{d}$ 2. $\bar{d}-\left(\frac{\bar{a}.\bar{d}}{\bar{a}.\bar{b}}\right)\bar{b}$
3. $\bar{d}+\left(\frac{\bar{a}.\bar{d}}{\bar{a}.\bar{b}}\right)\bar{b}$ 4. $\bar{b}+\left(\frac{\bar{a}.\bar{d}}{\bar{a}.\bar{b}}\right)\bar{d}$

158. If the vectors $-3\bar{i}+4\bar{j}+\lambda\bar{k}$ and $\mu\bar{i}+8\bar{j}+6\bar{k}$ are collinear, then $\lambda-\mu=$

[TS EAMCET 04-08-2021_Shift-1]

1. 0 2. -3
3. 6 4. 9

159. The angle between the vectors $2\bar{k}-3\bar{j}$ and $\hat{i}-2\hat{k}$ is **[TS EAMCET 04-08-2021_Shift-1]**

1. $\cos^{-1}\left(\frac{8}{\sqrt{65}}\right)$
2. $\cos^{-1}\left(\frac{-4}{\sqrt{65}}\right)$
3. $\cos^{-1}\left(\frac{2}{\sqrt{65}}\right)$
4. $\cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$

160. Three vectors $\bar{a},\bar{b}$ *and* $\bar{c}$ satisfy $\bar{a}+\bar{b}+\bar{c}=\bar{0}$. If $|\bar{a}|=3, |\bar{b}|=4, |\bar{c}|=2$, then $\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}+2\left(|\bar{a}|+|\bar{b}|+|\bar{c}|\right)=$

[TS EAMCET 04-08-2021_Shift-1]

1. $\frac{-7}{2}$
2. $\frac{7}{2}$
3. $\frac{-11}{2}$
4. $\frac{11}{2}$

161. $(\bar{a}+2\bar{b}-\bar{c}).\{(\bar{a}-\bar{b})\times(\bar{a}-\bar{b}-\bar{c})\}=$

[TS EAMCET 04-08-2021_Shift-1]

1. $2[\bar{a}\ \bar{b}\ \bar{c}]$
2. $[\bar{a}\ \bar{b}\ \bar{c}]$
3. $3[\bar{a}\ \bar{b}\ \bar{c}]$
4. $[\bar{a}\ \bar{b}\ \bar{c}]^2$

162. If $\vec{a}=\vec{i}+\vec{j}+\vec{k}, \vec{c}=\vec{j}-\vec{k}$ are given vectors ,then a vector $\vec{b}$ satisfying the equations $\vec{a}\times\vec{b}=\vec{c}$ and $\vec{a}.\vec{b}=3$ is

[TS EAMCET 04-08-2021_Shift-1]

1. $5\vec{i}+2\vec{j}+2\vec{k}$
2. $\frac{5}{2}\vec{i}+\vec{j}+\vec{k}$
3. $\frac{5}{3}\vec{i}+\frac{2}{3}\vec{j}+\frac{2}{3}\vec{k}$
4. $\vec{i}+\frac{2}{5}\vec{j}+\frac{2}{5}\vec{k}$

163. Let $\vec{a}=2\vec{i}-3\vec{j}+\vec{k}, \vec{b}=\vec{i}+2\vec{j}-3\vec{k}, \vec{c}=\vec{i}-\vec{j}$ *and* $\vec{d}=\vec{i}+\vec{j}+x\vec{k}$ .If $(\vec{a}\times\vec{b})\times\vec{c}$ is perpendicular to $\vec{d}$, then $x=$

[TS EAMCET 04-08-2021_Shift-1]

1. $\frac{3}{2}$
2. 2
3. $\frac{2}{3}$
4. 1

164. The position vectors of the points P and Q are respectively $-2\bar{i}-3\bar{j}+\bar{k}$ and $3\bar{i}+3\bar{j}+2\bar{k}$. The ratio in which the point having position vector $\frac{-9}{2}\bar{i}-6\bar{j}+\frac{1}{2}\bar{k}$ divides the line segment joining P and Q is

[TS EAMCET 05-08-2021_Shift-1]

1. $-3:2$
2. $1:2$
3. $2:1$
4. $-1:3$

165. Consider the vectors $\bar{a}=3\bar{i}+5\bar{j}+2\bar{k}, \bar{b}=2\bar{i}-3\bar{j}-5\bar{k}$ and $\bar{c}=-5\bar{i}-2\bar{j}+3\bar{k}$. If l, m and n are length of projections of $\bar{a}$ on $\bar{b}$, $\bar{b}$ on $\bar{c}$ and $\bar{c}$ on $\bar{a}$ respectively, then

[TS EAMCET 05-08-2021_Shift-1]

1. $l+m-n=0$
2. $l=m=n$
3. $l-m+n=0$
4. $m+n-l=0$

166. Let $(x,y)\in(R\times R)$ and $\bar{a}=x\bar{i}+2\bar{j}-\bar{k}; \bar{b}=6\bar{i}-y\bar{j}+2\bar{k}$ be two vectors. If $|\bar{a}\times\bar{b}|^2+|\bar{a}.\bar{b}|^2=f(x).g(y)$ then $f(x)+g(y)-46=0$ represents

[TS EAMCET 05-08-2021_Shift-1]

1. a pair of lines
2. an ellipse
3. a hyperbola
4. a circle

167. If $\bar{a}=2\bar{i}+2\bar{j}+\bar{k}, |\bar{b}|=6$ and the angle between $\bar{a}$ *and* $\bar{b}$ is $\frac{\pi}{6}$, then the area of the triangle (in square units) with $\bar{a}$ *and* $\bar{b}$ as two of its sides is **[TS EAMCET 05-08-2021_Shift-1]**

1. $\frac{3\sqrt{3}}{2}$
2. $\frac{\sqrt{3}}{2}$
3. $\frac{5}{4}$
4. $\frac{9}{2}$

168. If $\bar{r}$ is a vector perpendicular to both vectors $2\bar{i}+3\bar{j}-4\bar{k}$ and $3\bar{i}-\bar{j}+\bar{k}$ and satisfy $\bar{r}\cdot(3\bar{i}-3\bar{j}+4\bar{k})=5$ then $|\bar{r}|=$

[TS EAMCET 05-08-2021_Shift-1]

1. $\sqrt{366}$ 2. $\sqrt{222}$
3. $\sqrt{318}$ 4. $\sqrt{246}$

169. The perpendicular distance from the origin to the plane containing the points having position vectors $\bar{i}+2\bar{j}+3\bar{k}, 2\bar{i}+3\bar{j}-4\bar{k}, 3\bar{i}-4\bar{j}+5\bar{k}$, is **[TS EAMCET 05-08-2021_Shift-1]**

1. $\frac{10}{\sqrt{60}}$ 2. $\frac{12}{\sqrt{30}}$
3. $\frac{15}{\sqrt{127}}$ 4. $\frac{25}{\sqrt{57}}$

170. If the collinear points A, B and C have position vectors respectively $(1,x,3),(3,4,7)$ and $(y,-2,-5)$, then $x+y=$

[TS EAMCET 05-08-2021_Shift-2]

1. -1 2. 1
3. -5 4. 5

171. The two lines
$L_1:\bar{r}=(\bar{i}+5\bar{j}+5\bar{k})+t(4\bar{i}-4\bar{j}+5\bar{k})$ and
$L_2:\bar{r}=(2\bar{i}+4\bar{j}+5\bar{k})+s(8\bar{i}-3\bar{j}+\bar{k})$ are
such that **[TS EAMCET 05-08-2021_Shift-2]**

1. both are parallel
2. both are perpendicular
3. both are Skew lines
4. both are non-Skew lines, non -parallel, non-perpendicular

172. $\bar{a},\bar{b},\bar{c}$ are non-coplanar vectors. If the position vector of the point of intersection of the line $\bar{r}=\bar{a}+2\bar{b}+p(\bar{a}-2\bar{c})$ and the plane $\bar{r}=3\bar{a}-q(\bar{c}-\bar{b})+K(\bar{a}-\bar{b}+\bar{c})$ is $\bar{r}=x\bar{a}+y\bar{b}+z\bar{c}$, then $xyz=$

[TS EAMCET 05-08-2021_Shift-2]

1. -8 2. 8
3. 12 4. -12

173. Let $\bar{a},\bar{b},\bar{c}$ be unit vectors such that $2\bar{a}+3\bar{b}+4\bar{c}=0$. then $|\bar{b}\times\bar{c}|=$

[TS EAMCET 05-08-2021_Shift-2]

1. $\frac{\sqrt{15}}{8}$ 2. $\frac{\sqrt{15}}{16}$
3. $\frac{\sqrt{15}}{4}$ 4. $\frac{\sqrt{15}}{2}$

174. The shortest distance between the Skew lines $\bar{r}=(3\bar{i}+4\bar{j}-2\bar{k})+\lambda(-\bar{i}+2\bar{j}+\bar{k})$ and $\bar{r}=(\bar{i}-7\bar{j}-2\bar{k})+\mu(\bar{i}+3\bar{j}+2\bar{k})$ is

[TS EAMCET 05-08-2021_Shift-2]

1. $\frac{26}{5\sqrt{5}}$ 2. $\sqrt{45}$
3. $\sqrt{35}$ 4. $\frac{36}{5\sqrt{5}}$

175. If $\bar{b}=2\bar{i}-\bar{j}-\bar{k}, \bar{a}=3\bar{i}+4\bar{j}-5\bar{k}$ and $\bar{b}\times(\bar{a}\times\bar{b})=\frac{\bar{a}-k\bar{b}}{l}$ then $\frac{k}{l|\bar{b}|}$ is

[TS EAMCET 05-08-2021_Shift-2]

1. the orthogonal projection of $\bar{b}$ on $\bar{a}$ and equal to $\frac{7}{\sqrt{50}}$
2. the orthogonal projection of $\bar{a}$ on $\bar{b}$ and equal to $\frac{7}{\sqrt{6}}$
3. the orthogonal projection of $\bar{b}$ in the direction perpendicular to $\bar{a}$ and equal to $\frac{5}{3}$
4. the orthogonal projection of $\bar{a}$ in the direction perpendicular to $\bar{b}$ and equal to $\frac{752}{3}$

176. Let $\vec{a}=2\vec{i}-\vec{j}+2\vec{k}$ and $\vec{b}=3\vec{i}-2\vec{j}-5\vec{k}$ be two vectors. Then the projection vector of $\vec{b}$ on a vector perpendicular to $\vec{a}$ is

[TS EAMCET 06-08-2021_Shift-2]

1. $\frac{-2}{3}\left(2\vec{i}-\vec{j}-2\vec{k}\right)$ 2. $\vec{i}+4\vec{j}+\vec{k}$
3. $\frac{13}{3}\vec{i}+\frac{4}{3}\vec{j}-\frac{11}{3}\vec{k}$ 4. $\frac{31}{9}\vec{i}-\frac{20}{9}\vec{j}-\frac{41}{9}\vec{k}$

177. If $P\vec{i}-2\vec{j}+3\vec{k}, 2\vec{i}+3\vec{j}-4\vec{k}, 4\vec{i}+13\vec{j}-18\vec{k}$ are the position vectors of three collinear points A,B,C respectively, then the vector in the direction of $\overline{AB}$ of length $|P|$ units is

[TS EAMCET 06-08-2021_Shift-2]

1. $\frac{2}{5\sqrt{3}}\left(\vec{i}+5\vec{j}-7\vec{k}\right)$ 2. $\frac{1}{\sqrt{83}}\left(3\vec{i}+5\vec{j}-7\vec{k}\right)$
3. $\frac{1}{\sqrt{78}}\left(2\vec{i}+5\vec{j}-7\vec{k}\right)$ 4. $\frac{1}{5\sqrt{3}}\left(\vec{i}+5\vec{j}-7\vec{k}\right)$

178. If α, β are scalars and $\vec{r}=(2+\alpha-3\beta)\vec{i}+(\beta-3)\vec{j}+(2\alpha-5\beta-1)\vec{k}$ Is equation of a plane, then that equation in Cartesian form is

[TS EAMCET 06-08-2021_Shift-2]

1. $2x+y-z+2=0$ 2. $2x-y-z=8$
3. $2x-y-z+8=0$ 4. $2x+y-z=2$

179. Let $\vec{a},\vec{b},\vec{c}$ be three unit vectors such that $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\frac{1}{2}\vec{b}$. If the angle between $\vec{a},\vec{b}$ is θ_1 and the angle between $\vec{a},\vec{c}$ is θ_2, then $\theta_1+\theta_2=$

[TS EAMCET 06-08-2021_Shift-2]

1. 150^0 2. 180^0
3. 120^0 4. 90^0

180. Consider the four points $A(1,-2,-1)$, $B(4,0,-3)$, $C(1,2,-1)$ and $D(2,-4,-5)$ in space. If $\vec{b}=\overline{AB},\vec{c}=\overline{AC},\vec{d}=\overline{AD}$ then

$$\frac{\left[\vec{b}\times\vec{c}\quad \vec{c}\times\vec{d}\quad \vec{d}\times\vec{b}\right]}{\left[\vec{b}+\vec{c}\quad \vec{c}+\vec{d}\quad \vec{d}+\vec{b}\right]}=$$

[TS EAMCET 06-08-2021_Shift-2]

1. 40 2. -40
3. 20 4. -20

181. If $\vec{r}=\vec{b}+t\vec{a},\vec{r}=\vec{d}+s\vec{c}$ are the two skew lines, then the shortest distance between them is

[TS EAMCET 06-08-2021_Shift-2]

1. Magnitude of vector $\vec{b}\times\vec{d}$
2. Sum of orthogonal projection of $\vec{b}$ on $\vec{d}$ and projection of $\vec{d}$ on $\vec{b}$
3. Orthogonal projection of $\left(\vec{a}-\vec{c}\right)$ on $\left(\vec{b}\times\vec{d}\right)$
4. Orthogonal projection of $\left(\vec{b}-\vec{d}\right)$ on $\left(\vec{a}\times\vec{c}\right)$

182. If x and y are real numbers such that, $\bar{i}+\bar{j}+\bar{k},-2\bar{i}+3\bar{j}+2\bar{k},x\bar{i}-5\bar{j}+3\bar{k},\bar{i}+y\bar{j}-\bar{k}$ are the position vectors of four coplanar points, then the locus of $P(x,y)$ is

[TS EAMCET 06-08-2021_Shift-1]

1. $x^2+y^2+3x+5y=0$
2. $(x+5)(y+3)=60$
3. $(x+3)^2=5(y+5)$
4. $(x+3)(y+5)=45$

183. The perpendicular distance from the point $P(3,5,2)$ to the line L passing through the point $2\bar{i}+\bar{j}$ and parallel to the vector $\bar{i}+5\bar{j}+2\bar{k}$ is

[TS EAMCET 06-08-2021_Shift-1]

1. $\frac{1}{\sqrt{6}}$ 2. $\frac{2}{\sqrt{6}}$
3. $\frac{\sqrt{6}}{\sqrt{5}}$ 4. $7\sqrt{6}$

184. Suppose ABCDE is a pentagon. The resultant vector of the vectors $\overline{AB},\overline{AE},\overline{BC},\overline{DC},\overline{ED}\&\overline{AC}$ is ____ **[TS EAMCET 06-08-2021_Shift-1]**

1. $3\overline{AC}$
2. $3\overline{AD}$
3. $3\overline{AE}$
4. $2\overline{AB}$

185. If $\overline{a}=\overline{i}+\overline{j}+\overline{k},\overline{c}=\overline{j}-\overline{k},\overline{a}\times\overline{b}=\overline{c}\&\overline{a}.\overline{b}=3$, then $\overline{b}=$ **[TS EAMCET 06-08-2021_Shift-1]**

1. $\frac{1}{3}(5\overline{i}+2\overline{j}+2\overline{k})$
2. $\frac{1}{3}(2\overline{i}+5\overline{j}+2\overline{k})$
3. $\frac{1}{3}(2\overline{i}+2\overline{j}+5\overline{k})$
4. $\frac{1}{3}(2\overline{i}+5\overline{j}+5\overline{k})$

186. If the cartesian equation of the plane passing through the point $\overline{i}+2\overline{j}+\overline{k}$ and parallel to the vectors $2\overline{i}+3\overline{j}+\overline{k}$ and $-\overline{i}+2\overline{j}-3\overline{k}$ is $ax+by+cz=1$ then $18(a+b+c)=$

[TS EAMCET 06-08-2021_Shift-1]

1. -3
2. 3
3. 4
4. -4

187. The point of intersection of the lines $\overline{r}=2\overline{b}+t(6\overline{c}-\overline{a})$ and $\overline{r}=\overline{a}+s(\overline{b}-3\overline{c})$ is

[AP EAMCET 04-07-2022_Shift-1]

1. $\overline{a}+\overline{b}+\overline{c}$
2. $\overline{b}-\overline{c}-6\overline{a}$
3. $2\overline{a}-\overline{b}+\overline{c}$
4. $\overline{a}+2\overline{b}-6\overline{c}$

188. In quadrilateral ABCD. $\overline{AB}=\overline{a},\overline{BC}=\overline{b},\overline{DA}=\overline{a}-\overline{b}$, M is the midpoint of BC and X is a point on DM such that $\overline{DX}=\frac{4}{5}\overline{DM}$. Then the points A,X and C

1. form an equilateral triangle
2. are collinear
3. form an isosceles triangle
4. form a right angled triangle

[AP EAMCET 04-07-2022_Shift-1]

189. The vectors $3\overline{a}-5\overline{b}$ and $2\overline{a}+\overline{b}$ are mutually perpendicular and the vectors $\overline{a}+4\overline{b}$ and $-\overline{a}+\overline{b}$ are also mutually perpendicular then the acute angle between $\overline{a}$ and $\overline{b}$ is

[AP EAMCET 04-07-2022_Shift-1]

1. $\cos^{-1}\left(\frac{19}{5\sqrt{43}}\right)$
2. $\cos^{-1}\left(\frac{9}{5\sqrt{43}}\right)$
3. $\pi-\cos^{-1}\left(\frac{19}{5\sqrt{43}}\right)$
4. $\pi-\cos^{-1}\left(\frac{9}{5\sqrt{43}}\right)$

190. Let $\overline{a}=x\overline{i}+y\overline{j}+z\overline{k}$ and x = 2y. if $|\overline{a}|=5\sqrt{2}$ and $\overline{a}$ makes and angle of 135° with the z–axis then $\overline{a}=$

[AP EAMCET 04-07-2022_Shift-1]

1. $2\sqrt{3}\overline{i}+\sqrt{3}\overline{j}-3\overline{k}$
2. $2\sqrt{6}\overline{i}+\sqrt{6}\overline{j}-6\overline{k}$
3. $2\sqrt{5}\overline{i}+\sqrt{5}\overline{j}-5\overline{k}$
4. $2\sqrt{5}\overline{i}+\sqrt{5}\overline{j}+5\overline{k}$

191. Let $\overline{a},\overline{b},\overline{c}$ be the position vectors of the vertices of a triangle ABC. Through the vertices, lines are drawn parallel to the sides to form the triangle $A'B'C'$. Then the centroid of $\Delta A'B'C'$ is.

[AP EAMCET 04-07-2022_Shift-1]

1. $\frac{\overline{a}+\overline{b}+\overline{c}}{9}$
2. $\frac{\overline{a}+\overline{b}+\overline{c}}{6}$
3. $\frac{\overline{a}+\overline{b}+\overline{c}}{3}$
4. $\frac{2(\overline{a}+\overline{b}+\overline{c})}{3}$

192. D,E,F are respectively the points on the sides BC,CA and AB of a ΔABC dividing them in the ratio 2:3, 1:2, 3:1 internally. The lines $\overline{BE}$ and $\overline{CF}$ intersect on the line $\overline{AD}$ at P. If $\overline{AP}=x_1\overline{AB}+y_1\overline{AC}$ then $x_1+y_1=$

[AP EAMCET 04-07-2022_Shift-2]

1. 5/6
2. 1
3. 3/2
4. 2

193. OABC is a tetrahedron.If D,E are the midpoints of OA and BC respectively,then $\overline{DE}=$

[AP EAMCET 04-07-2022_Shift-2]

1. $\frac{1}{2}(\overline{OA}+\overline{OB}+\overline{OC})$
2. $\frac{1}{2}(\overline{OA}+\overline{OB}-\overline{OC})$
3. $\frac{1}{2}(\overline{OA}-\overline{OB}+\overline{OC})$
4. $\frac{1}{2}(-\overline{OA}+\overline{OB}+\overline{OC})$

194. If $\bar{a}+\bar{b}+\bar{c}=0$ and $|\bar{a}|=7, |\bar{b}|=5, |\bar{c}|=3$ then the anglebetween $\bar{b}$ and $\bar{c}$ is

[AP EAMCET 04-07-2022_Shift-2]

1. 30^0
2. 45^0
3. 60^0
4. 90^0

195. If P,Q are two points on the curve $y=2^{x+2}$ in the rectangular Cartesian coordinate system such that $\overline{OP}.\bar{i}=-1, \overline{OQ}.\bar{i}=2$ then $\overline{OQ}-4\overline{OP}=$

[AP EAMCET 04-07-2022_Shift-2]

1. $3\bar{i}+8\bar{j}$
2. $4\bar{i}+6\bar{j}$
3. $6\bar{i}+8\bar{j}$
4. $4\bar{i}+3\bar{j}$

196. If the equation of the plane passing through the point A(-2,1,3) and perpendicular to the vector $3\bar{i}+\bar{j}+5\bar{k}$ is $ax+by+cz+d=0$ then $\frac{a+b}{c+d}=$ **[AP EAMCET 04-07-2022_Shift-2]**

1. 4/5
2. 2/3
3. 1
4. -4/5

197. $\bar{a},\bar{b},\bar{c}$ are non– coplanar vectors. If $\bar{a}+3\bar{b}+4\bar{c}=x(\bar{a}-2\bar{b}+3\bar{c})$ $+y(\bar{a}+5\bar{b}-2\bar{c})+z(6\bar{a}+14\bar{b}+4\bar{c})$ then x + y + z =

[AP EAMCET 05-07-2022_Shift-1]

1. –5
2. –4
3. 4
4. 5

198. Three vectors of magnitudes a, 2a, 3a are along the directions of the diagonals of 3 adjacent faces of a cube that meet in a point. Then the magnitude of the sum of those diagonals is

[AP EAMCET 05-07-2022_Shift-1]

1. 4a
2. 5a
3. 6a
4. 8a

199. If $\bar{a}$ is collinear with $\bar{b}=3\bar{i}+6\bar{j}+6\bar{k}$ and $\bar{a}.\bar{b}=27$ then $|\bar{a}|=$

[AP EAMCET 05-07-2022_Shift-1]

1. 1
2. 2
3. 3
4. 4

200. Let $\bar{a},\bar{b},\bar{c}$ be unit vectors such that $\bar{a}$ is perpendicular to the plane containing $\bar{b}$ *and* $\bar{c}$ and angle between $\bar{b}$ *and* $\bar{c}$ is $\frac{\pi}{3}$. Then $|\bar{a}+\bar{b}+\bar{c}|=$

[AP EAMCET 05-07-2022_Shift-1]

1. 3
2. 1
3. 2
4. 4

201. Let $\bar{F}=2\bar{i}+2\bar{j}+5\bar{k}$, A=(1,2,5), B=(–1,–2,–3) and $\overline{BA}\times\bar{F}=4\bar{i}+6\bar{j}+2\lambda\bar{k}$ then $\lambda=$ **[AP EAMCET 05-07-2022_Shift-1]**

1. 0
2. 1
3. 2
4. –2

202. If the position vectors of the points A, B, C, D are $7\bar{i}-4\bar{j}+7\bar{k}, \bar{i}-6\bar{j}+10\bar{k}, -\bar{i}-3\bar{j}+4\bar{k}, 5\bar{i}-\bar{j}+5\bar{k}$ respectively, then ABCD is

[AP EAMCET 05-07-2022_Shift-2]

1. A parallelogram but not rhombus
2. A square
3. A quadrilateral which is not a parallelogram
4. A rectangle

203. M and N are the mid points of the sides BC and CD of a parallelogram ABCD respectively then $\overline{AM}+\overline{AN}=$

[AP EAMCET 05-07-2022_Shift-2]

1. $\frac{1}{3}\overline{AC}$
2. $\frac{2}{3}\overline{AC}$
3. $\frac{3}{4}\overline{AC}$
4. $\frac{3}{2}\overline{AC}$

204. In ΔABC. 'O' is the circumcenter, G is the centroid then $|\overline{OG}|^2=$

[AP EAMCET 05-07-2022_Shift-2]

1. $R^2-\frac{1}{3}(a^2+b^2+c^2)$
2. $R^2-\frac{1}{6}(a^2+b^2+c^2)$
3. $R^2-\frac{1}{9}(a^2+b^2+c^2)$
4. $R-\frac{1}{9}(a^2+b^2+c^2)$

205. Three vectors $\bar{a}, \bar{b}, \bar{c}$ satisfy the condition $\bar{a}+\bar{b}+\bar{c}=\bar{0}$. If $|\bar{a}|=1, |\bar{b}|=3, |\bar{c}|=4$ then $\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}=$

[AP EAMCET 05-07-2022_Shift-2]

1. 12
2. -12
3. -13
4. 13

206. Let $\overline{OA}=-4\bar{i}+3\bar{k}, \overline{OB}=14\bar{i}+2\bar{j}-5\bar{k}. \overline{OD}$ bisects $\angle AOB$ and $|\overline{OD}|=\sqrt{6}$, then $\overline{OD}=$

[AP EAMCET 05-07-2022_Shift-2]

1. $\pm(\bar{i}+\bar{j}+2\bar{k})$
2. $\pm(\bar{i}+2\bar{j}+\bar{k})$
3. $\pm(2\bar{i}+\bar{j}+\bar{k})$
4. $\pm\frac{1}{\sqrt{2}}(2\bar{i}+\bar{j}+\sqrt{7}\bar{k})$

207. If $\bar{a}=(p,-2,5)$ and $\bar{b}=(1,q,-3)$ are collinear vectors then

[AP EAMCET 06-07-2022_Shift-1]

1. $p=\frac{5}{3}, q=\frac{6}{5}$
2. $p=\frac{-5}{3}, q=\frac{-6}{5}$
3. $p=\frac{5}{3}, q=\frac{-6}{5}$
4. $p=\frac{-5}{3}, q=\frac{6}{5}$

208. If origin is the ortho–center of an equilateral triangle whose vertices are $\bar{a}, \bar{b}, \bar{c}$ then

[AP EAMCET 06-07-2022_Shift-1]

1. $\bar{a}+\bar{b}=\bar{c}$
2. $\bar{a}+\bar{b}=-\bar{c}$
3. $|\bar{a}|^2=|\bar{b}|^2=|\bar{c}|^2$
4. $\bar{a}=\bar{b}=\bar{c}$

209. Let $\bar{a}=2\bar{i}+3\bar{j}+\bar{k}, \bar{b}=4\bar{i}+\bar{j}, \bar{c}=\bar{i}-3\bar{j}-7\bar{k}$. If $\bar{r}=x\bar{i}+y\bar{j}+z\bar{k}, \bar{r}.\bar{a}=9, \bar{r}.\bar{b}=7, \bar{r}.\bar{c}=6$ then $(x,y,z)=$

[AP EAMCET 06-07-2022_Shift-1]

1. $(1,-3,2)$
2. $(-1,3,-2)$
3. $(1,3,2)$
4. $(1,3,-2)$

210. If ABCD is a cyclic quadrilateral with R as the radius of the circumcircle and $(AB)^2+(CD)^2=4R^2$ then

[AP EAMCET 06-07-2022_Shift-1]

1. $\bar{b}.\bar{c}-\bar{a}.\bar{d}=0$
2. $\bar{a}.\bar{c}-\bar{b}.\bar{d}=0$
3. $\bar{a}.\bar{b}+\bar{c}.\bar{d}=0$
4. $\bar{a}.\bar{c}+\bar{b}.\bar{d}=0$

211. If $|a|=13, |b|=5$ and $\bar{a}.\bar{b}=60$ then $|\bar{a}\times\bar{b}|=$

[AP EAMCET 06-07-2022_Shift-1

1. 15
2. 20
3. 30
4. 25

212. The vectors $\bar{a}=2\bar{i}+3\bar{j}+6\bar{k}$ and $\bar{b}$ are collinear and $|\bar{b}|=21$, then $\bar{b}=$

[AP EAMCET 06-07-2022_Shift-2]

1. $\pm(2\bar{i}+3\bar{j}+6\bar{k})$
2. $\pm(6\bar{i}+9\bar{j}+18\bar{k})$
3. $\frac{21}{\sqrt{3}}(\bar{i}+\bar{j}+\bar{k})$
4. $\pm21(2\bar{i}+3\bar{j}+6\bar{k})$

213. In a trapezium ABCD, $\overline{BC}=\lambda\overline{AD}$ and $\bar{x}=\overline{AC}+\overline{BD}$. If $\bar{x}=p\overline{AD}$ then $p=$

[AP EAMCET 06-07-2022_Shift-2]

1. $\lambda-1$
2. $\lambda+1$
3. $1-\lambda$
4. $2\lambda-1$

214. In a Δ ABC, $|\overline{CB}|=\bar{a}, |\overline{CA}|=\bar{b}, |\overline{AB}|=\bar{c}$ and CD is the median through the vertex C. Then $\overline{CA}.\overline{CD}=$

[AP EAMCET 06-07-2022_Shift-2]

1. $\frac{1}{4}(3a^2+b^2-c^2)$
2. $\frac{1}{4}(a^2+3b^2-c^2)$
3. $\frac{1}{4}(a^2+b^2-3c^2)$
4. $\frac{1}{4}(-3a^2-b^2+c^2)$

215. If $\bar{a}=\bar{i}+\bar{j}+\bar{k}, \bar{c}=\bar{j}-\bar{k}, \bar{c}=\bar{a}\times\bar{b}$ and $\bar{a}.\bar{b}=3$ then $\bar{b}=$

[AP EAMCET 06-07-2022_Shift-2]

1. $\frac{1}{3}(5\bar{i}+2\bar{j}+2\bar{k})$
2. $\frac{1}{3}(2\bar{i}+5\bar{j}+2\bar{k})$
3. $\frac{1}{3}(2\bar{i}+2\bar{j}+3\bar{k})$
4. $\frac{1}{3}(2\bar{i}+5\bar{j}+5\bar{k})$

216. PQRS is a quadrilateral and $\overline{PQ}=\bar{a}$, $\overline{QR}=\bar{b}$, $\overline{SP}=\bar{a}-\bar{b}$, M is the midpoint of QR and X is a point on $\overline{SM}$ such that $\overline{SX}=\frac{4}{5}\overline{SM}$. If $\overline{SM}=m(4\bar{a}-\bar{b})$ and $\overline{SX}=n(4\bar{a}-\bar{b})$ then m+n=

[AP EAMCET 07-07-2022_Shift-1]

1. 9/10
2. 10/9
3. 11/9
4. 4/3

217. If C is the midpoint of the line segment $\overline{AB}$ and P is any point outside the line AB, then

[AP EAMCET 07-07-2022_Shift-1]

1. $\overline{PA}+\overline{PB}+2\overline{PC}=0$
2. $\overline{PA}+\overline{PB}+\overline{PC}=0$
3. $\overline{PA}+\overline{PB}=2\overline{PC}$
4. $\overline{PA}+\overline{PB}=\overline{PC}$

218. $\bar{a}\bar{b}$ are non-collinear vectors, $|\bar{a}|=2\sqrt{2},|\bar{b}|=3$ and the angle between $\bar{a}$ and $\bar{b}$ is 45°. Then the length of the diagonals of the parallelogram whose adjacent sides are represented by the vectors $5\bar{a}+2\bar{b}$ and $\bar{a}-3\bar{b}$ are

[AP EAMCET 07-07-2022_Shift-1]

1. 15,593
2. 15, $\sqrt{593}$
3. 225, $\sqrt{593}$
4. 225,593

219. Two verticles of a triangle are at $-\bar{i}+3\bar{j}$ and $2\bar{i}+5\bar{j}$ and its orthocenter is at $\bar{i}+2\bar{j}$. If the position vector of the 3rd vertex is $a\bar{i}+b\bar{j}$, then (a,b)=

[AP EAMCET 07-07-2022_Shift-1]

1. $\left(\frac{5}{7},\frac{5}{7}\right)$
2. $\left(\frac{5}{7},\frac{17}{7}\right)$
3. $\left(\frac{-5}{7},\frac{17}{7}\right)$
4. $\left(\frac{5}{7},\frac{-17}{7}\right)$

220. If 3 vectors $\bar{a},\bar{b},\bar{c}$ are such that $\bar{a}\neq\bar{0}$ and $\bar{a}\times\bar{b}=2(\bar{a}\times\bar{c}),|\bar{a}|=1,|\bar{c}|=1,|\bar{b}|=4$ and angle between $\bar{b}$ and $\bar{c}$ is $\cos^{-1}\left(\frac{1}{4}\right)$ and $\bar{b}-2\bar{c}=\lambda\bar{a}$, then $\lambda=$

[AP EAMCET 07-07-2022_Shift-1]

1. 4
2. 3
3. 2
4. 1

221. Let $\bar{a}=\bar{i}+x\bar{j}+\bar{k},\bar{b}=\bar{i}+\bar{j}+\bar{k}$ and $|\bar{a}+\bar{b}|=|\bar{a}|+|\bar{b}|$ then **[AP EAMCET 07-07-2022_Shift-2]**

1. $x=1$
2. $x=-1$
3. $x=0$
4. No such Real x exists

222. If $\bar{a}=\bar{i}+2\bar{j}+3\bar{k},\bar{b}=2\bar{i}+3\bar{j}+\bar{k},\bar{c}=8\bar{i}+13\bar{j}+9\bar{k}$ and $x\bar{a}+y\bar{b}+z\bar{c}=0$ then $\frac{xy}{z^2}=$

[AP EAMCET 07-07-2022_Shift-2]

1. -1
2. -6
3. 6
4. 1

223. The vector $\bar{x}$ is perpendicular to the vectors $\bar{a}=3\bar{i}+2\bar{j}+2\bar{k},\bar{b}=18\bar{i}-22\bar{j}-5\bar{k}$ and makes an obtuse angle with $\bar{j}$. If $|x|=14$, then $\bar{x}=$

[AP EAMCET 07-07-2022_Shift-2]

1. $8\bar{i}+12\bar{j}+24\bar{k}$
2. $-8\bar{i}+6\bar{j}+24\bar{k}$
3. $8\bar{i}-12\bar{j}-24\bar{k}$
4. $-8\bar{i}-12\bar{j}+24\bar{k}$

224. $\bar{a},\bar{b}$ are two vectors such that $|\bar{a}|=\sqrt{3},|\bar{b}|=\sqrt{2}$. If $\bar{x}$ is a unit vector satisfying $\bar{x}\times\bar{a}=\bar{b}$ then $\bar{x}=$

[AP EAMCET 07-07-2022_Shift-2]

1. $\frac{1}{2}\left[(\bar{x}.\bar{a})\bar{a}-\bar{b}\times\bar{a}\right]$
2. $\frac{1}{2}\left[\pm(\bar{x}.\bar{a})\bar{a}+(\bar{b}\times\bar{a})\right]$
3. $\frac{1}{3}\left[(\bar{x}.\bar{a})\bar{a}+\bar{b}\times\bar{a}\right]$
4. $\frac{1}{3}\left[\bar{a}\times\bar{b}\pm\bar{a}\right]$

225. The set of real values of λ for which the vectors $\lambda\bar{i}-3\bar{j}+5\bar{k}$ and $2\lambda\bar{i}-\lambda\bar{j}+\bar{k}$ are perpendicular to each other is

[AP EAMCET 07-07-2022_Shift-2]

1. $\{0,1\}$
2. $\{-2\}$
3. $\{2,-1\}$
4. ϕ

226. If G(2, -1, 2) is the centroid of tetrahedron OABC where O =(0,0,0) and G_1 is the centroid of ΔABC, then $|\overline{OG_1}|=$

[AP EAMCET 08-07-2022_Shift-1]

1. 1
2. 3/2
3. 4
4. 9/2

227. Let $\bar{a} = a_1\bar{i} + a_2\bar{j} + a_3\bar{k}$ where a_1, a_2, a_3 and $|\bar{a}|$ are rational numbers. If $\bar{a}$ makes an angle 45^0 with $\bar{b}$ and $\bar{b} = \sqrt{2}\bar{i} + 3\sqrt{2}\bar{j} + 4\bar{k}$ then $\bar{a}$ lies in

[AP EAMCET 08-07-2022_Shift-1]

1. XY – plane
2. YZ – plane
3. XZ – plane
4. Along the bisector of the angle between $\bar{k}$ and $-\bar{b}$

228. If $\bar{e}_1, \bar{e}_2$ are two non-collinear unit vectors such that $|\bar{e}_1 + \bar{e}_2| = \sqrt{3}$ then $(2\bar{e}_1 - 5\bar{e}_2).(3\bar{e}_1 + \bar{e}_2) =$

[AP EAMCET 08-07-2022_Shift-1]

1. $\frac{11}{2}$ 2. $\frac{-11}{2}$
3. $\frac{9}{2}$ 4. $\frac{-9}{2}$

229. A, B, C, D are any 4 points and $|\overline{AB} \times \overline{CD} + \overline{BC} \times \overline{AD} + \overline{CA} \times \overline{BD}| = \lambda$ $(Area\ of\ \Delta ABC)$ then $\lambda =$

[AP EAMCET 08-07-2022_Shift-1]

1. 1 2. 2
3. 3 4. 4

230. If $\bar{a}, \bar{b}$ be two non collinear vectors and the vector $\bar{a}+\bar{b}$ bisects the angle between $\bar{a}$ and $\bar{b}$, then **[AP EAMCET 08-07-2022_Shift-2]**

1. $|\bar{a}| = |\bar{b}|$
2. Angle between $\bar{a}, \bar{b}$ is 0^0 (or) π
3. $\bar{a}, \bar{b}$ always form adjacent sides of a square
4. $\bar{a}, \bar{b}$ always form adjacent sides of a rectangle

231. OABCD is a pentagon in which the sides OA and CB are parallel and the sides OD and AB are parallel. Also, it is given that $\frac{OA}{CB} = 2, \frac{OD}{AB} = \frac{1}{3}$

If $\overline{OA} = \bar{a}, \overline{OD} = \bar{d}$ then $\overline{AD} + \overline{OC} + \overline{DC} =$

[AP EAMCET 08-07-2022_Shift-2]

1. $\bar{d} - \bar{a}$ 2. $\frac{1}{2}\bar{a} + 3\bar{d}$
3. $\frac{1}{2}\bar{a} + 2\bar{d}$ 4. $6\bar{d}$

232. If the points $\bar{P} = \bar{i} + 2\bar{j}, \bar{Q} = 4\bar{i} + 6\bar{j}, \bar{R} = 5\bar{i} + 7\bar{j}, \bar{S} = a\bar{i} + b\bar{j}$ are the consecutive vertices of a parallelogram PQRS, then **[AP EAMCET 08-07-2022_Shift-2]**

1. a = 2, b = 4 2. a =3, b = 4
3. a =2, b =3 4. a = 3, b = 5

233. If $\bar{a} = 4\bar{i} + 6\bar{j}, \bar{b} = 3\bar{j} + 4\bar{k}$ and $\bar{c}$ is the projection vector of $\bar{a}$ on $\bar{b}$, then $\bar{c}$ and $|\bar{c}|$ respectively are

[AP EAMCET 08-07-2022_Shift-2]

1. $\frac{18}{25}\bar{b}, \frac{18}{5}$ 2. $\frac{18}{5}\bar{b}, 18$
3. $\frac{25}{18}\bar{b}, \frac{18}{5}$ 4. $\frac{5}{18}\bar{b}, \frac{5}{18}$

234. The distance between a point P whose position vector is $5\bar{i} + \bar{j} + 3\bar{k}$ and the line $\bar{r} = (3\bar{i} + 7\bar{j} + \bar{k}) + t(\bar{j} + \bar{k})$ is

[AP EAMCET 08-07-2022_Shift-2]

1. 3 2. 4
3. 5 4. 6

235. If the points with position vectors $\bar{i} - 2\bar{j} + 3\bar{k}, 2\bar{i} + 3\bar{j} - 4\bar{k}, -3\bar{i} + \bar{j} - 5\bar{k}$ and $a\bar{i} - 2\bar{j} + 4\bar{k}$ are coplanner then a =

[TS EAMCET 18-07-2022_Shift-1]

1. $\frac{-4}{19}$ 2. $\frac{42}{19}$
3. $\frac{-42}{19}$ 4. $\frac{4}{19}$

236. If P is a point on the line parallel to the vector $2\bar{i} - 3\bar{j} - 6\bar{k}$ and passing through the point A whose position vector $\bar{i} + 2\bar{j} - 2\bar{k}$ and AP = 21, then the position vector of P

[TS EAMCET 18-07-2022_Shift-1]

1. $6\bar{i} - 9\bar{j} - 18\bar{k}$ 2. $6\bar{i} + 9\bar{j} - 18\bar{k}$
3. $-5\bar{i} + 11\bar{j} + 16\bar{k}$ 4. $5\bar{i} - 11\bar{j} + 16\bar{k}$

237. Let $\bar{a}$ be a vector in the plane containing vectors $\bar{b}=\bar{i}+2\bar{j}+\bar{k}$ and $\bar{c}=2\bar{i}-\bar{j}+\bar{k}$. If $\bar{a}$ is perpendicular to $\bar{i}+\bar{j}+3\bar{k}$ and its projection on $\bar{b}$ is $3\sqrt{6}$, then $\left|\bar{a}\right|^2 =$

[TS EAMCET 18-07-2022_Shift-1]

1. 186
2. 36
3. 128
4. 264

238. The Cartesian equation of the plane passing through the point (1, -2, 3) and perpendicular to the vector $-\bar{i}+2\bar{j}-3\bar{k}$, is

[TS EAMCET 18-07-2022_Shift-1]

1. $-x+2y-3z=14$
2. $x-2y+3z=14$
3. $x+2y-3z=14$
4. $-x+2y+3z=14$

239. Let $\bar{a}=\bar{i}+\bar{j}+\bar{k}$, $\bar{b}=\bar{i}-2\bar{j}+\bar{k}, \bar{c}=\bar{i}+3\bar{j}-2\bar{k}, \bar{d}=2\bar{i}+\bar{j}-\bar{k}$ be four vectors and let $l=\bar{b}.\bar{c}$ and $m=\bar{c}.\bar{a}$. Then $\left[m\bar{b}+l\bar{a}\ \bar{b}\ \bar{d}\right]=$

[TS EAMCET 18-07-2022_Shift-1]

1. 79
2. -63
3. 0
4. 1

240. If $3\bar{i}-5\bar{j}+2\bar{k}, 7\bar{i}+2\bar{j}-4\bar{k}, \bar{i}-3\bar{j}+4\bar{k}$ and $-7\bar{i}-17\bar{j}+16\bar{k}$, are position vectors of the points A, B, C and D respectively. then the angle between $\overline{AB}$ and $\overline{CD}$ is

[TS EAMCET 18-07-2022_Shift-2]

1. 0
2. $\frac{\pi}{4}$
3. $\frac{\pi}{2}$
4. π

241. If $A\left(2\bar{i}+\bar{j}-\bar{k}\right), B\left(\lambda\bar{i}+5\bar{j}+4\bar{k}\right)$, $C\left(-4\bar{i}+3\bar{j}+2\bar{k}\right)$ and $D\left(-\bar{i}-2\bar{j}+3\bar{k}\right)$ are four points in space such that $\overline{AB}=x\overline{AC}+y\overline{AD}$ for some real numbers $x\neq 0, y\neq 0$ then $17(\lambda+9)=$

[TS EAMCET 18-07-2022_Shift-2]

1. 5
2. 3
3. 7
4. 9

242. Let a plane P has the points $\bar{i}, \bar{j}$ and $\bar{i}+\bar{j}+\bar{k}$ Let L be the line through the point A and parallel to the vector $\bar{i}-\bar{j}+\bar{k}$. If the plane P and line L intersect at a point B (0, 3, 2) and the distance from A to B is 3 units. then equations of the normal to the plane P through A are

[TS EAMCET 18-07-2022_Shift-2]

1. $\frac{x-3}{1}=\frac{y}{1}=\frac{z-5}{-1}$
2. $\frac{x+3}{1}=\frac{y-6}{1}=\frac{z-1}{-1}$
3. $\frac{x+3}{1}=\frac{y}{1}=\frac{z-5}{-1}$
4. $\frac{x+3}{1}=\frac{y-6}{-1}=\frac{z+1}{1}$

243. $\bar{a}=\bar{i}+\bar{j}+\bar{k}$ and $\bar{b}$ be two vectors such that $\bar{a}\cdot\bar{b}=1, \cos\left(\bar{a},\bar{b}\right)=\frac{1}{3}$ and the components of $\bar{b}$ w.r.t $\left(\bar{i},\bar{j},\bar{k}\right)$ be integers. Then the number of possible vectors that represent $\bar{b}$ is

[TS EAMCET 18-07-2022_Shift-2]

1. 1
2. 2
3. 3
4. 4

244. Let π_1 be the plane passing through the point $2\bar{i}-\bar{j}+\bar{k}$ and perpendicular to the vector $a\bar{i}+2\bar{j}-3\bar{k}$ and π_2 be the plane passing through the point $\bar{i}+2\bar{j}-\bar{k}$ and perpendicular to the vector $\bar{i}-2\bar{j}+\bar{k}$. If θ is the angle between the planes π_1 and π_2 and $\cos\theta=-\sqrt{\frac{3}{7}}$, then the integral value of a is

[TS EAMCET 18-07-2022_Shift-2]

1. -2
2. -1
3. 2
4. 1

245. If $\bar{a}$ and $\bar{b}$ are two vector such that $\bar{a}=2\bar{i}+2\bar{j}+p\bar{k}, \left|\bar{b}\right|=7, \bar{a}.\bar{b}=4$ and $\left|\bar{a}\times\bar{b}\right|=5\sqrt{17}$ then p =

[TS EAMCET 18-07-2022_Shift-2]

1. ±5
2. ±6
3. ±1
4. ±3

246. Let the vectors $\overline{AB} = 2\overline{i} + 2\overline{j} + \overline{k}$ and $\overline{AC} = 2\overline{i} + 4\overline{j} + 4\overline{k}$ be two sides of a triangle ABC. If G is the centroid of ΔABC, then $\frac{27}{7}\left|\overline{AG}\right|^2 + 5 =$

[TS EAMCET 19-07-2022_Shift-I]

1. 25
2. 38
3. 47
4. 52

247. If (α, β, γ) is a triad of real numbers satisfying $\overline{i} - 2\overline{j} + 5\overline{k} = \alpha(\overline{i} + \overline{j} + \overline{k}) + \beta(\overline{i} + 2\overline{j} + 3\overline{k}) + \gamma(2\overline{i} - \overline{j} + \overline{k})$, then $\alpha^2 - \beta^2 + \gamma^2 =$

[TS EAMCET 19-07-2022_Shift-I]

1. 23
2. 31
3. 40
4. -6

248. Let L be a line passing through a point A and parallel to the vector $2\overline{i} + \overline{j} - 2\overline{k}$. Let $-7\overline{i} - 5\overline{j} + 11\overline{k}$, be the position vector of a point P on L such that $\left|\overline{AP}\right| = 12$. Then the position vector of A can be **[TS EAMCET 19-07-2022_Shift-I]**

1. $\overline{i} + \overline{j} + 3\overline{k}$
2. $15\overline{i} + 9\overline{j} - 19\overline{k}$
3. $-\overline{i} - \overline{j} + 3\overline{k}$
4. $-15\overline{i} - 9\overline{j} + 19\overline{k}$

249. If θ is the angle between the vectors $2\overline{i} - \overline{j} + 2\overline{k}$ and $a\overline{i} + 4\overline{j} + b\overline{k}$ and $\cos\theta = \frac{2}{3}$ then $2(a+b+3) =$

[TS EAMCET 19-07-2022_Shift-I]

1. $a^2 + b^2$
2. a^2
3. b^2
4. ab

250. A bisector of the angle between the normal of the planes $4x + 3y = 5$ and $x + 2y + 2z = 4$ is along the vector

[TS EAMCET 19-07-2022_Shift-I]

1. $(17\overline{i} + 9\overline{j} - 12\overline{k})$
2. $(17\overline{i} - 9\overline{j} + 12\overline{k})$
3. $(17\overline{i} - \overline{j} + 10\overline{k})$
4. $(7\overline{i} - \overline{j} - 10\overline{k})$

251. Let the volume of the tetrahedron with vertices $\overline{i} - \overline{j} - 2\overline{k}, -2\overline{i} + \overline{j} - 2\overline{k}, -\overline{i} - 2\overline{j} + \overline{k}, 2\overline{i} + 2\overline{j} + a\overline{k}$ be $\frac{20}{3}$. Then the integral value of a is

[TS EAMCET 19-07-2022_Shift-I]

1. -2
2. 1
3. -1
4. 2

252. If $2\overline{i} - \overline{j} + \overline{k}, \overline{i} - 3\overline{j} - 5\overline{k}$ are the position vectors of the points A and B respectively, C divides AB in the ratio 2:3 and M is the mid point of AB, then 5(position vector of C) –2(position vector of M) =

[TS EAMCET 19-07-2022_Shift-2]

1. $5\overline{i} - 5\overline{j} - 3\overline{k}$
2. $11\overline{i} - 13\overline{j} - 11\overline{k}$
3. $5\overline{i} + 5\overline{j} - 3\overline{k}$
4. $11\overline{i} + 13\overline{j} - 11\overline{k}$

253. If $\overline{a}, \overline{b}, \overline{c}$ are the non–coplanar vectors and $\overline{a} - 2\overline{b} + 3\overline{c}, -4\overline{a} + 5\overline{b} - 6\overline{c}, x\overline{a} - 9\overline{b} + z\overline{c}$ are collinear points then $2x - z =$

[TS EAMCET 19-07-2022_Shift-2]

1. –10
2. –9
3. 0
4. 9

254. The point which lies on the plane passing through the points $\overline{i} - 2\overline{j} - 3\overline{k}, 3\overline{i} - \overline{j} + 4\overline{k}, -3\overline{i} + 2\overline{j} - 5\overline{k}$

[TS EAMCET 19-07-2022_Shift-2]

1. $-\overline{i} + 3\overline{j} - 2\overline{k}$
2. $7\overline{i} - 5\overline{j} - 6\overline{k}$
3. $-\overline{i} + 9\overline{j} + 14\overline{k}$
4. $3\overline{i} - 7\overline{j} + 8\overline{k}$

255. If $\overline{a} = \overline{i} - 2\overline{j} - 2\overline{k}$, and $\overline{b} = 2\overline{i} - 3\overline{j} + \overline{k}$, then the component of $\overline{b}$ perpendicular to $\overline{a}$ is

[TS EAMCET 19-07-2022_Shift-2]

1. $\frac{1}{3}(4\overline{i} - 5\overline{j} + 7\overline{k})$
2. $\frac{1}{3}(8\overline{i} - 13\overline{j} - \overline{k})$
3. $\frac{2}{3}(\overline{i} - 2\overline{j} - 2\overline{k})$
4. $\frac{1}{7}(\overline{i} - 5\overline{j} - 17\overline{k})$

256. If the angle between the planes $\overline{r}.(11\overline{i} - 2\overline{j} + \alpha\overline{k}) = 7$ and $\overline{r}.(2\overline{i} + 4\overline{j} - 2\overline{k}) = 5$ is $\frac{\pi}{2}$

Then $\alpha =$

[TS EAMCET 19-07-2022_Shift-2]

1. 2
2. 3
3. 5
4. 7

257. If $2\bar{i}+3\bar{j}-4\bar{k}$ and $-\bar{i}+2\bar{j}+\bar{k}$ are the two diagonals of a parallelogram, then the area of the parallelogram in square units is

[TS EAMCET 19-07-2022_Shift-2]

1. $\frac{1}{2}\sqrt{170}$
2. $\sqrt{174}$
3. $\sqrt{\frac{87}{2}}$
4. $\frac{1}{4}\sqrt{174}$

258. Let ABC be a triangle and $\bar{a},\bar{b},\bar{c}$ be the position vectors of A,B,C respectively. If D divides BC in the ratio 2:3 internally and E divides CA in the ratio 2:1 internally then the position vector of the point P which divides DE in the ratio 3:5 internally is

[TS EAMCET 20-07-2022_Shift-1]

1. $\frac{1}{8}\left(2\bar{a}+3\bar{b}+3\bar{c}\right)$
2. $\frac{1}{8}\left(3\bar{a}+2\bar{b}+3\bar{c}\right)$
3. $\frac{1}{8}\left(3\bar{a}+3\bar{b}+2\bar{c}\right)$
4. $\frac{3}{8}\left(\bar{a}+\bar{b}+\bar{c}\right)$

259. If $2\bar{i}+4\bar{j}-5\bar{k}, \bar{i}+\bar{j}+\bar{k}, \bar{j}+2\bar{k}$ are the position vectors of the vertices A, B, C of a triangle respectively, then a unit vector along the median drawn through the vertex A is

[TS EAMCET 20-07-2022_Shift-1]

1. $\frac{1}{\sqrt{174}}\left(5\bar{i}+10\bar{j}-7\bar{k}\right)$
2. $\frac{1}{\sqrt{214}}\left(3\bar{i}+6\bar{j}-13\bar{k}\right)$
3. $\frac{1}{\sqrt{66}}\left(\bar{i}+\bar{j}-8\bar{k}\right)$
4. $\frac{1}{7}\left(3\bar{i}+6\bar{j}-2\bar{k}\right)$

260. Let L be a line passing through the points $2\bar{i}+3\bar{j}+8\bar{k}$ and $\bar{i}+6\bar{j}+4\bar{k}$. Let P be a plane passing through $-5\bar{i}+19\bar{j}-14\bar{k}$ and parallel to the vectors $\bar{i}-\bar{j}+\bar{k}$ and $\bar{i}-2\bar{j}+3\bar{k}$. If L meets the plane P at a point A, then the position vector of A, is **[TS EAMCET 20-07-2022_Shift-1]**

1. $-\bar{i}-12\bar{j}+4\bar{k}$
2. $-\bar{i}+12\bar{j}-4\bar{k}$
3. $\bar{i}-12\bar{j}-4\bar{k}$
4. $\bar{i}+12\bar{j}+4\bar{k}$

261. Let $\bar{a},\bar{b},\bar{c}$ be three unit vectors satisfying $\left|\bar{a}-\bar{b}\right|^2+\left|\bar{a}-\bar{c}\right|^2=10$. Then

Statement(I): $\left|\bar{a}+2\bar{b}\right|^2+\left|2\bar{a}+\bar{c}\right|^2=2$

Statement(II): $\left|2\bar{a}+3\bar{b}\right|^2+\left|3\bar{a}+2\bar{c}\right|^2=10$

Which of the above statements is (are) true?

[TS EAMCET 20-07-2022_Shift-1]

1. Statement I is true, but Statement II is false
2. Statement II is true, but Statement I is false
3. Both Statement I and Statement II are true
4. Both Statement I and Statement II are false

262. If $\bar{r}.\left(2\bar{i}+3\bar{j}+4\bar{k}\right)=5$, $\bar{r}.\left(\bar{i}+\bar{j}-\bar{k}\right)=7$ are two planes and (16,–9,0) is a point common to both the planes then the vector equation of the line of intersection of the planes is $\bar{r}=$

[TS EAMCET 20-07-2022_Shift-1]

1. $(16+7\lambda)\bar{i}+(6\lambda+9)\bar{j}+\lambda\bar{k}$
2. $(16-7\lambda)\bar{i}+(6\lambda-9)\bar{j}-\lambda\bar{k}$
3. $16\bar{i}-9\bar{j}+\lambda\left(\bar{i}-7\bar{j}+6\bar{k}\right)$
4. $16\bar{i}-9\bar{j}+\lambda\left(6\bar{i}-\bar{j}-7\bar{k}\right)$

263. Let ABC be a triangle and $\bar{a},\bar{b},\bar{c}$ be the position vectors of A, B, C respectively. Let D divide BC in the ratio 3 : 1 internally and E divide AD in the ratio 4 : 1 internally. Let BE meet AC in F. If E divides BF in the ratio 3 : 2 internally then the position vector of F is

[TS EAMCET 20-07-2022_Shift-2]

1. $\frac{\bar{a}+\bar{b}+\bar{c}}{3}$
2. $\frac{\bar{a}-2\bar{b}+3\bar{c}}{2}$
3. $\frac{\bar{a}+2\bar{b}+3\bar{c}}{2}$
4. $\frac{\bar{a}-\bar{b}+3\bar{c}}{3}$

264. If α, β,γ are real numbers sucht that $\left(\frac{7}{3}+\beta\right)\bar{i}-\bar{j}+(\alpha+\gamma)\bar{k}=\frac{5}{3}\left(\alpha\bar{i}+\bar{j}-\bar{k}\right)+\beta\left(2\bar{j}+\bar{k}\right)+\left(\bar{i}+\gamma\bar{j}+3\bar{k}\right)$, then $5\alpha-9\beta+13\gamma=$

[TS EAMCET 20-07-2022_Shift-2]

1. 4 2. 12
3. 0 4. 15

265. If $\bar{r}=(2-\lambda+\mu)\bar{i}+(1-\mu)\bar{j}+(2-3\lambda+2\mu)\bar{k}$ is the vector equation of a plane, then the equivalent Cartesian equation of the plane is
[TS EAMCET 20-07-2022_Shift-2]
1. $3x+y-z=5$ 2. $3x-y+z=5$
3. $-3x+y+z=5$ 4. $3x-y-z=5$

266. If $\vec{a}=2\bar{i}+\bar{j}-\bar{k}, \bar{b}=\bar{i}-\bar{j}+3\bar{k}$, $\bar{x}=\left(\dfrac{\bar{a}.\bar{b}}{|\bar{b}|^2}\right)\bar{b}, \bar{y}=\left(\dfrac{\bar{a}.\bar{b}}{|\bar{a}|^2}\right)\bar{a}$ and θ is angle between $\bar{a}$ and $\bar{b}$, then $x^2+y^2=$
[TS EAMCET 20-07-2022_Shift-2]
1. $17\cos^2\theta$ 2. $\left(\sqrt{6}+\sqrt{11}\right)\cos^2\theta$
3. $17\cos 2\theta$ 4. $17\sin^2\theta$

267. Let π_1 be a plane passing through the point $\bar{i}+\bar{j}+\bar{k}$ and perpendicular to the vector $-\bar{j}+2\bar{k}$. Let the line L passing through the points $3\bar{i}-2\bar{j}+\bar{k}$ and $-\bar{i}+3\bar{j}+\bar{k}$ be a normal to the plane π_2. If the angle between the planes π_1 and π_2 is θ then cos θ =
[TS EAMCET 20-07-2022_Shift-2]
1. $\sqrt{\dfrac{5}{41}}$ 2. $\dfrac{-14}{\sqrt{205}}$
3. $\dfrac{\pi}{4}$ 4. $\dfrac{\pi}{2}$

268. Three non-coplanar vectors $\bar{a},\bar{b},\bar{c}$ are the coterminous edges of a parallelepiped. If $\bar{a}$ and $\bar{b}$ determine the base of the parallelepiped then its height is
[TS EAMCET 20-07-2022_Shift-2]
1. $\dfrac{\left[\bar{a}\bar{b}\bar{c}\right]}{|\bar{b}\times\bar{c}|}$ 2. $\dfrac{\left[\bar{a}\bar{b}\bar{c}\right]}{|\bar{a}\times\bar{b}|}$
3. $\dfrac{\left[\bar{a}\bar{b}\bar{c}\right]}{|\bar{a}\times\bar{c}|}$ 4. $\dfrac{\left[\bar{a}\bar{b}\bar{c}\right]}{|\bar{b}+\bar{c}|}$

269. a and b are two vectors such that a is not parallel to b. If $\bar{p}=(x+2y+3)\bar{a}+(5x-y+2)\bar{b}$ and $\bar{q}=(2x+3y+5)\bar{a}+(x-5y-2)\bar{b}$ are two vectors such that $\bar{p}=2\bar{q}$, then $x-2y=$
[15th May 2023 Shift 1]
1. 3 2. 2
3. -2 4. -3

270. $3\bar{i}-2\bar{j}-\bar{k}$, $-2\bar{i}-\bar{j}+3\bar{k}$ and $-\bar{i}+3\bar{j}-2\bar{k}$ are the position vectors of the vertices A, B and C of a ΔABC respectively. If H is its orthocentre, then $\overline{HA}+\overline{HB}+\overline{HC}=$
[15th May 2023 Shift 1]
1. $2\overline{SA}$ 2. 0
3. $2\overline{AB}$ 4. $\bar{i}+\bar{j}+\bar{k}$

271. Let π_1 be the plane determined by the vectors $\bar{i}+2\bar{j}$ and $3\bar{j}-2\bar{k}$. Let π_2 be the plane determined by the vectors $\bar{j}+2\bar{k}$ and $3\bar{k}-2\bar{i}$. If θ is the angle between π_1 and π_2 then $\cos\theta=$
[15th May 2023 Shift 1]
1. $\dfrac{7}{26}$ 2. $\dfrac{-14}{29}$
3. $-\dfrac{32}{5\sqrt{2}}$ 4. $\dfrac{23}{38}$

272. If $\bar{a}=2\bar{i}+3\bar{j}, \bar{b}=3\bar{j}+4\bar{k}$ and $\bar{c}=5\bar{i}+4\bar{k}$ are three vectors, then a vector which is perpendicular to $\bar{a}$ and $\bar{b}\times\bar{c}$ is
[15th May 2023 Shift 1]
1. $45\bar{i}-30\bar{j}+15\bar{k}$ 2. $3\bar{i}-2\bar{j}+\bar{k}$
3. $-30\bar{i}+20\bar{j}+4\bar{k}$ 4. $-45\bar{i}+30\bar{j}+4\bar{k}$

273. Let $\overline{OA}=2\bar{i}-3\bar{j}+\bar{k}, \overline{OB}=\bar{i}-4\bar{j}-3\bar{k}$ and $\overline{OC}=-3\bar{j}+\bar{j}+2\bar{k}$ be the position vectors of three points A, B, C respectively. If G is the centroid of triangle ABC, then $BC^2+CA^2+AB^2+9(OG)^2=$
[15th May 2023 Shift 1]
1. 152 2. 156
3. 144 4. 132

274. If $7\bar{i}-4\bar{j}+5\bar{k}$ is the position vector of the vertex A of a tetrahedron ABCD and $-\bar{i}+4\bar{j}-3\bar{k}$ is the position vector of the centroid of the triangle BCD, then the position vector of the centroid of the tetrahedron ABCD is **[15th May 2023 Shift 2]**

1. $-\bar{i}+4\bar{j}-3\bar{k}$
2. $-\frac{1}{2}\bar{i}+4\bar{j}-3\bar{k}$
3. $\bar{i}+2\bar{j}-\bar{k}$
4. $-\bar{i}-2\bar{j}+\bar{k}$

275. Let $\overline{OA}=\bar{i}+2\bar{j}-2\bar{k}$ and $\overline{OB}=-2\bar{i}-3\bar{j}+6\bar{k}$ be the position vectors of two points A and B . If C is a point on the bisector $\angle AOB$ and OC=$\sqrt{42}$, then $\overline{OC}$ = **[15th May 2023 Shift 2]**

1. $4\bar{i}-\bar{j}+5\bar{k}$
2. $\bar{i}+5\bar{j}+4\bar{k}$
3. $5\bar{i}+4\bar{j}+\bar{k}$
4. $\bar{i}-4\bar{j}+5\bar{k}$

276. If $\bar{a}$ and $\bar{b}$ are two vectors such that $|\bar{a}|=|\bar{b}|=\sqrt{14}$ and $\bar{a}.\bar{b}=-7$, then $\frac{|\bar{a}\times\bar{b}|}{|\bar{a}.\bar{b}|}=$ **[15th May 2023 Shift 2]**

1. $7\sqrt{3}$
2. $\sqrt{3}$
3. $49\sqrt{3}$
4. $\frac{\sqrt{3}}{7}$

277. Let $(\bar{a},\bar{b})$ denote the angle between vectors $\bar{a}$ and $\bar{b}$. If $\bar{a}=2\bar{i}+3\bar{j}+6\bar{k},\bar{a}.\bar{b}=4$ and $(\bar{a},\bar{b})=\cos^{-1}\left(\frac{4}{21}\right)$, then $\bar{a}+\bar{b}=$ **[15th May 2023 Shift 2]**

1. $3\bar{i}+\bar{j}+8\bar{k}$
2. $3\bar{i}+5\bar{j}+4\bar{k}$
3. $3\bar{i}+5\bar{j}+8\bar{k}$
4. $\bar{i}+\bar{j}+8\bar{k}$

278. The distance of a point $\bar{a}$ from the plane $\bar{r}.\bar{m}$ =q is given by $\frac{|\bar{a}.\bar{m}-q|}{|\bar{m}|}$. If the distance of the point $\bar{i}+2\bar{j}+3\bar{k}$ from the plane $\bar{r}.(2\bar{i}+6\bar{j}-9\bar{k})=-1$ is p and the distance of the origin from this plane is q, then p-q= **[15th May 2023 Shift 2]**

1. 6
2. 5
3. 2
4. 1

279. If a point C divides the line segment joining the points with the position vectors $2\bar{i}-3\bar{j}+2\bar{k}$ and $3\bar{i}-\bar{j}-2\bar{k}$ in the ratio 2:3, then the distance of C from the point with position vector $2\bar{i}-\bar{j}+\bar{k}$ is **[16th May 2023 Shift 1]**

1. $\frac{7}{5}$
2. $\frac{4}{5}$
3. $\frac{1}{5}$
4. $\frac{3}{5}$

280. If $\bar{a}=(2x+y)\bar{i}+3\bar{j}+9\bar{k}$ and $\bar{b}=2\bar{i}+\bar{j}-(x-y)\bar{k}$ are two collinear vectors, then $x^3+27y^3=$ **[16th May 2023 Shift 1]**

1. 1241
2. 1512
3. 1072
4. 1729

281. Let $\bar{a}=\bar{i}-2\bar{j},\bar{b}=2\bar{j}+3\bar{k},\bar{c}=p\bar{i}+q\bar{j}$ and $\bar{d}=p\bar{j}-q\bar{k}$ be four vectors. If $(\bar{a}\times\bar{b}).\bar{c}=3=(\bar{a}\times\bar{b}).\bar{d}$, then $3p+q=$ **[16th May 2023 Shift 1]**

1. 0
2. 3
3. -2
4. 6

282. Let $\bar{a}=\bar{i}+2\bar{j}+3\bar{k}$ and $\bar{b}=\bar{i}-2\bar{j}-3\bar{k}$ be two vectors. If A_1 is the area of the quadrilateral having $\bar{a},\bar{b}$ as its diagonal and A_2 is the area of the parallelogram having $\bar{a},\bar{b}$ as its two adjacent sides, then $A_1.A_2=$ **[16th May 2023 Shift 1]**

1. 26
2. $\frac{27}{2}$
3. 52
4. 27

283. For some real number λ, if the area of the triangle having $\bar{a} = 3\bar{i} - \bar{j} + \lambda\bar{k}$ and $\bar{b} = \lambda\bar{i} + \bar{j} - 3\bar{k}$ as two of its sides is $\frac{\sqrt{195}}{2}$, then the number of distinct possible values of λ is **[16th May 2023 Shift 1]**

1. 4
2. 3
3. 2
4. 1

284. Let $\bar{a} = 2\bar{i} + \bar{j} - \bar{k}$ and $\bar{b} = \bar{i} + 3\bar{j} - 5\bar{k}$ be two vectors, and $\bar{r}$ be a vector along the vector $\overline{3a} - \overline{2b}$ such that $|\bar{r}| = \sqrt{74}$. If the direction of $\bar{r}$ is opposite to that of $\overline{3a} - \overline{2b}$ then $\bar{r} =$

[16th May 2023 Shift 2]

1. $-7\bar{i} - 4\bar{j} + 3\bar{k}$
2. $4\bar{i} - 7\bar{j} - 3\bar{k}$
3. $-4\bar{i} + 3\bar{j} - 7\bar{k}$
4. $4\bar{i} - 3\bar{j} + 7\bar{k}$

285. If $\bar{i}$ is the position vector of the centroid G of triangle ABC and $2\bar{i} + \bar{j} + \bar{k}$ and $2\bar{i} + 4\bar{j} - 4\bar{k}$ are respectively the position vectors of its vertices A and B, then $AG^2 + BG^2 + CG^2 =$

[16th May 2023 Shift 2]

1. 77
2. 74
3. 86
4. 83

286. If $\bar{a} = -2\bar{i} + 9\bar{j} - 6\bar{k}$ and $\bar{b} = t\bar{i} - 2\bar{j} + 6\bar{k}$ are vectors such that $|\bar{a} + \bar{b}| = 25$, then then sum of the values of t is

[16th May 2023 Shift 2]

1. 14
2. 11
3. 4
4. 77

287. If $\bar{a} = \bar{i} + 3\bar{j} + 13\bar{k}$ and $\bar{b} = 2\bar{i} - 4\bar{j} + 3\bar{k}$ are two vectors, then the component vector of $\bar{a}$ perpendicular to $\bar{b}$ is

[16th May 2023 Shift 2]

1. $\bar{i} - \bar{j} - 2\bar{k}$
2. $3\bar{i} + 3\bar{j} + 2\bar{k}$
3. $-\bar{i} + 7\bar{j} + 10\bar{k}$
4. $4\bar{i} + 5\bar{j} + 4\bar{k}$

288. Let $\bar{a} = \overline{2i} - 3\bar{j} - 5\bar{k}$ and $\bar{b} = \overline{3i} + \overline{2j} - 5\bar{k}$ be two vectors and $\bar{r}$ be a vector in the plane of $\bar{a}$ and $\bar{b}$. If $\bar{r}$ is orthogonal to the vector $\bar{c} = 5\bar{i} - 2\bar{j} + 3\bar{k}$ and the magnitude of $\bar{r}$ is $\sqrt{94}$, then $|\bar{r}.\bar{b}| =$

[16th May 2023 Shift 2]

1. 36
2. 38
3. 42
4. 46

289. Let $\bar{a}, \bar{b}$ and $\bar{c}$ be any three non coplanar vectors. If m, n are scalars such that $\bar{a} + \bar{b} = m\bar{d} - \bar{c}$ and $\bar{b} + \bar{c} = n\bar{a} - \bar{d}$, then $3\bar{a} + 2\bar{b} + 2\bar{c} + \bar{d} =$ **[17th May 2023 Shift 1]**

1. $\bar{a} - \bar{d}$
2. $\bar{a} + \bar{d}$
3. $\bar{0}$
4. $\bar{b} + \bar{c} + 2\bar{d}$

290. If $2\bar{i} + \bar{j} - \bar{k}, \bar{i} - 3\bar{j} + 5\bar{k}$ and $-3\bar{i} + 4\bar{j} + 4\bar{k}$ are the position vectors of three of three points A,B and C respectively, then

[17th May 2023 Shift 1]

1. ABC is a right angled triangle
2. ABC is an isosceles triangle
3. A,B,C are collinear points
4. ABC is a scalene triangle

291. Let L be the line passing through the points $\bar{i} - 9\bar{k}$ and $7\bar{j} + \bar{k}$ and π be the plane passing through the point $6\bar{i} + \bar{j}$ and perpendicular to the vector $\bar{i} + \bar{j} + \bar{k}$. If θ is the angle between L and π, then $\sin\theta =$

[17th May 2023 Shift 1]

1. $\frac{8\sqrt{2}}{15}$
2. $\frac{3\sqrt{3}}{8}$
3. $\frac{7}{13}$
4. $\frac{24}{25}$

292. If $\overline{OA} = 2\overline{i} - \overline{j} + \overline{k}, \overline{OB} = 3\overline{i} - \overline{k}$ and $\overline{OC} = 2\overline{j} + 3\overline{k}$ are the position vectors of the points A, B and C, then a unit vector perpendicular to the plane containing A,B and C is

[17th May 2023 Shift 1]

1. $\dfrac{8\overline{i} - 4\overline{j} + 2\overline{k}}{2\sqrt{21}}$
2. $\dfrac{6\overline{i} + 2\overline{j} + 3\overline{k}}{7}$
3. $\dfrac{9\overline{i} + 2\overline{j} + 6\overline{k}}{11}$
4. $\dfrac{8\overline{i} + 2\overline{j} + 5\overline{k}}{\sqrt{93}}$

293. Let $\overline{b} = 3\overline{i} - 2\overline{j} + \overline{k}$ and $\overline{c} = \overline{i} - \overline{j} - \overline{k}$ be two vectors. If $\overline{a}$ is a vector such that $\overline{a} + \overline{b} + \overline{c} = \overline{0}$, then $\left|\overline{a}\times\overline{b} + \overline{b}\times\overline{c} + \overline{c}\times\overline{a}\right| =$

[17th May 2023 Shift 1]

1. 15
2. $\sqrt{261}$
3. $\sqrt{234}$
4. 33

294. If the position vectors of the points A and B are $2\overline{i} + 3\overline{j} - \overline{k}$ and $\overline{i} - \overline{j} + 2\overline{k}$ respectively, then the unit vector along $\overline{BA}$ and in the direction of $\overline{AB}$ is

[17th May 2023 Shift 2]

1. $\dfrac{1}{\sqrt{14}}(3\overline{i} + 2\overline{j} + \overline{k})$
2. $\dfrac{1}{\sqrt{26}}(-\overline{i} - 4\overline{j} + 3\overline{k})$
3. $\dfrac{1}{\sqrt{26}}(-3\overline{i} - 4\overline{j} + k)$
4. $\dfrac{1}{\sqrt{22}}(3\overline{i} - 4\overline{j} + 3\overline{k})$

295. Let 'O' be the origin. A and B be two points with position vectors $-3\overline{i} - 3\overline{j} + 4\overline{k}$ and $4\overline{i} - 4\overline{j} - 3\overline{k}$ respectively. Let P be a point such that the line drawn through P parallel to $\overline{OB}$ meets OA in L and another line through P parallel to $\overline{OA}$ meets OB in M. If L divides the OA in the ratio 2:3 and M divides OB in the ratio 3:2, then the distance from O to P is

[17th May 2023 Shift 2]

1. $\dfrac{19}{5}$
2. $\dfrac{\sqrt{389}}{5}$
3. $\dfrac{\sqrt{341}}{5}$
4. $\dfrac{21}{5}$

296. For a positive real number λ, if the vector $\overline{a} = \lambda\overline{i} - 5\overline{j} + 6\overline{k}$ satisfies the equation $[\overline{i}\times(\overline{a}\times\overline{i}) + \overline{j}\times(\overline{a}\times\overline{j}) + \overline{k}\times(\overline{a}\times\overline{k})]^2 = 440$, then $\lambda =$

[17th May 2023 Shift 2]

1. 3
2. 4
3. 7
4. 11

297. If $\overline{p} = 4\overline{i} - \overline{j} + \overline{k}$ is a point and $\overline{q} = 9\overline{i} - 2\overline{j} + 6\overline{k}$ is a vector, then the perpendicular distance of origin from the plane passing through $\overline{P}$ and perpendicular to $\overline{q}$ is

[17th May 2023 Shift 2]

1. 4
2. $3\sqrt{2}$
3. 9
4. 11

298. Let $\overline{a} = 3\overline{i} + \overline{j} - 2\overline{k}, \overline{b} = -5\overline{i} + 7\overline{j}$ and $\overline{c} = 3\overline{i} + y\overline{j}$ be three vectors such that $\left|\overline{a} - \overline{b} + \overline{c}\right| = \sqrt{141}$. If y_1 and y_2 are the values of y satisfying the given condition, then $\left|y_1 - y_2\right| =$

[17th May 2023 Shift 2]

1. 12
2. 11
3. 9
4. 8

299. If $\overline{a} = \overline{i} + 2\overline{j} - 3\overline{k}$ *and* $\overline{b} = \overline{2i} - 3\overline{j} - 5\overline{k}$, *then*

[18th May2023 shift -1]

1. $\left|\overline{a} - \overline{b}\right| > \left|\overline{a}\right| + \left|\overline{b}\right|$
2. $\left|\overline{a} - \overline{b}\right| > \left|\overline{b}\right| - \left|\overline{a}\right|$
3. $\left|\overline{a} + \overline{b}\right| < \left|\overline{a} - \overline{b}\right|$
4. $\left\|\overline{a}\right| - \left|\overline{b}\right\| > \left|\overline{a} - \overline{b}\right|$

300. Let $\overline{i} - \overline{j} + 2\overline{k}$ *and* $\overline{i} + 2\overline{j} - 2\overline{k}$ be the position vectors of points A and B respectively. If C is a point on the line joining A and B such that BC=10, then the position vector of C can be

[18th May2023 shift -1]

1. $\overline{i} + 8\overline{j} - 10\overline{k}$
2. $\overline{i} + 4\overline{j} - 6\overline{k}$
3. $\overline{i} - 8\overline{j} + 10\overline{k}$
4. $\overline{i} - 4\overline{j} - 6\overline{k}$

301. The volume of the tetrahedron with $\bar{i}-\lambda\bar{j}+\bar{k}$, $\lambda\bar{i}-\bar{j}-\bar{k}$ and $\bar{i}+\bar{j}+\lambda\bar{k}$ as coterminous edges is 2. If λ is an integer, then $\left|\lambda\bar{i}-3\lambda\bar{j}+3\bar{k}\right|=$

[EAPCET 13-05-23 SHIFT-2]

1. 3
2. $\sqrt{19}$
3. 7
4. 13

302. If $\bar{a}=2\bar{i}-\bar{j}+3\bar{k}$, $\bar{b}=-3\bar{i}+5\bar{j}-4\bar{k}$ and $\bar{c}=6\bar{i}-4\bar{j}+5\bar{k}$, then $\left(\bar{a}\times\bar{b}\right).\left(\bar{b}\times\bar{c}\right)=$

[18th May2023 shift -1]

1. -216
2. 243
3. 81
4. -27

303. Let π_1 be the plane determined by the vectors $\bar{i}+\bar{j}$ and $\bar{j}+\bar{k}$, π_2 be the plane determined by the vectors $\bar{i}-\bar{j}$ and $\bar{i}+\bar{j}-\bar{k}$. Let $\bar{a}$ be a vector parallel to the line of intersection of π_1 and π_2. If $\left|\bar{a}\right|=\sqrt{14}$, then $\left|\bar{a}.(\bar{i}+\bar{j}+\bar{k})\right|=$

[18th May2023 shift -1]

1. 1
2. 2
3. 5
4. 7

304. If $\bar{a}=t\bar{b}$ where $t<0$ is a scalar, then

[18th May 2023 Shift 2]

1. $\bar{a},\bar{b}$ are like vectors and $\left|\bar{a}\right|>\left|\bar{b}\right|$
2. $\bar{a},\bar{b}$ are unlike vectors and $\left|\bar{a}\right|>\left|\bar{b}\right|$
3. $\bar{a},\bar{b}$ are like vectors and $\left|\bar{a}\right|<\left|\bar{b}\right|$
4. $\bar{a},\bar{b}$ are unlike vectors and either $\left|\bar{a}\right|\geq\left|\bar{b}\right|$ or $\left|\bar{a}\right|<\left|\bar{b}\right|$

305. Let $\bar{a},\bar{b},\bar{c}$ be co-initial vectors and $\bar{a}=2\bar{i}-\bar{j}+5\bar{k}$ and $\bar{b}=3\bar{i}+7\bar{j}-\bar{k}$, Let $(\bar{a},\bar{b})=\theta$ be an acute angle and $\bar{c}$ be the vector along the bisector of the angle θ. If $\lambda,x,y,\in R$, then $\bar{c}=$ **[18th May 2023 Shift 2]**

1. $\lambda(5\bar{i}+6\bar{j}+4\bar{k})$
2. $\lambda(-\bar{i}-8\bar{j}+6\bar{k})$
3. $(2x+3y)\bar{i}+(7y-x)\bar{j}+(5x-y)\bar{k}$
4. $(2x+3y)\bar{i}+(x+7y)\bar{j}+(5x+y)\bar{k}$

306. If $\bar{a}=2\bar{i}-5\bar{j}+8\bar{k}$, $\bar{b}=7\bar{i}-5\bar{j}++3\bar{k}$ are two vectors and $(2\bar{a}-3\bar{b})\times(4\bar{a}+\bar{b})=x\bar{i}+y\bar{j}+z\bar{k}$ then $x+y+z=$ **[18th May 2023 Shift 2]**

1. -1000
2. 1400
3. 1000
4. -1400

307. If $\bar{a},\bar{b}$ are two unit vectors with $\left(\bar{a},\bar{b}\right)=\theta$ and $\left|\bar{a}-\bar{b}\right|=1$, then $2\left|\bar{a}+\bar{b}\right|\cos\frac{\theta}{2}=$

[18th May 2023 Shift 2]

1. 3
2. 1
3. $\sqrt{3}$
4. 9

308. If the vectors $\bar{a}=2\bar{i}+3\bar{j}-\bar{k}$, $\bar{b}=4\bar{i}-\bar{j}+3\bar{k}$ and $\bar{c}=p\bar{i}+\bar{j}-\bar{k}$ are coplanar, then $\left|\bar{a}\times\bar{c}\right|$

[18th May 2023 Shift 2]

1. $\sqrt{14}$
2. $\frac{3\sqrt{10}}{2}$
3. $\sqrt{26}$
4. $\frac{\sqrt{90}}{4}$

309. Let ABCD be a parallelogram and $2\bar{i}+\bar{j}$, $4\bar{i}+5\bar{j}+4\bar{k}$ and $-\bar{i}-4\bar{j}-3\bar{k}$ be the position vectors of the vertices A,B,D respectively . then the position vector of one of the point of trisection of the diagonal AC is

[19th May 2023 Shift 1]

1. $\frac{1}{3}\left(5\bar{i}+2\bar{j}-\bar{k}\right)$
2. $\frac{1}{3}\left(5\bar{i}+2\bar{j}+\bar{k}\right)$
3. $\frac{1}{3}\left(5\bar{i}+4\bar{j}+\bar{k}\right)$
4. $\frac{1}{3}\left(3\bar{i}+2\bar{j}+\bar{k}\right)$

310. Let $\bar{a},\bar{b},\bar{c}$ be three non–coplanar vectors. Then the point of intersection of the line joining the points $\bar{a}+\bar{b}+\bar{c}$, $\bar{a}-\bar{b}+3\bar{c}$ and the line joining the points $2\bar{a}-\bar{b}+\bar{c}$, $\bar{a}-2\bar{b}+4\bar{c}$ is

[19th May 2023 Shift 1]

1. $2\bar{a}+4\bar{c}$ 2. $3\bar{a}-3\bar{b}+5\bar{c}$
3. $\bar{a}-2\bar{b}+4\bar{c}$ 4. $\bar{a}-\bar{b}+3\bar{c}$

311. The vector equation of any plane passing through the line of intersection of the planes $\bar{r}.\bar{m}_1=q_1$ and $\bar{r}.\bar{m}_2=q_2$ is given by $\bar{r}.(\bar{m}_1+\lambda\bar{m}_2)=q_1+\lambda q_2$ *for* $\lambda\in R$ .the vector equation of a plane passing through the point $2\bar{i}-3\bar{j}+\bar{k}$ and the line of intersection of the planes $\bar{r}.\left(\bar{i}-2\bar{j}+3\bar{k}\right)=5$ and $\bar{r}.\left(3\bar{i}+\bar{j}-2\bar{k}\right)=7$ is

[19th May 2023 Shift 1]

1. $\bar{r}.\left(-2\bar{i}-3\bar{j}+5\bar{k}\right)=-2$ 2. $\bar{r}.\left(7\bar{i}-\bar{k}\right)=19$
3. $\bar{r}.\left(4\bar{i}-\bar{j}+\bar{k}\right)=12$ 4. $\bar{r}.\left(8\bar{i}+5\bar{j}-9\bar{k}\right)=16$

312. Let $\bar{a},\bar{b},\bar{c}$ be three vectors such that $\bar{a}$ is perpendicular to $\bar{b}$ *and* $\bar{b}$ is perpendicular to $\bar{c}$ If $|\bar{a}|=2,|\bar{b}|=3,|\bar{c}|=5$ *and* $|\bar{a}+\bar{b}+\bar{c}|=4\sqrt{3}$ then the angle between $\bar{a}$ *and* $\bar{c}$ is

[19th May 2023 Shift 1]

1. $\cos^{-1}\left(\frac{2}{5}\right)$ 2. $\frac{\pi}{3}$
3. $\cos^{-1}\left(\frac{2}{3}\right)$ 4. $\frac{\pi}{6}$

313. *let* $\bar{a}=\bar{i}+\bar{j}+\bar{k},\ \bar{b}=\bar{i}+\bar{j}-2\bar{k},\bar{c}=\bar{i}-2\bar{j}+3\bar{k}$, and $\bar{d}=-4\bar{i}+5\bar{j}-3\bar{k}$ be four vectors. if $\bar{d}=x\left(\bar{b}\times\bar{c}\right)-\frac{7}{9}\left(\bar{c}\times\bar{a}\right)+z\left(\bar{a}\times\bar{b}\right)$, then x=

[19th May 2023 Shift 1]

1. $\frac{-7}{9}$ 2. $\frac{2}{9}$
3. $\frac{23}{9}$ 4. 2

314. If the position vectors of P and Q are $\bar{i}+2\bar{j}-7\bar{k}$ *and* $5\bar{i}-3\bar{j}+4\bar{k}$ respectively, then the cosine of the angle between $\overline{PQ}$ and Z-axis is

[12TH MAY 2023 SHIFT-1]

1. $\frac{4}{\sqrt{162}}$ 2. $\frac{11}{\sqrt{162}}$
3. $\frac{5}{\sqrt{162}}$ 4. $\frac{-5}{\sqrt{162}}$

315. $\bar{a},\bar{b},\bar{c}$, are three-unit vectors such that $\left|\bar{a}+\bar{b}+\bar{c}\right|=1$ and $\bar{a}$ is perpendicular to $\bar{b}$. If $\bar{c}$ makes angles α,β with $\bar{a},\ \bar{b}$ respectively, then $\cos\alpha+\cos\beta=$

[12TH MAY 2023 SHIFT-1]

1. 1 2. -1
3. 2 4. -2

316. If $\bar{a}$ is a vector such that $\bar{a}\times\bar{i}=\bar{j}+\bar{k}$ *and* $\bar{a}.\bar{i}=1$, then equation of the line passing through the point $\bar{i}+\bar{j}+\bar{k}$ and parallel to $\bar{a}$ is **[12TH MAY 2023 SHIFT-1]**

1. $\bar{r}=(t+1)\bar{i}+(1-t)\bar{j}+(t+1)\bar{k}$
2. $\bar{r}=(t+1)\bar{i}-(2t-1)\bar{j}+t\bar{k}$
3. $\bar{r}=\bar{i}+t\bar{j}-t\bar{k}$
4. $\bar{r}=5t\bar{i}+7t\bar{j}+\bar{k}$

317. The position vectors of the points A, B are $\bar{a},\ \bar{b}$ respectively. If the position vector of the point C is $\frac{\bar{a}}{2}+\frac{\bar{b}}{3}$, then

[12TH MAY 2023 SHIFT-1]

1. C lies inside ΔOAB
2. C lies outside ΔOAB but inside $\angle AOB$
3. C lies outside ΔOAB but inside $\angle OAB$
4. C lies outside ΔOAB but inside $\angle OBA$

318. If $|\bar{a}|=1,|\bar{b}|=2,|\bar{a}-\bar{b}|^2+|\bar{a}+2\bar{b}|^2=20$ *then* $\left(\bar{a},\bar{b}\right)=$

[12TH MAY 2023 SHIFT-1]

1. $\frac{\pi}{3}$ 2. $\frac{\pi}{4}$
3. $\frac{\pi}{6}$ 4. $\frac{2\pi}{3}$

319. If two vectors $\bar{a}$ and $\bar{b}$ which are perpendicular to each other are such that $|\bar{a}|=8$ and $|\bar{b}|=3$, then $|\bar{a}-2\bar{b}|=$

[12TH MAY 2023 SHIFT -2]

1. 10 2. 2
3. 6 4. 12

320. Let $\bar{a}$ and $\bar{b}$ be non-collinear vectors. If the vectors $(\lambda-1)\bar{a}+2\bar{b}$ and $3\bar{a}+\lambda\bar{b}$ are collinear, then the set of all possible values of λ is **[12TH MAY 2023 SHIFT -2]**

1. $\{2,3\}$
2. $\{-2,3\}$
3. $\{-2,-3\}$
4. $\{2,-3\}$

321. If M is the foot of the perpendicular drawn from P(1,2,-1) to the plane passing through the point A(3,-2,1) and perpendicular to the vector $4\bar{i}+7\bar{j}-4\bar{k}$, then the length of PM is **[12TH MAY 2023 SHIFT -2]**

1. $\frac{16}{3}$
2. $\frac{18}{5}$
3. $\frac{22}{9}$
4. $\frac{28}{9}$

322. Vectors $\bar{p}=a\bar{i}+b\bar{j}+c\bar{k}, \bar{q}=d\bar{i}+3\bar{j}+4\bar{k}$ and $\bar{r}=3\bar{i}+\bar{j}-2\bar{k}$ forming a triangle ABC are such that $\bar{p}=\bar{q}+\bar{r}$. If the area of ΔABC is $5\sqrt{6}$ sq. units then the sum of the absolute values of a,b,c is **[12TH MAY 2023 SHIFT -2]**

1. 14
2. 13
3. 12
4. 10

323. $\bar{b}$ and $\bar{c}$ are non collinear vectors and $(\bar{c}.\bar{c})\bar{a}=\bar{c}$. If $(\bar{a}\bar{c})\bar{b}-(\bar{a}\bar{b})\bar{c}+(\bar{a}\bar{b})\bar{b}=(4-2\beta-\sin\alpha)\bar{b}+(\beta^2-1)\bar{c}$ the $\mathrm{Sin}(\alpha+\beta)=$ **[12TH MAY 2023 SHIFT -2]**

1. 0
2. 1
3. sin 1
4. cos 1

324. Let $\overline{OA}=\bar{i}-3\bar{j}+\bar{k}, \overline{OB}=\bar{i}+3\bar{j}-2\bar{k}$ and $\overline{OC}=4\bar{i}+3\bar{j}+5\bar{k}$ be the position vectors of three points A, B and C. Let P be the point which divides AB in the ratio 2:1. If l, m, n are the direction cosines of the vector $\overline{PC}$ then $l+3m+2n=$ **[13TH MAY 2023 SHIFT-1]**

1. 23/7
2. 5
3. 18/7
4. 3

325. The point of intersection of the line passing through the points $\bar{i}-\bar{j}, \bar{j}-\bar{k}$ and the plane passing through the points $2\bar{i}+\bar{j}, 2\bar{j}-\bar{k}, \bar{i}+2\bar{k}$ is **[13TH MAY 2023 SHIFT-1]**

1. $\frac{1}{6}(-5\bar{i}+16\bar{j}-11\bar{k})$
2. $\frac{1}{23}(22\bar{i}-44\bar{j}+25\bar{k})$
3. $\frac{1}{5}(18\bar{i}+16\bar{j}-21\bar{k})$
4. $\frac{1}{11}(5\bar{i}-41\bar{j}+21\bar{k})$

326. If the vectors $\overline{BC}=2\bar{i}+\bar{j}+\bar{k}$ *and* $\overline{CD}=\bar{i}+2\bar{j}-2\bar{k}$ represent two adjacent sides of a parallelogram ABCD and θ is the angle between its diagonals $\overline{AC}$ *and* $\overline{BD}$ then $\tan\theta=$ **[13TH MAY 2023 SHIFT-1]**

1. $\frac{-3}{\sqrt{209}}$
2. $\frac{-10\sqrt{2}}{3}$
3. $\frac{10\sqrt{2}}{\sqrt{209}}$
4. $-\frac{3}{10\sqrt{2}}$

327. A plane π passing through the point $3\bar{i}-4\bar{j}+5\bar{k}$ is parallel to the plane which passes through the point $\bar{i}+\bar{j}-\bar{k}$ and perpendicular to the vector $\bar{i}+2\bar{j}-3\bar{k}$. Then the Cartesian equation of π is **[13TH MAY 2023 SHIFT-1]**

1. $3x-4y+5z+20=0$
2. $2x-y+3z-25=0$
3. $x+2y-3z+20=0$
4. $4x+5y-6z+38=0$

328. Let $\bar{a}=\lambda\bar{i}+3\bar{j}+4\bar{k}, \bar{b}=3\bar{i}-\bar{j}+\lambda\bar{k}$ and $\bar{c}=\lambda\bar{i}+\bar{j}-3\bar{k}$ be three vectors for some integer λ. If the volume of the parallelepiped with $\bar{a},\bar{b},\bar{c}$ as coterminus edges is 61 cubic units, then the number of possible values of λ is **[13TH MAY 2023 SHIFT-1]**

1. 4
2. 3
3. 2
4. 1

329. If $|\bar{a}|=4, |\bar{b}|=5, |\bar{a}-\bar{b}|=3$ and θ is the angle between the vectors $\bar{a}$ *and* $\bar{b}$, then $\cot^2\theta=$ **[EAPCET 14-05-23 SHIFT-1]**

1. $\frac{9}{16}$ 2. $\frac{4}{3}$

3. $\frac{3}{4}$ 4. $\frac{16}{9}$

330.If A (1,2,3),B(3,7,-2),C(6,7,7)and D(-1,0,-1) are points in a plane, then the vector equation of the line passing through the centroids of ΔABD and ΔACD is

[EAPCET 14-05-23 SHIFT-1]

1. $\bar{r}=\left(2\bar{i}-\bar{j}\right)+t\left(\bar{j}+4\bar{k}\right)$
2. $\bar{r}=\left(1+t\right)\bar{i}+3\bar{j}+3t\bar{k}$
3. $\bar{r}=\left(2\bar{i}+3\bar{j}+3\bar{k}\right)+t\left(\bar{i}+3\bar{j}\right)$
4. $\bar{r}=\left(\bar{i}+\bar{j}+\bar{k}\right)+t\left(2\bar{i}-\bar{j}\right)$

331.If $\bar{a}+\bar{b}+\bar{c}=\bar{0},|\bar{a}|=3,|\bar{b}|=5,|\bar{c}|=7$, then the angle between $\bar{a}$ and $\bar{b}$

[EAPCET 14-05-23 SHIFT-1]

1. $\frac{\pi}{6}$ 2. $\frac{\pi}{4}$

3. $\frac{\pi}{3}$ 4. $\frac{\pi}{2}$

332.If $2\bar{i}-\bar{j}+3\bar{k},-12\bar{i}-\bar{j}-3\bar{k},-\bar{i}+2\bar{j}-4\bar{k}$ and $\lambda\bar{i}+2\bar{j}-\bar{k}$ are the position vectors of four coplanar points, then $\lambda=$

[EAPCET 14-05-23 SHIFT-1]

1. 9 2. -2

3. 8 4. 6

333.Let $\bar{a}=\bar{i}+2\bar{j}-2\bar{k}$ and $\bar{b}=2\bar{i}-\bar{j}-2\bar{k}$ be two vectors. If the orthogonal projection vector of $\bar{a}$ on $\bar{b}$ is $\bar{x}$ and orthogonal projection vector of $\bar{b}$ on $\bar{a}$ is $\bar{y}$ then $|\bar{x}-\bar{y}|=$

[EAPCET 14-05-23 SHIFT-1]

1. $\frac{4}{9}\sqrt{10}$ 2. $\frac{4}{9}\sqrt{26}$

3. $\frac{8}{9}\sqrt{10}$ 4. $\frac{8}{9}\sqrt{26}$

334.If the points with position vectors $\bar{i}-\bar{j}+\bar{k},2\bar{i}-\bar{k},\bar{j}+2\bar{k}$ and $\bar{i}+\bar{j}+\lambda\bar{k}$ are coplanar, then the magnitude of the vector $6\lambda\bar{i}-3\bar{j}+6\bar{k}$ is

[EAPCET 13-05-23 SHIFT-2]

1. $\sqrt{54}$ 2. $\sqrt{46}$

3. 7 4. 9

335.Let $\bar{a},\bar{b},\bar{c}$ be three non- coplanar vectors and L be the line passing through the points $\bar{a}-\bar{b}+\bar{c}$ and $\bar{b}-\bar{c}$. If π is a plane passing through the points $2\bar{a}-\bar{b},2\bar{b}-\bar{c}$ and $2\bar{c}-\bar{a}$, then the point of intersection of L and π is

[EAPCET 13-05-23 SHIFT-2]

1. $\bar{a}-\bar{b}$ 2. $\bar{b}+\bar{c}$

3. $\bar{c}-\bar{a}$ 4. $\bar{a}-\bar{b}+\bar{c}$

336.Let $\bar{a}=\bar{i}-2\bar{j}+2\bar{k}$, $\bar{b}=6\bar{i}+2\bar{j}-3\bar{k}$ and $\bar{c}=3\bar{i}-4\bar{j}-12\bar{k}$ be three vectors. If $\bar{p}$ is the projection of $\bar{b}$ on $\bar{a}$ and $\bar{q}$ is the projection of $\bar{c}$ on $\bar{a}$, then 13 $\bar{p}=$

[EAPCET 13-05-23 SHIFT-2]

1. $4\bar{q}$ 2. $5\bar{q}$

3. $6\bar{q}$ 4. $7\bar{q}$

337.Let $\bar{a}=\bar{i}+2\bar{j}+3\bar{k},\bar{b}=3\bar{i}-\bar{j}+5\bar{k}$ and $\bar{c}=\bar{i}-4\bar{j}-2\bar{k}$ be three vectors . Let $\bar{r}$ be a vector perpendicular to both $\bar{b},\bar{c}$ and $\bar{r}.\bar{a}=11$. Then the vector among the following that is perpendicular to $\bar{r}$ is

[EAPCET 13-05-23 SHIFT-2]

1. $\bar{i}+\bar{j}+\bar{k}$ 2. $\bar{i}-\bar{j}+\bar{k}$

3. $\bar{i}+\bar{j}-\bar{k}$ 4. $\bar{i}-\bar{j}-\bar{k}$

KEY

1)	1	2)	4	3)	4	4)	4	5)	1
6)	3	7)	3	8)	1	9)	3	10)	1
11)	3	12)	1	13)	2	14)	3	15)	2
16)	3	17)	2	18)	2	19)	1	20)	1
21)	4	22)	1	23)	4	24)	4	25)	3
26)	4	27)	2	28)	3	29)	2	30)	2
31)	2	32)	3	33)	3	34)	1	35)	1

36) 2	37) 2	38) 2	39) 1	40) 3
41) 3	42) 3	43) 2	44) 3	45) 2
46) 2	47) 3	48) 3	49) 3	50) 2
51) 2	52) 2	53) 2	54) 1	55) 2
56) 4	57) 2	58) 3	59) 3	60) 1
61) 3	62) 4	63) 1	64) 4	65) 3
66) 2	67) 3	68) 4	69) 2	70) 3
71) 4	72) 2	73) 3	74) 4	75) 2
76) 2	77) 3	78) 4	79) 2	80) 4
81) 3	82) 1	83) 1	84) 3	85) 3
86) 3	87) 1	88) 2	89) 1	90) 2
91) 3	92) 4	93) 3	94) 2	95) 4
96) 2	97) 3	98) 2	99) 1	100) 3
101) 2	102) 1	103) 4	104) 1	105) 1
106) 3	107) 2	108) 3	109) 2	110) 1
111) 2	112) 1	113) 4	114) 2	115) 1
116) 2	117) 4	118) 4	119) 2	120) 1
121) 2	122) 3	123) 1	124) 3	125) 1
126) 2	127) 4	128) 4	129) 4	130) 4
131) 3	132) 2	133) 4	134) 2	135) 1
136) 1	137) 2	138) 2	139) 3	140) 4
141) 3	142) 4	143) 2	144) 4	145) 4
146) 4	147) 3	148) 2	149) 2	150) 3
151) 2	152) 3	153) 1	154) 2	155) 4
156) 4	157) 2	158) 4	159) 2	160) 2
161) 3	162) 3	163) 4	164) 4	165) 2
166) 4	167) 4	168) 3	169) 2	170) 1
171) 3	172) 1	173) 1	174) 3	175) 2
176) 4	177) 4	178) 4	179) 1	180) 4
181) 4	182) 2	183) 1	184) 1	185) 1
186) 2	187) 4	188) 2	189) 1	190) 3
191) 3	192) 1	193) 4	194) 3	195) 3
196) 4	197) 2	198) 2	199) 3	200) 3
201) 4	202) 3	203) 4	204) 3	205) 3
206) 1	207) 4	208) 2	209) 4	210) 3
211) 4	212) 2	213) 2	214) 2	215) 1
216) 1	217) 3	218) 2	219) 2	220) 1
221) 1	222) 3	223) 4	224) 4	225) 4
226) 3	227) 1	228) 2	229) 4	230) 1

231) 4	232) 3	233) 1	234) 4	235) 2
236) 3	237) 4	238) 2	239) 2	240) 4
241) 3	242)	243) 3	244) 4	245) 3
246) 2	247) 2	248) 4	249) 4	250) 4
251) 3	252) 1	253) 3	254) 3	255) 1
256) 4	257) 3	258) 1	259) 2	260) 2
261) 4	262) 2	263) 4	264) 2	265) 1
266) 1	267) 1	268) 2	269) 4	270) 2
271) 2	272) 4	273) 1	274) 3	275) 2
276) 2	277) 4	278) 4	279) 1	280) 4
281) 1	282) 1	283) 3	284) 3	285) 2
286) 3	287) 3	288) 4	289) 1	290) 4
291) 1	292) 4	293) 3	294) 2	295) 1
296) 3	297) 1	298) 4	299) 2	300) 1
301) 3	302) 1	303) 2	304) 4	305) 3
306) 2	307) 1	308) 2	309) 2	310) 3
311) 3	312) 2	313) 2	314) 2	315) 2
316) 1	317) 1	318) 4	319) 1	320) 2
321) 4	322) 1	323) 4	324) 4	325) 1
326) 2	327) 3	328) 4	329) 4	330) 2
331) 3	332) 4	333) 1	334) 3	335) 4
336) 1	337) 2			

SOLUTIONS

1. Conceptual

2. The vector equation of the plane through three non collinear points $\bar{a},\bar{b},\bar{c}$ is

$$(\bar{r})\frac{\{(\bar{b}\times\bar{c})+(\bar{c}\times\bar{a})+(\bar{a}\times\bar{b})\}}{|(\bar{b}\times\bar{c})+(\bar{c}\times\bar{a})+(\bar{a}\times\bar{b})|}$$

$$=\frac{[\bar{a}\ \bar{b}\ \bar{c}]}{|(\bar{b}\times\bar{c})+(\bar{c}\times\bar{a})+(\bar{a}\times\bar{b})|}$$

Which is in the standard form of $\bar{r}.\hat{n}=p$ and thus perpendicular distance from origin to the plane containing the three points $\bar{a},\bar{b},\bar{c}$ is

$$\frac{|[\bar{a}\ \bar{b}\ \bar{c}]|}{|(\bar{b}\times\bar{c})+(\bar{c}\times\bar{a})+(\bar{a}\times\bar{b})|}$$

3. $a\bar{i}+\bar{j}+\bar{k};\bar{i}+b\bar{j}+\bar{k};\bar{i}+\bar{j}+c\bar{k}$ are coplanar

$$\Rightarrow \begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 0$$

$$\Rightarrow abc = a+b+c-2$$

$$\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=\frac{(1-b)(1-c)+(1-a)(1-c)+(1-a)(1-b)}{(1-a)(1-b)(1-c)}$$

$$=\frac{3-2(a+b+c)+bc+ca+ab}{1-(a+b+c)+ab+bc+ca-abc}$$

$$=\frac{3-2(a+b+c)+bc+ca+ab}{1-(a+b+c)+ab+bc+ca-(a+b+c-2)}$$

$=1$

4. concept

5. Given

$$\overline{PO}+\overline{OQ}=\overline{QO}+\overline{OR}$$

$$\Rightarrow -\overline{OP}+\overline{OQ}=-\overline{OQ}+\overline{OR}$$

$$\Rightarrow \overline{OQ}+\overline{OQ}=\overline{OP}+\overline{OR}$$

$$\Rightarrow 2\overline{OQ}=\overline{OP}+\overline{OR}$$

$$\overline{OQ}=\frac{\overline{OP}+\overline{OR}}{2}$$

Therefore Q is midpoint of $\overline{PR}$

6. Given

$$\vec{r}\times\vec{b}=\vec{c}\times\vec{b}$$

$$\Rightarrow(\vec{r}\times\vec{b})\times\bar{a}=(\vec{c}\times\vec{b})\times\bar{a}$$

$$\Rightarrow(\bar{a}.\bar{r})\bar{b}-(\bar{a}.\bar{b})\bar{r}=(\bar{a}.\bar{c})\bar{b}-(\bar{a}.\bar{b})\bar{c}$$

$$\Rightarrow 0.\bar{b}-(\bar{a}.\bar{b})\bar{r}=(\bar{a}.\bar{c})\bar{b}-(\bar{a}.\bar{b})\bar{c}$$

$$\Rightarrow \bar{r}=-\frac{(\bar{a}.\bar{c})\bar{b}}{\bar{a}.\bar{b}}+\bar{c}$$

$$\Rightarrow \bar{r}=\bar{c}-\left(\frac{\bar{c}.\bar{a}}{\bar{b}.\bar{a}}\right)\bar{b}$$

7. Conceptual

8. $\overline{AB}.\overline{PC}=0$

$$(\bar{b}-\bar{a}).\frac{\bar{b}+\bar{a}}{2}-\bar{r}=0$$

$$(\bar{b}-\bar{a}).(\bar{b}+\bar{a}-2\bar{r})=0$$

$$(2\vec{r}-\vec{a}-\vec{b}).(\vec{a}-\vec{b})=0$$

9. $\sin(\alpha)=\dfrac{|\bar{p}\times\bar{q}|}{|\bar{p}||\bar{q}|}$

$$=\frac{|3\bar{i}-5\bar{j}-11\bar{k}|}{\sqrt{26}\sqrt{6}}=\sqrt{\frac{155}{156}}$$

10. Given $\overline{U}+\overline{V}+\overline{W}=\overline{O}$

$$\overline{U}+\overline{V}=-\overline{W}$$

S.O.B.S

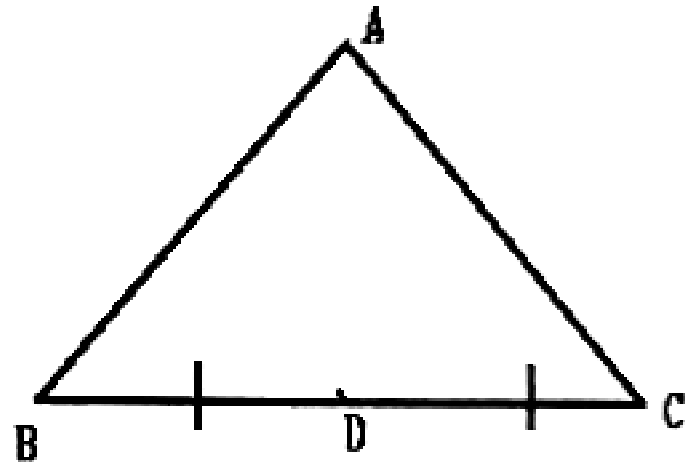
$$U^2+V^2+2\overline{U}\bullet\overline{V}=W^2$$

$$9+25+2|\overline{U}||\overline{V}|\text{COS}\theta=49$$

$$\text{COS}\theta=\frac{1}{2}$$

$$\theta=60^0$$

11. Let 'A' be the origin of reference



P.V of B is $\overline{AB}=\bar{u}$

P.V of C is $\overline{AC}=\bar{v}$

P.V of D is $\overline{AD}=\dfrac{\bar{u}+\bar{v}}{2}$

12. $|\bar{u}\times\bar{v}|=|\bar{u}||\bar{v}|\sin\theta$

$$\le|\bar{u}||\bar{v}|$$

13. Let $\bar{a}=\hat{i}+\hat{j}+\hat{k}$

$$\bar{b}=2\hat{i}+4\hat{j}-5\hat{k}$$

$$\bar{c}=\lambda\hat{i}+2\hat{j}+3\hat{k}$$

Let $\bar{d}$ = unit vector along $\bar{b}+\bar{c}$

Then

$$\bar{a}\times\bar{d}=\frac{-8\bar{i}}{\sqrt{\lambda^2+4\lambda+44}}+\frac{(4+\lambda)\bar{j}}{\sqrt{\lambda^2+4\lambda+44}}+\frac{(4-\lambda)\bar{k}}{\sqrt{\lambda^2+4\lambda+44}}$$

Given that $|a \times d| = \sqrt{2}$

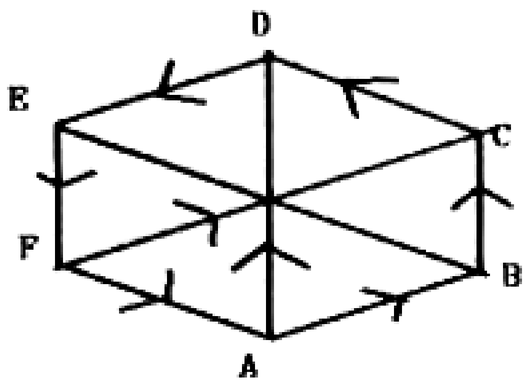
$\Rightarrow \lambda = 1$

14. $\lambda^2 + \lambda + 1 = \begin{vmatrix} 4 & 3 & -1 \\ 4 & 3 & 2 \\ 1 & -4 & -1 \end{vmatrix}$

$\Rightarrow \lambda^2 + \lambda - 56 = 0$

$\Rightarrow \lambda = 7 \text{ or } \lambda = -8$

15.



$\overrightarrow{AD} + \overrightarrow{EB} + \overrightarrow{FC}$

$= \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} + \overrightarrow{ED} + \overrightarrow{DC} + \overrightarrow{CB} + \overrightarrow{FC}$

$= \overrightarrow{AB} + \left(\overrightarrow{BC} + \overrightarrow{CB}\right) + \left(\overrightarrow{CD} + \overrightarrow{DC}\right) + \left(\overrightarrow{ED} + \overrightarrow{FC}\right)$

$= \overrightarrow{AB} + 0 + 0 + \overrightarrow{AB} + 2\overrightarrow{AB}$

$= 4\overrightarrow{AB}$

$\therefore \lambda = 4$

16. $\bar{u}$ and $\bar{v}$ are parallel if and only if
One of them is a scalar multiple of other

17. $|\bar{u} + \bar{v}|^2 = |\bar{u} - \bar{v}|^2$

$\Rightarrow \bar{u}.\bar{v} = 0$

$\Rightarrow \bar{u}$ *and* $\bar{v}$ are perpendicular.

18. Let $\bar{a} = (3,2,6), \bar{b} = (2,1,1), \bar{c} = (1,-1,1)$

Option verification:

$\bar{d} = \pm\frac{1}{\sqrt{10}}(0,3,-1)$

$\bar{a}.\bar{d} = 0 \text{ and } \left[\bar{b}\ \bar{c}\ \bar{d}\right] = 0$

19. $\vec{u} = \hat{i} - 2\hat{j}, U = (1,-2)$

$\vec{v} = -3\hat{i} + 5\hat{j}, V = (-3,5)$

Eq. of line passing through U,V is

$7x + 4y + 1 = 0$

is collinear with $P = \left(\frac{-1}{7}, 0\right), Q = \left(0, \frac{-1}{4}\right)$

20. $\cos(\bar{u}, \bar{v}) = \frac{|(-2)(1) + (2)(-2) + (1)(2)|}{\sqrt{4+4+1}\sqrt{1+4+4}}$

$= \frac{4}{9}$

$(\bar{u}, \bar{v}) = \cos^{-1}\left(\frac{4}{9}\right)$

21. $|\bar{a}| = |\bar{b}| = 1 \text{ and } |\bar{a} + \bar{b}| = 1$

$|\bar{a}|^2 + |\bar{b}|^2 + 2\left(\bar{a}.\bar{b}\right) = 1$

$\bar{a}.\bar{b} = \frac{-1}{2}$

$\cos\left(\bar{a}, \bar{b}\right) = \frac{\bar{a}.\bar{b}}{|\bar{a}|.|\bar{b}|} = \frac{-1}{2}$

$\left(\bar{a}, \bar{b}\right) = 120^o$

22. Conceptual

23. $\left[\vec{a} \times \vec{b}\quad \vec{b} \times \vec{c}\quad \vec{c} \times \vec{a}\right] = \left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$

$= \begin{vmatrix} 2 & -3 & -4 \\ 1 & 4 & -2 \\ 3 & -1 & 4 \end{vmatrix}^2 = (110)^2 = 12100$

24. Let $\overline{AB} = \bar{a}, \overline{BC} = \bar{b}$

$\overline{AC} = \bar{a} + \bar{b}$ & $\overline{CD} = \bar{b} - \bar{a}$

$\overline{AB} + \overline{AF} + \overline{CD} + \overline{EF}$

$= \bar{a} + 2\left(\bar{b} - \bar{a}\right) - \bar{b}$

$= \bar{b} - \bar{a}$

$= \overline{DE} + \overline{BC}$

DIAG

25. In ΔABC, using vector concept:

$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC} = \vec{a} + \vec{b}$

In $\Delta ADC, \overrightarrow{AD} + \overrightarrow{DC} = \overrightarrow{AC} \Rightarrow \overrightarrow{DC} = 2\vec{a}$

In $\Delta MDC, \overrightarrow{MD} + \overrightarrow{DC} = \overrightarrow{MC}$

$\Rightarrow \overrightarrow{MD} = \frac{\vec{b}}{2} - 2\vec{a} = \frac{\vec{b} - 4\vec{a}}{2}$

$\Rightarrow \overrightarrow{DM} = \frac{4\vec{a} - \vec{b}}{2}$

$In\ \Delta ADN, \overrightarrow{AD} + \overrightarrow{DN} = \overrightarrow{AN}$

$$\overrightarrow{AN} = \overrightarrow{AD} + \frac{4}{5}\overrightarrow{DM}\left(given\ \overrightarrow{DN} = \frac{4}{5}\overrightarrow{DM}\right)$$

$$\overrightarrow{AN} = \left(\vec{b} - \vec{a}\right) + \frac{4}{5}\left(\frac{4\vec{a} - \vec{b}}{2}\right)$$

$$\overrightarrow{AN} = \frac{3}{5}\left(\vec{b} + \vec{a}\right)$$

$$\overrightarrow{AN} = \frac{3}{5}\overrightarrow{AC}$$

$$5\overrightarrow{AN} = 3\overrightarrow{AC}$$

26. Let the vector $\bar{i} + 3\bar{j} + 4\bar{k}$ represents the point A(1,3,4) The given plane is

$$r.\left(2\bar{i} - \bar{j} + \bar{k}\right) + 3 = 0$$

$$\Rightarrow 2x - y + z + 3 = 0 \rightarrow (1)$$

Let C(a,b,c) be the required image of the point 'A' in the given plane.

Let 'B' be a point on the plane and also lying in the line joining AC.

$$\frac{x-1}{2} = \frac{y-3}{-1} = \frac{z-4}{1} = k$$

$$x = 2k + 1; y = 3 - k; z = k + 4$$

$$k = -1$$

$$\therefore B = (-1,4,3)$$

$$\frac{a+1}{2} = -1; \frac{b+3}{2} = 4; \frac{c+4}{2} = 3$$

$$a = -3; b = 5; c = 2$$

$$\because C(a,b,c) = (-3,5,2)$$

27. Given two vectors

$$u = -2\hat{i} + 2\hat{j} + \hat{k}\ and\ v = \hat{i} - 2\hat{j} + 2\hat{k}$$

Now the component of v on u is

$$= \frac{(u.v)}{|u|} = \frac{-2-4+2}{\sqrt{9}} = -\frac{4}{3}$$

28. Given $\vec{P} = 3\hat{i} + 5\hat{j} - \hat{k}\ and\ \vec{Q} = \hat{i} + 2\hat{j} + 3\hat{k}$ are two sides of a triangle

w.k.t Area of $\Delta^{le} = \frac{1}{2}\left|\bar{P} \times \bar{Q}\right|$

$$now\ \bar{P} \times \bar{Q} = \begin{vmatrix} i & j & k \\ 3 & 5 & -1 \\ 1 & 2 & 3 \end{vmatrix}$$

$$= i(17) - j(10) + k(1)$$

$$= 17i - 10j + k$$

$$\left|\bar{P} \times \bar{Q}\right| = \sqrt{(17)^2 + (10)^2 + (1)^2} = \sqrt{390}$$

$\therefore$ the required area $= \frac{1}{2}\sqrt{390}$

29. Given A=(2,-1,1),B(1,-3,-5),C=(3,-4,-4)

Now $AB = \sqrt{1+4+36} = \sqrt{41}$

$$BC = \sqrt{4+1+1} = \sqrt{6}$$

$$CA = \sqrt{1+9+25} = \sqrt{35}$$

$$\therefore AB^2 = BC^2 + CA^2$$

30. $\dfrac{2\left(-3\bar{i} + 5\bar{j}\right) + 1\left(\bar{i} - 2\bar{j}\right)}{2+1} = \dfrac{-5\bar{i} + 8\bar{j}}{3}$

31. Conceptual

32. Conceptual

33. Conceptual

34. Conceptual

35. $\left|\bar{u} + \bar{v}\right|^2 = 2\left(\left|\bar{u}\right|^2 + \left|\bar{v}\right|^2\right)$

$$\left|\bar{u}\right|^2 + \left|\bar{v}\right|^2 + 2\bar{u}.\bar{v} = 2\left|\bar{u}\right|^2 + 2\left|\bar{v}\right|^2$$

$$\left|\bar{u}\right|^2 + \left|\bar{v}\right|^2 - 2\bar{u}.\bar{v} = 0$$

$$\left|\bar{u} - \bar{v}\right|^2 = 0$$

$$\bar{u} = \bar{v}$$

36. $\cos A = \dfrac{\left(\vec{c} - \vec{a}\right).\left(\vec{b} - \vec{a}\right)}{\left|\vec{c} - \vec{a}\right|\left|\vec{b} - \vec{a}\right|}$

by right angled triangle

$$\tan A = \frac{\left(\vec{c} - \vec{a}\right) \times \left(\vec{b} - \vec{a}\right)}{\left(\vec{c} - \vec{a}\right).\left(\vec{b} - \vec{a}\right)}$$

37. $L = midpoint\ of\ BC$

$M = midpoint\ of\ CD$

$$\overline{AC} = \overline{AB} + \frac{1}{2}\overline{BC}$$

$$\overline{AM} = \overline{AC} - \frac{1}{2}\overline{AB}$$

$$Add\quad \overline{AL} + \overline{AM} = \overline{AC} + \frac{1}{2}\left(\overline{AB} + \overline{BC}\right) = \frac{3}{2}\overline{AC}$$

38. $\vec{p}\times\vec{q} = \vec{p}\times\vec{r} \Rightarrow \vec{p}\times(\vec{q}-\vec{r}) = 0...(1)$

$\vec{p}.\vec{q} = \vec{p}.\vec{r} \Rightarrow \vec{p}.(\vec{q}-\vec{r}) = 0...(2)$

$from\ (1)\&(2), \vec{q}-\vec{r} = 0 \Rightarrow \vec{q} = \vec{r}$

39. $Diagonals\ PR = PQ + PS = 4i - 2j$

$QS = PS - PQ = -2i + 2j - 4k$

$$\cos\theta = \frac{-8-4}{\sqrt{20}\sqrt{24}} = -\sqrt{\frac{3}{10}}$$

40. $\left|\overline{u}\right|^2 + \left|\overline{v}\right|^2 - 2\left|\overline{u}\right|\left|\overline{v}\right|\cos\theta = \left|\overline{u}\right|^2 + \left|\overline{v}\right|^2 - 2\left|\overline{u}\right|\left|\overline{v}\right|$

$\cos\theta = 1 \Rightarrow \theta = 0$

41. $\frac{1}{2}|\overline{a}\times\overline{b}| = \frac{\sqrt{62}}{2}$

42. $a\hat{i} + b\hat{j} + c\hat{k}$ is unit vector then

$a^2 + b^2 + c^2 = 1$

Possible vectors are $\hat{i}, \hat{j}, \hat{k}$

43. $$\hat{d} = \frac{\overline{b}+\overline{c}}{|\overline{b}+\overline{c}|} = \frac{(2+\lambda)\hat{i} + 6\hat{j} - 2\hat{k}}{\sqrt{(2+\lambda)^2 + 40}}$$

$\overline{a}.\hat{d} = 1$

$(\lambda+6)^2 = (2+\lambda)^2 + 40$

$8\lambda = 8 \Rightarrow \lambda = 1$

44. $\overline{PQ} + \overline{PT} + \overline{QR} + \overline{RS} + \overline{TS} + \overline{PS}$

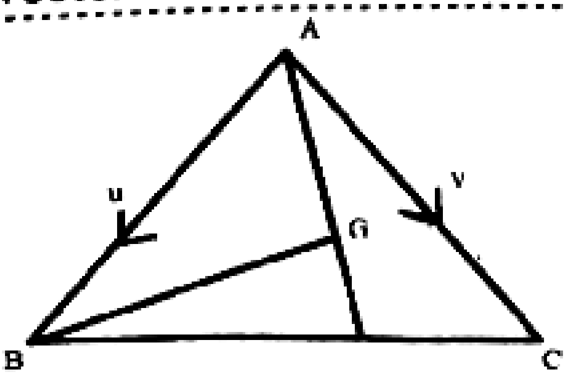
$= \left(\overline{PT} + \overline{TS}\right) + \left(\overline{PQ} + \overline{QR} + \overline{RS}\right) + \overline{PS}$

$= 3\overline{PS}$

45. By option verification,

The given vectors are collinear iff $\overline{uv} = \lambda\overline{uw}$.

46.



$$\overline{AB} + \overline{BC} + \overline{CA} = 0$$

$$\overline{u} + \overline{BC} - \overline{v} = 0$$

$$\overline{BC} = \overline{v} - \overline{u}$$

In ΔABD, $\overline{u} + \frac{\overline{v}-\overline{u}}{2} + \overline{DA} = 0$

$$\overline{AD} = \frac{\overline{u}+\overline{v}}{2}$$

In ΔABD, length of median BG

$$= \frac{1}{2}\sqrt{2\overline{u}^2 + 2\left(\frac{\overline{v}-\overline{u}}{2}\right)^2 - \left(\frac{\overline{u}+\overline{v}}{2}\right)^2}$$

$$= \frac{1}{4}|3\overline{u} - \overline{v}|$$

47. Let $\overline{a} = 2\hat{i} + 3\hat{j} + \hat{k}$

A vector in the direction of $2\hat{i} + 3\hat{j} + \hat{k}$ with magnitude $\sqrt{7}$ is $\sqrt{7}\left(\frac{\overline{a}}{|\overline{a}|}\right)$

$$= \sqrt{7}\left(\frac{2\hat{i} + 3\hat{j} + \hat{k}}{\sqrt{14}}\right) = \frac{2\hat{i}}{\sqrt{2}} + \frac{3\hat{j}}{\sqrt{2}} + \frac{\hat{k}}{\sqrt{2}}$$

48. $|\overline{a}| = |\overline{b}| = |\overline{c}| = 1$

$\overline{a}.\overline{b} = 0,\ \overline{a}.\overline{c} = 0$

Thus $\overline{a}$ is perpendicular to $\overline{b}\ \&\ \overline{c}$

$\therefore$ A unit vector perpendicular to $\overline{b}\ and\ \overline{c}$ is

$$\overline{a} = \pm\frac{\left(\overline{b}\times\overline{c}\right)}{|\overline{b}\times\overline{c}|}$$

$$= \pm\frac{\left(\overline{b}\times\overline{c}\right)}{|\overline{b}||\overline{c}|\sin\left(\overline{b},\overline{c}\right)} = \pm\frac{2}{\sqrt{3}}\left(\overline{b}\times\overline{c}\right).$$

49. $|\overline{a}| = |\overline{b}| = |\overline{c}| = 1$

$$\overline{a} + \overline{b} + \sqrt{3}\overline{c} = \overline{0}$$

$$\overline{a} + \overline{b} = -\sqrt{3}\overline{c}$$

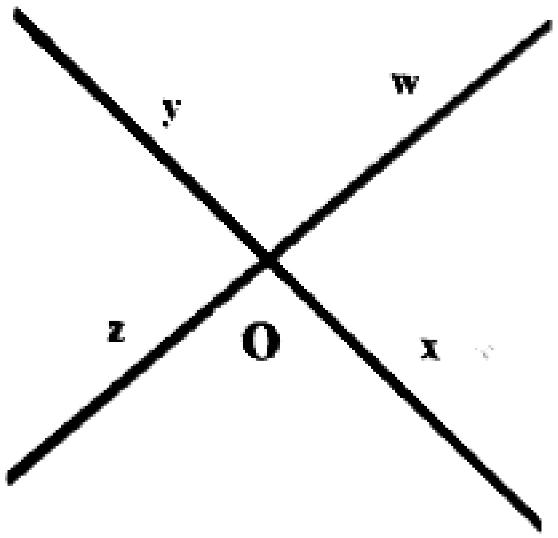
$$|\overline{a} + \overline{b}|^2 = 3|\overline{c}|^2$$

$$|\bar{a}|^2+|\bar{b}|^2+2\bar{a}.\bar{b}=3$$

$$2+2\cos\left(\bar{a},\bar{b}\right)=3$$

$$\left(\bar{a},\bar{b}\right)=\frac{\pi}{3}$$

50.



From the given conditions it is clear that

$A(\bar{a}),\ B(\bar{b}),\ C(\bar{c})$ *and* $D(\bar{d})$ are coplanar

Now, A,B,C,D are concyclic

$\therefore AP\times BP=CP\times DP$

$$\left|\frac{y}{x+y}\right||\bar{a}-\bar{b}|\left|\frac{x}{x+y}\right||\bar{a}-\bar{b}|$$

$$=\left|\frac{w}{w+z}\right||\bar{c}-\bar{d}|\left|\frac{z}{w+z}\right||\bar{c}-\bar{d}|$$

$$|xy||\bar{a}-\bar{b}|^2=|wz||\bar{c}-\bar{d}|^2$$

51. $$\frac{\bar{a}\times\left(\bar{b}\times\bar{a}\right)}{|\vec{a}|^2}=\frac{\left(\bar{a}.\vec{a}\right)\bar{b}-\left(\vec{a}.\bar{b}\right)\bar{a}}{|\vec{a}|^2}$$

By verification

(2) projection of b along a vector perpendicular to the vector

$$\bar{a}=\bar{b}-\frac{(\bar{a}.\bar{b})\bar{a}}{|\bar{a}|^2}=\frac{(\bar{a}.\bar{a})\bar{b}-(\bar{a}.\bar{b})\bar{a}}{|\bar{a}|^2}$$

52. Centroid of ABD =(1,3,0) $\quad \bar{i}+3\bar{j}=\bar{a}$

Centroid of ACD =(2,3,3) $\quad 2\bar{i}+3\bar{j}+3\bar{k}=\bar{b}$

The vector equation is $(1-t)\bar{a}+t\bar{b}$

$$(1+t)\bar{i}+3\bar{j}+3t\bar{k}$$

53. $\bar{a}$ and $\bar{b}$ are orthogonal vectors then $\bar{a}.\bar{b}=0$

$$\tan^2\theta-\tan\theta-6=0$$

$$\tan\theta=3 \qquad \tan\theta=-2$$

$$\bar{c}=(\sin 2\theta)\bar{i}-2\bar{j}+2\bar{k}$$

Drs of x-axis is $\bar{d}=\bar{i}$

$$\bar{c}.\bar{d}<0$$

$$\sin 2\theta<0\Rightarrow\frac{2\tan\theta}{1+\tan^2\theta}<0$$

$$\tan\theta<0$$

$$\therefore \tan\theta=-2$$

$$\theta=n\pi+\tan^{-1}(-2)=n\pi-\tan^{-1}(2)$$

54. $$\bar{\alpha}=\frac{\left(\bar{a}+\bar{b}\right).\left(\bar{b}\times\bar{c}\right)}{[\bar{a}\ \ \bar{b}\ \ \bar{c}]}+\frac{\left(\bar{b}+\bar{c}\right).\left(\bar{c}\times\bar{a}\right)}{[\bar{a}\ \ \bar{b}\ \ \bar{c}]}+\frac{\left(\bar{c}+\bar{a}\right).\left(\bar{a}\times\bar{b}\right)}{[\bar{a}\ \ \bar{b}\ \ \bar{c}]}$$

$$=\frac{3[\bar{a}\ \bar{b}\ \bar{c}]}{[\bar{a}\ \bar{b}\ \bar{c}]}=3$$

$$\bar{\beta}=\frac{\left(\bar{a}\times\bar{b}\right).\left[\bar{b}\times\bar{a}+\bar{b}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}+\bar{c}\times\bar{b}+\bar{c}\times\bar{c}\right]}{-\left[\bar{a}\ \bar{b}\ \bar{c}\right]}$$

$$=-1$$

$$\alpha+\beta=2$$

55. $$\bar{a}+l\bar{b}+l^2\bar{c}=\bar{0}\Rightarrow\bar{a}=-\left(l\bar{b}+l^2\bar{c}\right)$$

$$\bar{a}+\bar{b}-\bar{a}\times\bar{c}=2\left(\bar{b}\times\bar{c}\right)$$

$$-\left(l\bar{b}+l^2\bar{c}\right)\times\left(\bar{b}-\bar{c}\right)=2\left(\bar{b}\times\bar{c}\right)$$

$$l^2+l-2=0$$

$$l=-2,1$$

Minimum value of l is -2

56. $\overline{OA}=\bar{a},\overline{OB}=\bar{b},\overline{OC}=\bar{c}$

$$\overline{OP}=\frac{3\bar{c}+4\bar{b}}{7},\overline{OQ}=\frac{2\bar{a}+5\bar{c}}{7},\overline{OQ}=\frac{9\bar{b}+5\bar{a}}{14}$$

$$\overline{OD}=\frac{2\bar{c}+3\bar{b}}{5},\overline{AD}=\overline{OD}-\overline{OA}$$

$$=\frac{2\bar{c}+3\bar{b}}{5}-\bar{a}=\frac{2\bar{c}+3\bar{b}-5\bar{a}}{5}$$

$$\overline{AP}+\overline{BQ}+\overline{CR}=k\overline{AD}$$

$\overline{OP}-\overline{OA}+\overline{OQ}-\overline{OB}+\overline{OR}-\overline{OC}$

$==\frac{3\bar{c}+4\bar{b}}{7}-\bar{a}+\frac{2\bar{a}+5\bar{c}}{7}-\bar{b}+\frac{9\bar{b}+5\bar{a}}{14}-\bar{c}$

$=\frac{1}{14}\left(-5\bar{a}+3\bar{b}+2\bar{c}\right)$

K=5/14

$(14k+1):(14k-1)=(5+1):(5-1)=3:2$

57. $\overline{OA}=(1,1,2)$

$\overline{OD}=\frac{\overline{OB}+\overline{OC}}{2}=\left(3,\frac{5}{2},3\right)$

$\bar{r}=(1-t)\overline{OA}+t\overline{OD}=\overline{OA}+t\left(\overline{OD}-\overline{OA}\right), t\in R$

$\bar{r}=\left(1+2t,1+\frac{3}{2}t,2+t\right)$

58. $\bar{b}\times\bar{d}=\hat{i}+3\hat{j}-5\hat{k}, \Rightarrow|\bar{b}\times\bar{d}|=\sqrt{35}$

$S.D=\left|\frac{\left[\bar{a}-\bar{c}\ \ \bar{b}\ \ \bar{d}\right]}{\left|\bar{b}\times\bar{d}\right|}\right|=\sqrt{35}$

By verification $\bar{Q}=-\hat{i}+3\hat{j}+5\hat{k}$

59. $\bar{a}=\bar{i}+\bar{j}, \bar{b}=\bar{i}+2\bar{j}-\bar{k}$

$\bar{c}=\bar{i}+\bar{j}, \bar{d}=-\bar{i}+\bar{j}-2\bar{k}$

$\bar{b}\times\bar{d}=-3\left(\bar{i}-\bar{j}-\bar{k}\right)$

$\bar{n}=\bar{i}-\bar{j}-\bar{k}, \bar{a}.\bar{n}=0$

$\bar{r}.\bar{n}=0$

60. $\left|\bar{c}\right|=1$

$\left[\bar{a}\ \ \bar{b}\ \ \bar{c}\right]=\left(\bar{a}\times\bar{b}\right).\bar{c},\ \bar{a}\times\bar{b}=-\bar{i}+\bar{j}+\bar{k}$

$=\left|\bar{a}\times\bar{b}\right|\left|\bar{c}\right|\cos\theta$ is max at $\theta=0^0$

$=\left|\bar{a}\times\bar{b}\right|$

$\bar{c}$ is parallel to $\bar{a}\times\bar{b}$

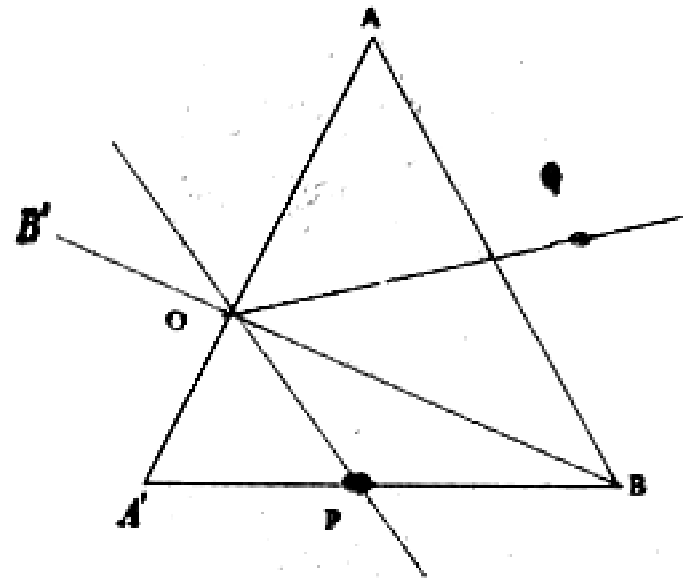
$\bar{c}=\lambda\left(\bar{a}\times\bar{b}\right), \lambda\in R$

$\left|\bar{c}\right|=\lambda\sqrt{3}, \lambda=\frac{1}{\sqrt{3}}$

$\bar{c}=\frac{1}{\sqrt{3}}\left(-\bar{i}+\bar{j}+\bar{k}\right)$

61. $S.D=\left|\frac{\left[\bar{a}-\bar{c}\ \ \bar{b}\ \ \bar{d}\right]}{\left|\bar{b}\times\bar{d}\right|}\right|$

62.



$\overline{OP}=\frac{m\bar{b}+n\bar{a}}{m+n}$

$=\frac{-3}{4}\bar{a}+\frac{7}{4}\bar{b}=\frac{7\bar{b}-3\bar{a}}{7-3}$

$\therefore$ **P lies on $\Delta A'OB$**

$\overline{OQ}=\frac{1}{3}\bar{a}+\frac{5}{3}\bar{b}=\frac{5\bar{b}+\bar{a}}{3}>\frac{5\bar{b}+\bar{a}}{6}$

Q lies outside ΔAOB

63. $\vec{a}\times\vec{b}=2\vec{i}-\vec{k}$

The equation of a line through P normal to $\bar{b}$ and lying on the plane π is

$\vec{r}=\overline{OP}+\lambda\left(\vec{b}\times\left(\vec{a}\times\vec{b}\right)\right)$

$\bar{r}=2\vec{i}+\vec{j}+3\vec{k}+\lambda\left(-\vec{i}+5\vec{j}-2\vec{k}\right)$

64. $\overline{AB}+\overline{BC}+\overline{AD}-2\overline{DC}$

$\overline{AC}+\overline{AD}-2\overline{DC}$

$\overline{AC}+\overline{AC}+\overline{CD}-2\overline{DC}$

$2\overline{AC}-3\overline{DC}$

$2\left(2\overline{QC}\right)-3\left(\frac{4}{3}\overline{PC}\right)$

$4\overline{QC}-4\overline{PC}$

$-4\left(\overline{PC}-\overline{QC}\right)$

$-4\left(\overline{PC}+\overline{CQ}\right)$

$-4\overline{PQ}$

$\therefore \lambda=-4$

65. $\bar{a}=\dfrac{(\bar{p}.\bar{q})\bar{q}}{|\bar{q}|^2}=\dfrac{-2\left(\bar{i}+\bar{j}-\bar{k}\right)}{3}$

$\bar{b}=\dfrac{(\bar{p}.\bar{q})\bar{p}}{|\bar{p}|^2}=\dfrac{-\left(2\bar{i}-3\bar{j}+\bar{k}\right)}{7}$

$\bar{a}\times\bar{b}=-\dfrac{2}{21}\left(2\vec{i}+3\vec{j}+5\vec{k}\right)$

$\bar{a}.b=-\dfrac{4}{21}$

66. Let $\mathrm{x}=a\vec{i}+b\vec{j}+c\vec{k}$

$\mathrm{x}.\bar{c}=60 \Rightarrow a+b+c=0$......(1)

$\mathrm{x}.\bar{a}=0 \Rightarrow 2a-3b+4c=0$......(2)

$\mathrm{x}.\bar{b}=0 \Rightarrow 7a+2b-3c=0$......(3)

Solving (1),(2) and (3) , we get

$a=1, b=34, c=25$

$\therefore \mathrm{x}=\vec{i}+34\vec{j}+25\vec{k}$

67. Since the line is parallel to the plane

Thus, $\left(\bar{i}-\bar{j}+4\bar{k}\right).\left(\bar{i}+5\bar{j}+\bar{k}\right)=0$

General point on the line is

$(\lambda+2,-\lambda-2,4\lambda+3)$

For $\lambda=0$ a point on this line is (2,-2,3)

and distance from $\bar{r}.\left(\vec{i}+5\vec{j}+\vec{k}\right)=5$ is

$d=\left|\dfrac{2+5(-2)+3-5}{\sqrt{1+25+1}}\right|=\dfrac{10}{3\sqrt{3}}$

68. $A=(12,-12,-18)$

$B=(-3,-6,-9)$

$C=(3,3,-24)$

Incentre of ΔABC=centroid of ΔABC

$=(4,-5,-17)$

69. $\begin{vmatrix} x-0 & y+5 & z+1 \\ 1-0 & -2+5 & 5+1 \\ -3 & 5+5 & 0+1 \end{vmatrix}=0$

$3x+y-z+4=0$

Normal $\rightarrow 3\bar{i}+\bar{j}-\bar{k}$

Unit normal $\rightarrow \bar{a}=\dfrac{3}{\sqrt{11}}\bar{i}+\dfrac{1}{\sqrt{11}}\bar{j}-\dfrac{1}{\sqrt{11}}\bar{k}$

$\bar{b}=\bar{i}+5\bar{j}-6\bar{k}$

$\dfrac{\bar{a}.\bar{b}}{|\bar{b}|}=\dfrac{\dfrac{3}{\sqrt{11}}+\dfrac{5}{\sqrt{11}}+\dfrac{6}{\sqrt{11}}}{\sqrt{1+25+36}}=\dfrac{14}{\sqrt{682}}$

70. $\bar{a}+t\left(\bar{b}-\bar{c}\right)=\bar{b}+\bar{c}+x\left(\bar{a}-\bar{b}\right)+y\left(c+\bar{a}\right)$

$x+y=1, 1-x=t, 1+y=-t$

Solving we get $t=\dfrac{-1}{2}$

$\bar{r}=\bar{a}-\dfrac{1}{2}\left(\bar{b}-\bar{c}\right)$

Here, $l=1, m=\dfrac{-1}{2}, n=\dfrac{1}{2}$

$3l+4m+2n=3-2+1=2$

71. $A=(2,3,5)$

$B=(5,2,3)$

$C=(3,5,2)$

$AB=BC=CA=\sqrt{14}$

Orthocentre $=\left(\dfrac{10}{3},\dfrac{10}{3},\dfrac{10}{3}\right)$

$\therefore x=y=z$

72. By option verification choose

$p=8, q=4, r=2, s=5$

Area $=\dfrac{1}{2}\left|A\bar{B}\times A\bar{C}\right|$

$=\dfrac{1}{2}\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 8 & 4 & 2 \\ 5 & 3 & 4 \end{vmatrix}$

$=\dfrac{1}{2}\left|10\hat{i}-22\hat{j}+4\hat{k}\right|$

$=\dfrac{\sqrt{600}}{2}$

$= 5\sqrt{6}$

73. Given $|\bar{a}| = |\bar{b}| = |\bar{c}|$

$$\bar{a} \times (\bar{b} \times \bar{c}) = \frac{1}{\sqrt{2}}(\bar{b} + \bar{c})$$

$$(\bar{a}.\bar{c})\bar{b} - (\bar{a}.\bar{b})\bar{c} = \frac{1}{\sqrt{2}}\bar{b} + \frac{1}{\sqrt{2}}\bar{c}$$

Comparing on both sides

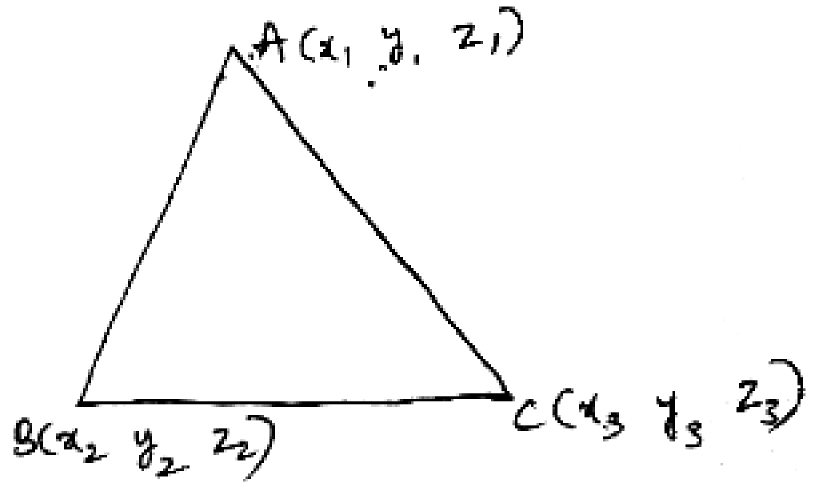
$$\bar{a}.\bar{c} = \frac{1}{\sqrt{2}} \quad ; \bar{a}.\bar{b} = \frac{-1}{\sqrt{2}}$$

$$|\bar{a}||\bar{c}|\cos\beta = \frac{1}{\sqrt{2}} \quad ; |\bar{a}||\bar{b}|\cos\alpha = \frac{-1}{\sqrt{2}}$$

$$\beta = \frac{\pi}{4} \qquad \alpha = \frac{3\pi}{4}$$

Now , $\alpha - \beta = \frac{\pi}{2}$

74.



Let $\overline{OA} = \bar{a}; \overline{OB} = \bar{b}; \overline{OC} = \bar{c}$

For $\bar{a}, \bar{b}, \bar{c}$ collinear, $AB + BC = AC$

For ΔABC is isosceles, any two sides must be equal i.e.

$|AB| = |BC|$ *or* $|BC| = |CA|$ *or* $|CA| = |AB|$

For ΔABC is right angled,

$AB.BC = 0$ *or* $BC.CA = 0$ *or* $CA.AB = 0$

For equilateral Δ^{le}, $|AB| = |BC| = |CA|$

75. Given P.O.I of given two lines is

$8\bar{i} + 8\bar{j} + 9\bar{k}$

i.e., $8\bar{i} + 8\bar{j} + 9\bar{k} = (1+t)\bar{i} + (6+2t)\bar{j} + (P\sec\alpha + t)\bar{k}$

By comparing we get

$1 + t = 8 \Rightarrow t = 7$

and $p\sec\alpha + t = 9$

$\Rightarrow p\sec\alpha = 2 \ldots (1)$

Again

$$8\bar{i} + 8\bar{j} + 9\bar{k} = (2\lambda)\bar{i} + (4 + \lambda p\tan\alpha)\bar{j} + (1 + 2\lambda)\bar{k}$$

By comparing we get,

$2\lambda = 8$

$\lambda = 4$

and $4 + \lambda p\tan\alpha = 8 \Rightarrow 1 + p\tan\alpha = 2$

$\tan\alpha = \frac{1}{p} \ldots (2)$

From (1) *and* (2)

$$\Rightarrow p\left(\frac{\sqrt{1+p^2}}{p}\right) = 2$$

$\Rightarrow 1 + p^2 = 4$

$\Rightarrow p = \sqrt{3}$

76. Given position vectors,

$\overline{OA} = p\bar{l} + 7\bar{m} - 6\bar{n}; \ \overline{OB} = 2\bar{l} + 5\bar{m} - 4\bar{n}$

$\overline{OC} = \bar{l} + 4\bar{m} - 3\bar{n}$

Since $\overline{OA}, \overline{OB}, \overline{OC}$ are collinear,

$\overline{AB} = \lambda\overline{BC} \ (\lambda - parameter)$

$\Rightarrow (2-p)\bar{l} - 2\bar{m} + 2\bar{n} = \lambda(-\bar{l} - \bar{m} + \bar{n})$

Comparing $\bar{l}, \bar{m}, \bar{n}$ on both sides we get

$2 - p = -\lambda$ *and* $\lambda = 2$

$\Rightarrow 2 - p = -2 \Rightarrow p = 4$

Now, equation of plane containing line 'L' and passing through $(-p, p, p+1) = (-4, 4, 5)$ is ,

$$\begin{vmatrix} x-4 & y-7 & z+6 \\ 1 & 1 & -1 \\ -5 & 0 & 8 \end{vmatrix} = 0$$

$\Rightarrow 8x - 3y + 5z + 19 = 0$

Now, $p(a+b+c) = 4\left(\frac{-8}{19} + \frac{3}{19} - \frac{5}{19}\right) = \frac{-40}{19}$

77. Given $\bar{a} = \bar{i} + 2\bar{j} - 2\bar{k}$ *and* $\bar{b} = 2\bar{i} - \bar{j} - 2\bar{k}$

Orthogonal projection of $\bar{a}$ *on* $\bar{b}$ is $\frac{(\bar{a}.\bar{b})\bar{b}}{|\bar{b}|^2}$

Orthogonal projection of $\bar{b}$ *on* $\bar{a}$ is $\frac{(\bar{b}.\bar{a})\bar{a}}{|\bar{a}|^2}$

On simplifying $\frac{(\bar{a}.\bar{b})\bar{b}}{|\bar{b}|^2}$ is $\frac{4}{9}\left[2\bar{i}-\bar{j}-2\bar{k}\right]$

And $\frac{(\bar{b}.\bar{a})\bar{a}}{|\bar{a}|^2}$ is , $\frac{4}{9}\left[\bar{i}+2\bar{j}-2\bar{k}\right]$

$Now, |X-Y| = \frac{4}{9}\left|\left[2\bar{i}-\bar{j}-2\bar{k}\right]-\left[\bar{i}+2\bar{j}-2\bar{k}\right]\right| = \frac{4}{9}\left|(\bar{i}-3\bar{j})\right|$

$= \frac{4}{9}\sqrt{10}$

78. Volume of a parallelepiped $= [\bar{a},\bar{b},\bar{c}]$

$|(Base\ area)\times(height)| = |[\bar{a}\ \bar{b}\ \bar{c}]|$

$|(\bar{a}\times\bar{c})\times h| = |[\bar{a}\ \bar{b}\ \bar{c}]|$

$\left|\frac{(\bar{q}\times\bar{r})\times(\bar{p}\times\bar{q})}{[\bar{p}\,\bar{q}\,\bar{r}]^2}\right|\times h =$

$\left[\frac{\bar{q}\times\bar{r}}{[\bar{p}\ \bar{q}\ \bar{r}]}\ \frac{\bar{r}\times\bar{q}}{[\bar{p}\ \bar{q}\ \bar{r}]}\ \frac{\bar{p}\times\bar{q}}{[\bar{p}\ \bar{q}\ \bar{r}]}\right]$

$\left|\frac{-[\bar{q}\ \bar{r}\ \bar{p}]\bar{q}}{[\bar{p}\ \bar{q}\ \bar{r}]^2}\right| h = \frac{[\bar{p}\ \bar{q}\ \bar{r}]^2}{[\bar{p}\ \bar{q}\ \bar{r}]^3}$

$\therefore h = \frac{1}{|\bar{q}|}$

79. $\bar{a}\times(\bar{b}\times\bar{c})+(\bar{a}.\bar{b})\bar{b} = (4-2\beta-\sin\alpha)\bar{b}+$

$(\beta^2-1)\bar{c}$

$(\bar{a}.\bar{c})\bar{b}-(\bar{a}.\bar{b})\bar{c}+(\bar{a}.\bar{b})\bar{b} = (4-2\beta-\sin\alpha)\bar{b}+$

$+(\beta^2-1)\bar{c}$

$\Rightarrow\left[(\bar{a}.\bar{c})+(\bar{a}.\bar{b})\right]\bar{b}-(\bar{a}.\bar{b})\bar{c} = (4-2\beta-\sin\alpha)\bar{b}+$

$(\beta^2-1)\bar{c}$

$(\bar{a}.\bar{c})+(\bar{a}.\bar{b}) = (4-2\beta-\sin\alpha)$....(1) &

$-(\bar{a}.\bar{b}) = (\beta^2-1)$..(2)

$1+1-\beta^2 = 4-2\beta-\sin\alpha\left[\because from\ (1)\ \&\ (2)\right]$

$\sin\alpha-1 = (\beta-1)^2$

$given\ (\bar{c}.\bar{c})\bar{a} = \bar{c}$

$(\bar{c}.\bar{c})(\bar{a}.\bar{c}) = (\bar{c}.\bar{c})$

$\bar{a}.\bar{c} = 1 ...(3)$

$w.k.t \Rightarrow (\beta-1)^2 \geq 0$

$\beta \geq 1$

& $\sin\alpha - 1 \geq 0$

$\sin\alpha \geq 1$

$\therefore \alpha \in (4n+1)\frac{\pi}{2}, n\in Z$

80. $x\bar{i}+y\bar{j}+z\bar{k} = (2+3\lambda-u)i+$

$(1-2\lambda+3u)j+(-2+2\lambda+u)k$

$x = 2+3\lambda-u,$

$y = 1-2\lambda+3u$

$z = -2+2\lambda+u$

$8x+5y-7z-35=0$

81. Let $p(\bar{r})$ be any point in plane

$\overline{PA}\times\bar{C}$ *is perpendicular to* $\bar{b}$

$(\overline{PA}\times\bar{C})\bullet\bar{b} = 0$

$\{(\bar{r}-\bar{a})\times\bar{C}\}\bullet\bar{b} = 0$

$\{(\bar{r}\times\bar{C})-(\bar{a}\times\bar{C})\}\bullet\bar{b} = 0$

$(\bar{r}\times\bar{C})\bullet\bar{b} = [\bar{a}\ \ \bar{c}\ \ \bar{b}]$

$\bar{r}\bullet\frac{\bar{b}\times\bar{c}}{|\bar{b}\times\bar{c}|} = \frac{[\bar{a}\ \ \bar{b}\ \ \bar{c}]}{|\bar{b}\times\bar{c}|}$

82. A(1,2,0) lies on the plane x+y+z=3

Q is the Orthogonal Projection of B(2,1,1) on the plane x+y+z=3

Q=(h,k,l) is foot of the perpendicular of B

$\frac{h-2}{1} = \frac{k-1}{1} = \frac{l-1}{1} = \frac{-(2+1+1-3)}{1+1+1}$

$Q = (h,k,l) = \left(\frac{5}{3},\frac{2}{3},\frac{2}{3}\right)$

$P = (1,2,0),\ Q = \left(\frac{5}{3},\frac{2}{3},\frac{2}{3}\right)$

$PQ = \frac{2\sqrt{2}}{\sqrt{3}}$

83. $|x|=|y|=|z|=\sqrt{2}$

$\overline{x}\overline{y}=\overline{y}\overline{z}=\overline{z}\overline{x}=1$

$\overline{a}=(\overline{x}.\overline{z})\overline{y}-(\overline{x}.\overline{y})\overline{z}=\overline{y}-\overline{z}$

$\overline{b}=(\overline{y}.\overline{x})\overline{z}-(\overline{y}.\overline{z})\overline{x}=\overline{z}-\overline{x}$

$(\overline{a}+\overline{b})\times\overline{c}=(\overline{y}-\overline{x})\times(\overline{x}\times\overline{y})=\overline{y}\times(\overline{x}\times\overline{y})-\overline{x}\times(\overline{x}\times\overline{y})$

$=(\overline{y}.\overline{y})\overline{x}-(\overline{y}.\overline{x})\overline{y}-(\overline{x}.\overline{y})\overline{x}+(\overline{x}.\overline{x})\overline{y}$

$=2\overline{x}-\overline{y}-\overline{x}+2\overline{y}+2\overline{y}=\overline{x}+\overline{y}$

84. $|\overline{a}|=3,|\overline{b}|=\sqrt{2},\overline{a}.\overline{c}=|\overline{c}|,(\overline{a}\times\overline{b}\times\overline{c})=\frac{\pi}{3}$

$|\overline{c}-\overline{a}|=2\sqrt{2}\Rightarrow|\overline{c}|^2+|\overline{a}|^2-2.\overline{c}\overline{a}=8$

$\Rightarrow|\overline{c}|^2-2|\overline{c}|+1=0$

$(|\overline{c}|-1)^2=0\Rightarrow|c|=1$

$|(\overline{a}\times\overline{b})\times\overline{c}|=|\overline{a}\times\overline{b}||\overline{c}|\sin(\overline{a}\times\overline{b},\overline{c})$

$=3\times1\times\frac{\sqrt{3}}{2}=\frac{3\sqrt{3}}{2}$

85. Use $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

Here $\alpha=\beta$ *and* $\gamma=90^\circ$

86. *Let required angle* $=\alpha$

use $\cos\alpha=\frac{|a|}{\sqrt{a^2+b^2+c^2}}$

Here $a=5,b=-4,c=-3$

87. Here $\overline{OE}=\frac{\overline{c}+\overline{a}}{2},\overline{OF}=\frac{\overline{b}+\overline{c}}{2},\overline{OD}=\frac{\overline{a}+\overline{b}}{2}$

Now find $\overline{BE}+\overline{AF}$

88. Find $\overline{a}+\overline{b},\overline{a}-\overline{b}$

Now calculate $(\overline{a}+\overline{b}).(\overline{a}-\overline{b})$

89. First find $\overline{a}+\overline{b},\overline{b}+\overline{c}$

Now use Area $=\frac{1}{2}|(\overline{a}+\overline{b})\times(\overline{b}+\overline{c})|$sq.uints

90. Use $\begin{vmatrix}\overline{a}.\overline{a} & \overline{a}.\overline{b} & \overline{a}.\overline{c}\\ \overline{b}.\overline{a} & \overline{b}.\overline{b} & \overline{b}.\overline{c}\\ \overline{c}.\overline{a} & \overline{c}.\overline{b} & \overline{c}.\overline{c}\end{vmatrix}=[\overline{a}\,\overline{b}\,\overline{c}]^2$

91. Take $(\overline{a}+t\overline{b}).(\overline{a}-t\overline{b})=0$

92. Use option verification

93. *Here* $\overline{OD}=2\overline{i}+2\overline{j}+2\overline{k}$

$\overline{OE}=2\overline{i}+3\overline{j}+2\overline{k}$

Find $\overline{DE}=\overline{OE}-\overline{OD}$

94. $\overline{a}.\overline{b}<0$

$|\overline{a}.\overline{b}|=|\overline{a}\times\overline{b}|$

$-|\overline{a}||\overline{b}|\cos\theta=|\overline{a}||\overline{b}|\sin\theta$

$\Rightarrow\theta=135^\circ$

95. *Use* $S.D=\frac{|[\overline{a}-\overline{c}\;\overline{b}\;\overline{d}]|}{|\overline{b}\times\overline{d}|}$

Here $\overline{a}=2\overline{i}-\overline{k},c=2\overline{i}+\overline{j}-3\overline{k}$

$b=3\overline{i}-\overline{j}+2\overline{k},d=\overline{i}-2\overline{j}+\overline{k}$

96. *Here* $|\overline{a}|=|\overline{b}|=|\overline{c}|=1$

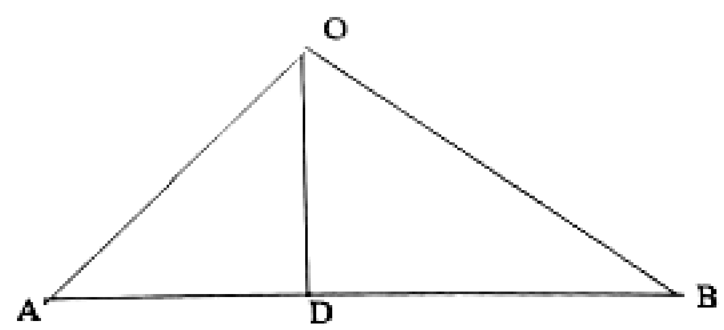
$\overline{a}.\overline{b}=\overline{a}.\overline{c}=0,\overline{b}.\overline{c}=\frac{1}{2}$

use $[\overline{a}\,\overline{b}\,\overline{c}]^2=\begin{vmatrix}\overline{a}.\overline{a} & \overline{a}.\overline{b} & \overline{a}.\overline{c}\\ \overline{b}.\overline{a} & \overline{b}.\overline{b} & \overline{b}.\overline{c}\\ \overline{c}.\overline{a} & \overline{c}.\overline{b} & \overline{c}.\overline{c}\end{vmatrix}$

97. First find $\overline{a}\times\overline{b}$

Next calculate $|\overline{a}\times\overline{b}|$

98. Take O as origin



Here m:n = $|\overline{OA}|:|\overline{OB}|=1:2$

Now find $\overline{OD}$ using section formula

length = $|\overline{OD}|$

99. Here $\overline{u}.\overline{v}=0$ *and* $\overline{u}.\overline{w}\neq 0$

100. Let required vector $=x\overline{i}+y\overline{j}+z\overline{k}$

Then $x^2+y^2+z^2=1$

$x+y=0(\perp ler\ condition)$

$x-y=0(coplanar\ condition)$

From above $x=0, y=0, z=1$

101. The intersecting line is

$$\frac{x-1}{1}=\frac{y-1}{2}=\frac{z+1}{-1}$$

$\Rightarrow p(x,y,z)=(r+1, 2r+1, -r-1)$

Sub 'P' in given line we get r=1

$\Rightarrow$P(x,y,z) =(2,3,–2) =A

Sub 'p' in plane , we get r=3

P(x,y,z)= (4,7,–4) =B

Now find AB

102. $\overline{r}\times\overline{a}=-(\overline{r}\times\overline{b})$

$\Rightarrow \overline{r}\times(\overline{a}+\overline{b})=0$

$\Rightarrow \overline{r}=t(\overline{a}+\overline{b}), t\in R$

for this $\overline{r}=\overline{a}+\overline{b}=\overline{i}+\overline{j}$

103. Take $[\overline{a}\,\overline{b}\,\overline{c}]=0$

104. $\overline{r}=(1-t)(2\overline{i}+\overline{j})+t(3\overline{i}-5\overline{j}), t\in R$

$x\overline{i}+y\overline{j}+z\overline{k}=(2+t)\overline{i}+(1-6t)\overline{j}$

$x=2+t....(1),\ y=1-6t...(2)$

from (1) & (2) $6x+y=13$ now take varification

105. *Here* $\overline{r}=(1-t)(\overline{i}+2\overline{j})+t(2\overline{i}-\overline{j}).....(1)$

$\overline{r}=(1-s)(-\overline{i})+s(2\overline{i}).......(2)$

Equating (1) & (2) we get t = 2 / 3..(1)

Now sub t $=2/3$ *in* (1)

106. *Use* $|\overline{a}\times\overline{b}|^2+|\overline{a}.\overline{b}|^2=|\overline{a}|^2|\overline{b}|^2$

107. *Let* $d=x\overline{i}+y\overline{j}+z\overline{k}$

take $[\overline{b}\,\overline{c}\,\overline{d}]=0$

$\Rightarrow x+y+z=0$

Now use option verification

108. $|\overline{u}\times\overline{v}|=|\overline{u}||\overline{v}|\sin\theta$

$=|\overline{u}||\overline{v}|1/\sqrt{2}$

$=|\overline{u}||\overline{v}|\cos\theta$

$=\overline{u}.\overline{v}$

109. Cartesian eq is $\begin{vmatrix} x-3 & y-2 & z-6 \\ 2 & 1 & 1 \\ 1 & -1 & 1 \end{vmatrix}=0$

$\Rightarrow 2x-y-37=-14$

110. $\overline{b_1}=\lambda\overline{a}$

$\Rightarrow \overline{b_1}=3\lambda\overline{i}-\lambda\overline{j}$

$b_2=\overline{b}-\overline{b_1}$

$=(2-3\lambda)\overline{i}+(1+\lambda)\overline{j}-3\overline{k}...(1)$

take $\overline{b_2}.\overline{a}=0$

$\Rightarrow \lambda=\frac{1}{2}$ *sub in...*(1)

111. $|\overline{u}-\overline{v}|=||\overline{u}|-|\overline{v}||$

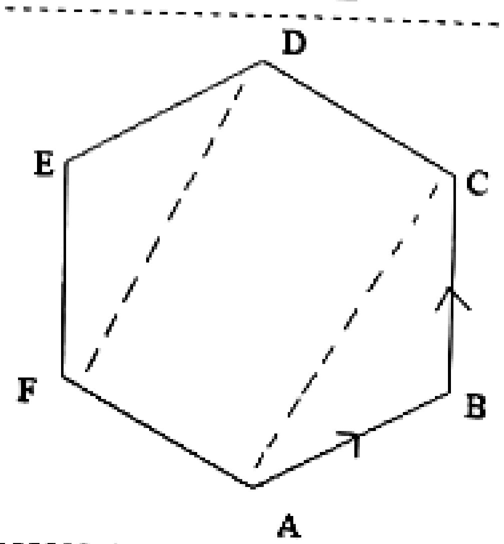
$\Rightarrow \cos\theta=1$

$\theta=0^o$

$\Rightarrow u+v$ *have same direction*

112. *Use* $\overline{OB}=\frac{\overline{OA}+\overline{OC}}{2}$

113.



$$\overline{AB}+\overline{BC}=AC$$
$$=\overline{FD}=\overline{FE}+\overline{ED}$$

114.Take $[\,\bar{a}\;\bar{b}\;\bar{c}]=0$

115. $Sub\ \bar{b}+\bar{c}=\bar{a}-\bar{d}\ in\ \bar{a}+\bar{b}+\bar{c}=s\bar{d}$

$$\Rightarrow 2\bar{a}-d=S\bar{d}$$
$$2\bar{a}=(1+S)\bar{d}$$
$$\Rightarrow 2\bar{a}.\bar{d}=(1+S)|\bar{d}|^2$$
$$2(4)=1+S$$
$$S=7$$

116. $take\ \bar{a}.\bar{b}>0$

117.Here lengths of any two sides are not equal and any two sides are not parallel

118. $Take(\bar{A}+\bar{B}).\bar{B}=15$

$$\bar{A}.\bar{B}+|\bar{B}|^2=15$$

119.Use area $|\bar{a}\times\bar{b}|$ sq.units

120. $\bar{a}.\bar{b}=0=\bar{a}.\bar{c}$

$$\Rightarrow \bar{a}\perp(\bar{b}-\bar{c})$$
$$|\bar{b}-\bar{c}|^2=|\bar{b}|^2+|\bar{c}|^2-2|\bar{b}||\bar{c}|\cos(\bar{b},\bar{c})$$
$$\Rightarrow |\bar{b}-\bar{c}|=1$$
$$|\bar{a}\times\bar{b}-\bar{a}\times\bar{c}|=|\bar{a}\times(\bar{b}-\bar{c})|$$
$$=|\bar{a}|\ |\bar{b}-\bar{c}|\sin 90^o$$

121.Plane is $3(x-2)-1(y-1)+2(z+3)=0$

$\Rightarrow 3x-y+2z+1=0$

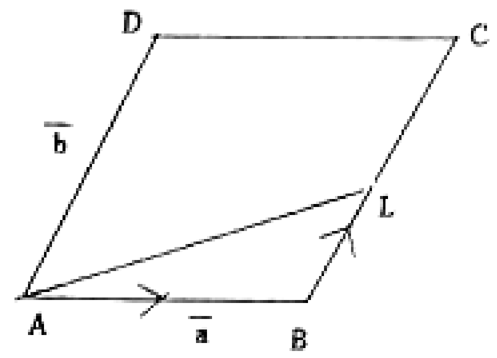
Now use option vartication

122. $Here\ |u\times v|=1$

$$r.(\bar{u}\times\bar{v})=0\Rightarrow(\bar{r},(\bar{u}\times\bar{v})=90^o$$
$$|r\times(u\times v)|=|r||u\times v|\sin 90^o$$

123.Take ‘A’ is origin

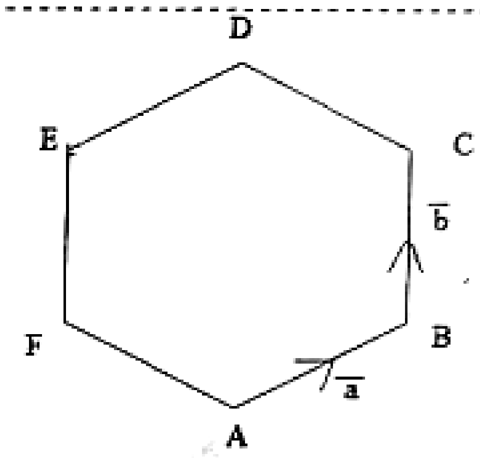
$$\overline{AL}=\frac{\overline{AB}+\overline{AC}}{2}$$
$$=\bar{a}+\frac{\bar{b}}{2}$$
$$=\overline{DC}+\frac{1}{2}\overline{AD}$$



124. $\frac{1}{1}=\frac{2}{m}=\frac{m}{2}$

$$\Rightarrow m=2$$

125.



$$\overline{CD}=\overline{AD}-\overline{AC}$$
$$=2b-(\bar{a}+\bar{b})$$
$$=\bar{b}-\bar{a}$$

126. $\bar{a}+\bar{b}=-\bar{c}$

squaring on b.s

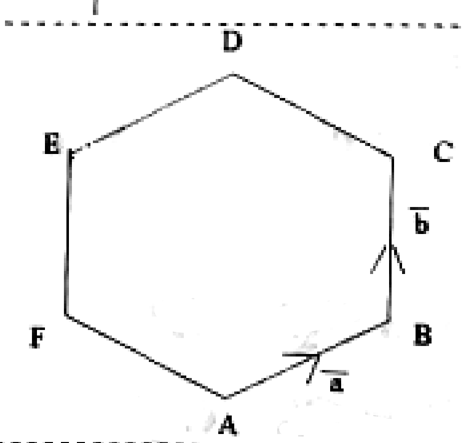
127.Use $(\bar{a}\times\bar{b})\times c=(\bar{a}.\bar{c})\bar{b}-(\bar{b}.\bar{c})\bar{a}$

128. $\bar{a}.\bar{b}>6$

$$x^3-4x>0$$

129. $Take\begin{vmatrix}1 & -\lambda & 0\\ 0 & 1 & -2\\ 2 & 0 & 1\end{vmatrix}=0$

130.



$\overline{BE}+\overline{BC}+\overline{EF}+\overline{BA}+\overline{CF}+\overline{AF}$

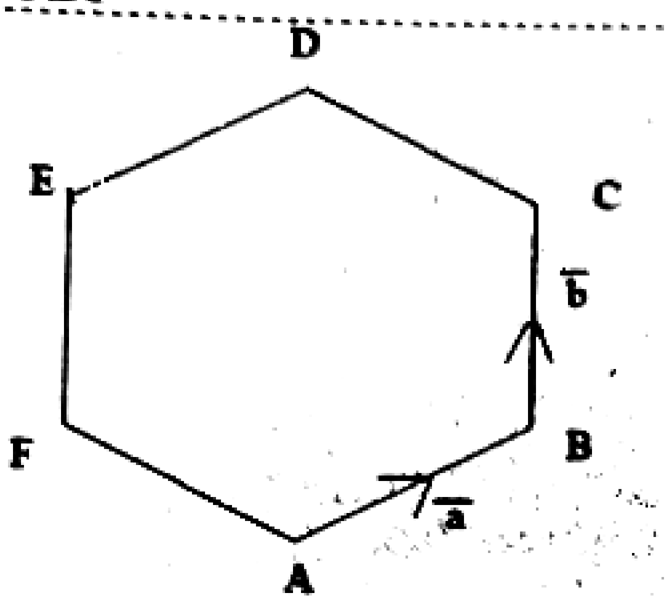
$=2\bar{b}-2\bar{a}+\bar{b}-\bar{b}-\bar{a}-2\bar{a}+\bar{b}-\bar{a}$

$3\bar{b}-6\bar{a}$

$3(\bar{b}-2\bar{a})$

$=3\overline{BF}$

131.



$\overline{CE}=\overline{BA}+\overline{AF}$

$=-\bar{a}+\bar{b}-\bar{a}$

$=\bar{b}-2\bar{a}$

132.Find $\overline{OR}$ and $\overline{OS}$ using section formula.

Then find, mid point $=\dfrac{\overline{OR}+\overline{OS}}{2}$

133.$|\bar{a}\bar{b}|=|\bar{a}|\,|\bar{b}|\,|\cos\theta|$ Now take option

varitification

134.From concept

135.Take $\bar{a}.\bar{c}=0,\ \bar{b}.\bar{c}=0$

136.$\bar{a}\times(\bar{a}\times\bar{b})=\bar{c}$

$|\bar{a}|\,|\bar{a}\times\bar{b}|=|\bar{c}|$

$|\bar{a}|^2|\bar{b}|\sin\theta=|\bar{c}|$

$\Rightarrow \sin\theta=\dfrac{8}{17},\cos\theta=\dfrac{15}{17},\operatorname{cosec}\theta=17/8$

137.$f(t)=\bar{a}.\bar{b}$

$f'(t)=4t+t^2e^t+2te^t+1/t$

$f'(1)=3e+5$

138. *write* $\overline{PQ}$ *as* $\overline{OQ}-\overline{OP}$

$\overline{QR}$ *as* $\overline{OR}-\overline{OQ}$

139. $OC=\dfrac{\overline{OA}+\overline{OB}}{2}$

$\overline{PA}+\overline{PB}=\overline{OA}-\overline{OP}+\overline{OB}-\overline{OP}$

$=\overline{OA}+\overline{OB}-2\overline{OP}$

$=2\overline{OC}-2\overline{OP}$

$=2(\overline{PC})$

$\overline{PA}-\overline{PC}=\overline{PC}-\overline{PB}$

140.$|a-b|^2=4\sin^2\left(\dfrac{\theta}{2}\right)$

$|a-b|=2\sin\left(\dfrac{\theta}{2}\right)$

141. $\bar{a},\bar{b},\bar{c}$ *are coplanar vectors*

$\Rightarrow[\bar{a}\ \bar{b}\ \bar{c}]=0$

142.$|\bar{a}+2\bar{b}|=1$

Squaring on b.s

$\cos\theta=-1$

$\theta=\pi$

143. $\bar{a}\times\bar{c}=(\bar{b}\times\bar{c})\times(\bar{a}\times\bar{b})$

$=-[\bar{b}\ \bar{c}\ \bar{a}]\bar{b}$

$=\lambda\bar{b}$

$\Rightarrow \bar{a}\times\bar{c}\parallel\bar{b}$

144. *Take* $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix}=0$

145.$\overline{OC}=\dfrac{3\overline{OB}-\overline{OA}}{2}$

146.$\bar{a}+2\bar{b}=\lambda\bar{c}$

$\dfrac{\bar{a}}{2}+\bar{b}-\lambda\dfrac{\bar{c}}{2}=\bar{0}...(1)$

$\bar{b}+3\bar{c}=\lambda'\bar{a}$

$\Rightarrow \bar{b}+3\bar{c}-\lambda'\bar{a}=\bar{0}...(2)$

Equating (1) & (2)

$\dfrac{\bar{a}}{2}+\bar{b}-\dfrac{\lambda}{2}\bar{c}=\bar{b}+3\bar{c}-\lambda'\bar{a}$

$-\lambda/2=3\Rightarrow\lambda=-6$ *sub in* (1)

147. The cartesian eq is x+7y+3z–20=0

Now use option verification

148. $\bar{a}+\bar{b}+\bar{c}=0$

$|\bar{a}+\bar{b}|=|-\bar{c}|$

squaring on B.S

149. $(\bar{u}+2\bar{v}-\bar{w}).[(\bar{u}-\bar{v})\times(\bar{u}-\bar{v}-\bar{w})]$

$$=\begin{vmatrix}1 & 2 & -1\\ 1 & -1 & 0\\ 1 & -1 & -1\end{vmatrix}$$

$=3[\bar{u}\ \bar{v}\ \bar{w}]$

150. Take formulae for $\bar{u}\times\bar{v}$ and $\bar{u}.\bar{v}$

151. From concept

152. $\bar{a}=2\bar{i}-2\bar{j}+5\bar{k}, \bar{b}=-2\bar{i}+5\bar{j}-3\bar{k}$

$\bar{a}+\bar{b}=3\bar{j}+2\bar{k}$

Parallel to YZ-plane

153. $\bar{a}=2\bar{i}+3\bar{j}-6\bar{k}, \bar{b}=6\bar{i}-2\bar{j}+3\bar{k}, \bar{c}=3\bar{i}-6\bar{j}-2\bar{k}$

$$\begin{vmatrix}2 & 3 & -6\\ 6 & -2 & 3\\ 3 & -6 & -2\end{vmatrix}=151\neq 0$$

154. Verify Dr's of vector and Dr's of normal to plane same

Perpendicular distance from origin to plane

155. Verify dot product "0" and det = 0

156. $\bar{a}\parallel\bar{c}$, $\quad \bar{a}\perp\bar{d} \quad \bar{a}.\bar{b}=-5$

$\bar{a}=\lambda\bar{c} \quad \bar{a}.\bar{d}=0$

Given $\bar{b}=\bar{c}-\bar{d}$

$\bar{a}.\bar{b}=\bar{a}.\bar{c}-\bar{a}.\bar{d}$

$-5=\bar{a}.\bar{c}$

$\bar{a}=\lambda\bar{c}$

$\bar{a}.\bar{a}=\lambda\bar{a}.\bar{c}\Rightarrow|\bar{a}|^2=\lambda(-5)\Rightarrow\lambda=\frac{-6}{5}$

$\bar{c}=\frac{-5}{6}(2\bar{i}-\bar{j}+\bar{k})$.....(1)

$\bar{b}=\bar{c}-\bar{d}$

$2\bar{j}-3\bar{k}=\frac{-5}{6}(2\bar{i}-\bar{j}+\bar{k})-\bar{d}$

$\bar{d}=\frac{-10}{6}\bar{i}+\frac{5}{6}\bar{j}-\frac{5}{6}\bar{k}-2\bar{j}+3\bar{k}$

$=\frac{-10}{6}\bar{i}-\frac{7}{6}\bar{j}+\frac{13}{6}\bar{k}$

$\bar{d}=\frac{1}{6}\left[-10\bar{i}-7\bar{j}+13\bar{k}\right]$....(2)

$\bar{c}+\bar{d}=(1)+(2)$

157. conceptual

158. $\frac{-3}{\mu}=\frac{4}{8}=\frac{\lambda}{6}$

$\boxed{\mu=-6, 2\lambda=6}$

$\lambda-\mu=9$

159. $\cos\theta=\frac{\bar{a}.\bar{b}}{|\bar{a}||\bar{b}|}\Rightarrow\theta=Cos^{-1}\left(\frac{-4}{\sqrt{65}}\right)$

160. $\bar{a}+\bar{b}+\bar{c}=0$

$|\bar{a}|^2+|\bar{b}|^2+|\bar{c}|^2+2(\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a})=\bar{0}$

$\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}=\frac{-29}{2}$

$\therefore\frac{-29}{2}+2(3+4+2)=\frac{7}{2}$

161. $\left[\bar{a}+2\bar{b}-\bar{c}\quad \bar{a}-\bar{b}\quad \bar{a}-\bar{b}-\bar{c}\right]$

$=3\left[\bar{a}\ \bar{b}\ \bar{c}\right]$

162. Given $\bar{a}.\bar{b}=3$

By verification op.(3)

$(\bar{i}+\bar{j}+\bar{k}).\left(\frac{5}{3}\bar{i}+\frac{2}{3}\bar{j}+\frac{2}{3}\bar{k}\right)=3$

Similarly

$$\bar{a}\times\bar{b}=\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 1 & 1 & 1\\ 5/3 & 2/3 & 2/3\end{vmatrix}=\bar{j}-\bar{k}$$

Which is $\bar{c}$.

163. $\bar{a}\times\bar{b}=7\bar{i}+7\bar{j}+7\bar{k}$

$(\bar{a}\times\bar{b})\times\bar{c}=7\bar{i}+7\bar{j}-14\bar{k}$

$\therefore 7\bar{i}+7\bar{j}-14\bar{k}$ *is* $\perp^r$ *to* $\bar{i}+\bar{j}+x\bar{k}$

$\boxed{x=1}$

164. $P(-2,-3,1), Q(3,3,2), R\left(\frac{-9}{2},-6,\frac{1}{2}\right)$

$x_1 - x_2 : x_2 - x_3$

$-2+\frac{9}{2} : \frac{-9}{2}-3$

$\frac{5}{2} : \frac{-15}{2}$

$1 : -3$

165. $l = \frac{(\bar{a}.\bar{b})}{|\bar{b}|} = \frac{6-15-10}{\sqrt{38}} = \frac{-19}{\sqrt{38}}$

$m = \frac{(\bar{b}.\bar{c})}{|\bar{c}|} = \frac{-10+6-15}{\sqrt{38}} = \frac{-19}{\sqrt{38}}$

$n = \frac{(\bar{c}.\bar{a})}{|\bar{a}|} = \frac{-15-10+6}{\sqrt{38}} = \frac{-19}{\sqrt{38}}$

166. We know that

$|\bar{a}\times\bar{b}|^2 + |\bar{a}.\bar{b}|^2 = |\bar{a}|^2 + |\bar{b}|^2$

$= (x^2+4+1) + (36+y^2+4)$

$= (x^2+5) + (40+y^2)$

$\therefore f(x) + g(y) - 46 = 0$

$x^2+y^2+45-46=0$

$x^2+y^2=1 \to Circle$

167. $\Delta = \frac{1}{2}|\bar{a}\times\bar{b}|$

$= \frac{1}{2}|\bar{a}||\bar{b}|\sin(\bar{a},\bar{b})$

$= \frac{1}{2}\sqrt{4+4+1}(6)\sin\frac{\pi}{6}$

$= \frac{1}{2}(3)(6)\frac{1}{2} = \frac{9}{2}$

168. $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$

$\bar{r}.\bar{a} = 0$

$2x+3y-4z=0 \to (1)$

$\bar{r}.\bar{b} = 0$

$3x-y+z=0 \to (2)$

Claim : $3x-3y+4z-5=0 \to (3)$

$(1)+(3) \Rightarrow 5x-5=0 \Rightarrow \boxed{x=1}$

$(1)+(2)\times 3$

$2x+3y-4z=0$

$9x-3y+3z=0$

$11x-z=0$

$\boxed{11=z}$

$3-y+11=0$

$\boxed{y=14}$

$|r| = \sqrt{1+121+196} = \sqrt{318}$

169. Equation of plane is $\left[\overline{AP}\ \ \overline{AB}\ \ \overline{AC}\right] = 0$

$$\begin{vmatrix} x-1 & y-2 & z-3 \\ 1 & 1 & -7 \\ 2 & -6 & 2 \end{vmatrix} = 0$$

$5x+2y+z-12=0$

Perpendicular distance from $(0,0)$ to plane

$d = \frac{|c|}{\sqrt{a^2+b^2+c^2}} = \frac{|-12|}{\sqrt{25+4+1}} = \frac{12}{\sqrt{30}}$

170. $A(1,x,3), B(3,4,7), C(y,-2,-5)$

Dr's of $AB(3-1,4-x,7-3) = (2,4-x,4)$

Dr's of BC

$(y-3,-2-4,-5-7) = (y-3,-6,-12)$

Clearly $((y-3),-6,-12) = (-6,-12+3x,-12)$

$y-3=-6 \qquad -6=-12+3x$

$y=-3 \qquad 3x=2 \Rightarrow x=2$

$x+y=-3+2=-1$

171. $\bar{r} = \bar{a}+t\bar{b}, \bar{r} = \bar{c}+s\bar{d}$

$b.d \neq 0, b\times d \neq 0$

Not parallel and perpendicular

If they lie on same plane then they are not skew lines

$$\therefore \begin{vmatrix} x_2-x_1 & y_2-y_1 & z_2-z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = \begin{vmatrix} 1 & -1 & 0 \\ 4 & -4 & 5 \\ 8 & -3 & 1 \end{vmatrix} \neq 0$$

They lie in different planes

Both are skew lines

172. $(p+1)\bar{a}+2\bar{b}-2p\bar{c}=(3+k)\bar{a}+(q-k)\bar{b}+(-q+k)\bar{c}$

$p+1=3+k, 2=q-k, -2p=-q+k$

By solving $k=-1, q=1, p=1$

$(1) \Rightarrow \bar{r}=\bar{a}+2\bar{b}+\bar{a}-2\bar{c}$

$=2\bar{a}+2\bar{b}-2\bar{c}$

$xyz=(2)(2)(-2)=-8$

173. $3\bar{b}+4\bar{c}=-2\bar{a}, |a|=|b|=|c|=1$

Squaring on both sides

$9|b|^2+16|c|^2+24(\bar{b}.\bar{c})=4|a|^2$

$25+24(\bar{b}.\bar{c})=4$

$\bar{b}.\bar{c}=\frac{-7}{8}$

We know that $(b.c)^2+|b\times c|^2=|b|^2|c|^2$

$\frac{49}{64}+|b\times c|^2=1$

$|b\times c|^2=1-\frac{49}{64}=\frac{15}{64}\Rightarrow |b\times c|=\frac{\sqrt{15}}{8}$

174. $\left|\frac{[AC \quad b \quad d]}{|b\times d|}\right|$

175. $b\times(a\times b)=\frac{\bar{a}-k\bar{b}}{l}$

$(b.b)\bar{a}-(\bar{b}.\bar{a})\bar{b}$

$|\bar{b}|^2\bar{a}-(\bar{b}.\bar{a})\bar{b}=\frac{\bar{a}}{l}-k\frac{\bar{b}}{l}$

$6\bar{a}-7\bar{b}=\frac{\bar{a}}{l}-\frac{k\bar{b}}{l}$

$6=\frac{1}{l} \quad -7=\frac{-k}{l}$

$l=\frac{1}{6} \quad k=\frac{7}{6}$

$\frac{k}{l(|\bar{b}|)}=\frac{7}{6\left(\frac{1}{6}\right)\sqrt{6}}=\frac{7}{\sqrt{6}}$

Orthogonal projection $\frac{(\bar{a}.\bar{b})}{|\bar{b}|}=\frac{7}{\sqrt{6}}$

176. $\vec{a}=2\vec{i}-\vec{j}+2\vec{k}$, $\vec{b}=3\vec{i}-2\vec{j}-5\vec{k}$

$\bar{a}.\bar{b}=-2, |\bar{a}|=\sqrt{9}$

$\frac{(\bar{a}.\bar{b})\bar{a}}{|\bar{a}|^2}=\frac{-2}{9}(2\bar{i}-\bar{j}+2\bar{k})$

The projection vector of $\bar{b}$ on a vector $\perp'$ to $\bar{a}$ is $\bar{b}-\frac{(\bar{a}.\bar{b})\bar{a}}{|\bar{a}|^2}=\frac{31}{9}\bar{i}-\frac{20}{9}\bar{j}-\frac{41}{9}\bar{k}$

177. $\begin{vmatrix} p & -2 & 3 \\ 2 & 3 & -4 \\ 4 & 13 & -18 \end{vmatrix}=0\Rightarrow p=1$

$\overline{AB}=\overline{OB}-\overline{OA}=\bar{i}+5\bar{j}-7\bar{k}$

Vector in the direction of $\overline{AB}$ length $|P|$ is

$p\frac{AB}{|AB|}=\frac{\bar{i}+5\bar{j}-7\bar{k}}{\sqrt{1+25+49}}=\frac{\bar{i}+5\bar{j}-7\bar{k}}{5\sqrt{3}}$

178. Conceptual

179. $\bar{a}\times(\bar{b}\times\bar{c})=\frac{1}{2}\bar{b}, (\bar{a}.\bar{c})\bar{b}-(\bar{a}.\bar{b})\bar{c}=\frac{1}{2}\bar{b}$

$\bar{a}.\bar{c}=\frac{1}{2} \quad ,\bar{a}.\bar{b}=0$

$\cos(\bar{a}.\bar{c})=\frac{1}{2} \ ,\cos(\bar{a}.\bar{b})=\cos 90^0$

$\theta_1=60^0 \quad ,\theta_2=90^0$

$\theta_1+\theta_2=150^0$

180. $\bar{b}=3\bar{i}+2\bar{j}-2\bar{k}$, $\bar{b}+\bar{c}=3\bar{i}+6\bar{j}-2\bar{k}$

$\bar{c}=4\bar{j}$, $\bar{c}+\bar{d}=\bar{i}+2\bar{j}-4\bar{k}$

$\bar{d}=\bar{i}-2\bar{j}-4\bar{k}$, $\bar{d}+\bar{b}=4\bar{i}-6\bar{k}$

$\bar{b}\times\bar{c}=8\bar{i}+12\bar{k}$

$\bar{c}\times\bar{d}=-16\bar{i}-4\bar{k}$

$\bar{d}\times\bar{b}=12\bar{i}-10\bar{j}+8\bar{k}$

$\left[\bar{b}\times\bar{c}\quad \bar{c}\times\bar{d}\quad \bar{d}\times\bar{b}\right]=1600$

$\left[\bar{b}+\bar{c}\quad \bar{c}+\bar{d}\quad \bar{d}+\bar{b}\right]=-80^0$

Now, $\dfrac{\left[\bar{b}\times\bar{c}\quad \bar{c}\times\bar{d}\quad \bar{d}\times\bar{b}\right]}{\left[\bar{b}+\bar{c}\quad \bar{c}+\bar{d}\quad \bar{d}+\bar{b}\right]}=-20$

181.Conceptual

182. $\overline{OA}=\bar{i}+\bar{j}+\bar{k},\overline{OB}=-2\bar{i}+3\bar{j}+2\bar{k},$

$\overline{OC}=x\bar{i}-5\bar{j}+3\bar{k},\overline{OD}=\bar{i}+y\bar{j}-\bar{k}$

$\overline{AB}=-3\bar{i}+2\bar{j}+\bar{k},\overline{AC}=(x-1)\bar{i}-6\bar{j}+2\bar{k},$

$\overline{AD}=(y-1)\bar{j}-2\bar{k}$

Now $\begin{vmatrix}-3 & 2 & 1\\ x-1 & -6 & 2\\ 0 & y-1 & -2\end{vmatrix}=0$

$\Rightarrow 3x+5y+xy+15=60$

$\Rightarrow (x+5)(y+3)=60$

183.Let 'Q' be the point on line .

Equation of line $\dfrac{x-2}{1}=\dfrac{y-1}{5}=\dfrac{z-0}{2}=k$

$Q=(k+2,5k+1,2k)$

D.r's of $PQ=(k-1,5k-4,2k-2)$

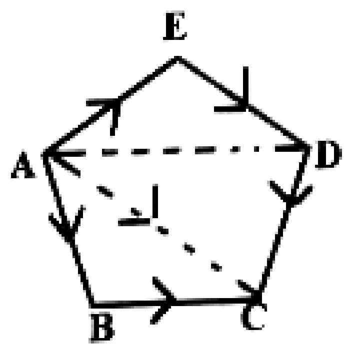
Now, $PQ\perp\left(\bar{i}+5\bar{j}+2\bar{k}\right)$

$\Rightarrow k=\dfrac{5}{6}$

$\therefore Q=\left(\dfrac{17}{6},\dfrac{31}{6},\dfrac{10}{6}\right)$

Now $PQ=\sqrt{\dfrac{1}{36}+\dfrac{1}{36}+\dfrac{4}{36}}=\dfrac{1}{\sqrt{6}}$

184.



Consider $\overline{AB}+\overline{AE}+\overline{BC}+\overline{DC}+\overline{ED}+\overline{AC}$

$=\left(\overline{AB}+\overline{BC}\right)+\left(\overline{AE}+\overline{ED}\right)+\overline{AC}+\overline{DC}$

$=\left(\overline{AC}\right)+\overline{AD}+\overline{DC}+\overline{AC}$

$=\overline{AC}+\overline{AC}+\overline{AC}=3\overline{AC}$

185. Given $\bar{a}=\bar{i}+\bar{j}+\bar{k},\bar{c}=\bar{j}-\bar{k}$

Let $\bar{b}=x\bar{i}+y\bar{j}+z\bar{k}$

$\bar{a}\times\bar{b}=\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 1 & 1 & 1\\ x & y & z\end{vmatrix}=\bar{i}(z-y)-\bar{j}(z-x)+\bar{k}(y-x)$

$\bar{a}\times\bar{b}=\bar{c}\Rightarrow z-y=0\Rightarrow y=z,$

$z-x=-1\Rightarrow x=z+1,\ y-x=-1\Rightarrow x=y+$

and $\bar{a}\bar{b}=3\Rightarrow x+y+z=3$

solving above equations, we get

$x=\dfrac{5}{3},y=\dfrac{2}{3},z=\dfrac{2}{3}$

$\therefore \bar{b}=\dfrac{1}{3}\left(5\bar{i}+2\bar{j}+2\bar{k}\right)$

(or)

Option verification .

186. $\begin{vmatrix}x-1 & y-2 & z-1\\ 2 & 3 & 1\\ -1 & 2 & -3\end{vmatrix}=0$

$\Rightarrow 11x-5y-7z=-6$

$\Rightarrow\left(\dfrac{-11}{6}\right)x+\left(\dfrac{5}{6}\right)y+\left(\dfrac{7}{6}\right)z=1$

$a=\dfrac{-11}{6},b=\dfrac{5}{6},c=\dfrac{7}{6}$

Now $18(a+b+c)=3$

187. From given data

$2\bar{b}+t\left(6\bar{c}-\bar{a}\right)=\bar{a}+s\left(\bar{b}-3\bar{c}\right)$

On comparing ,t = -1

Now sub t = -1 in $\bar{r}=2\bar{b}+t\left(6\bar{c}-\bar{a}\right)$

188. Let 'A' as origin

$\overline{AB}=\bar{a}$, $\overline{AC}=\bar{a}+\bar{b}$, $\overline{AD}=\bar{b}-\bar{a}$

$\overline{AM}=\dfrac{\bar{a}+\bar{b}+\bar{a}}{2}=\bar{a}+\dfrac{\bar{b}}{2}$

$DX:XM=4:1$

$\overline{AX}=\dfrac{4\left(\bar{a}+\dfrac{\bar{b}}{2}\right)+\bar{b}-\bar{a}}{5}$

$=\dfrac{3}{5}\overline{AC}$

189. $\left(3\bar{a}-5\bar{b}\right).\left(2\bar{a}+\bar{b}\right)=0$

$$\Rightarrow \bar{a}.\bar{b}=\frac{6\left|\bar{a}\right|^2-5\left|\bar{b}\right|^2}{7}..........(1)$$

$$\left(\bar{a}+4\bar{b}\right).\left(-\bar{a}+\bar{b}\right)=0$$

$$\bar{a}.\bar{b}=\frac{4\left|\bar{b}\right|^2-\left|\bar{a}\right|^2}{3}.................(2)$$

from (1) and (2)

$$\left|\bar{a}\right|=\sqrt{\frac{43}{25}}\left|\bar{b}\right|$$

Now use eq (2), *we get*

$$\cos\theta=\frac{19}{5\sqrt{43}}$$

190. $\left|\bar{a}\right|=5\sqrt{2}$

$$\Rightarrow x^2+y^2+z^2=50.........(1)$$

$$\cos 135^0=\frac{z}{5\sqrt{2}}$$

$$z=-5................(2)$$

Now use option verification.

191. Centroid of $\Delta ABC=$ Centroid of $\Delta A'B'C'$

192. $\overline{OF}=\dfrac{3\bar{b}+\bar{a}}{4}$

$$\overline{OE}=\frac{\bar{a}+2\bar{c}}{3}$$

Eq of BE is $\bar{r}=(1-t)\bar{b}+t\left(\dfrac{\bar{a}+2\bar{c}}{3}\right)\to(1)$

Eq of CF is $\bar{r}=(1-s)\bar{c}+s\left(\dfrac{3\bar{b}+\bar{a}}{4}\right)\to(2)$

The POI of (1) and (2) is

$$\bar{r}=\overline{OP}=\frac{\bar{a}+3\bar{b}+2\bar{c}}{6}$$

take $\overline{AP}=x_1\overline{AB}+y_1\overline{AC}$

$$\frac{-5\bar{a}+3\bar{b}+2\bar{c}}{6}=x_1\left(\bar{b}-\bar{a}\right)+y_1\left(\bar{c}-\bar{a}\right)$$

On comparing, $x=3/6, y_1=2/6$

193. *take 'O' as Origin*

$$\overline{OD}=\frac{\bar{a}}{2}$$

$$\overline{OE}=\frac{\bar{b}+\bar{c}}{2}$$

$$\overline{DE}=\frac{\bar{b}+\bar{c}-\bar{a}}{2}$$

194. $\bar{b}+\bar{c}=-\bar{a}$

Squaring on bothsides

195. $\overline{OP}=x_1\bar{i}+2^{x_1+2}\bar{j}$

$$\overline{OP}.\bar{i}=-1$$

$$\Rightarrow x_1=-1$$

$$\Rightarrow \overline{OP}=-\bar{i}+2\bar{j}$$

and $\overline{OQ}=x_2\bar{i}+2^{x_2+2}\bar{j}$

$$\overline{OQ}.\bar{j}=2$$

$$\Rightarrow x_2=2$$

$$\Rightarrow \overline{OQ}=2\bar{i}+16\bar{j}$$

196. $\bar{a}=-2\bar{i}+\bar{j}+3\bar{k}$

$$\bar{b}=3\bar{i}+\bar{j}+5\bar{k}$$

Eq is $\bar{r}.\bar{b}=\bar{a}.\bar{b}$

$$3x+y+5z=10$$

197. On comparing *Coff of* $\bar{a},\bar{b},\bar{c}$

$$x+y+6z=1$$

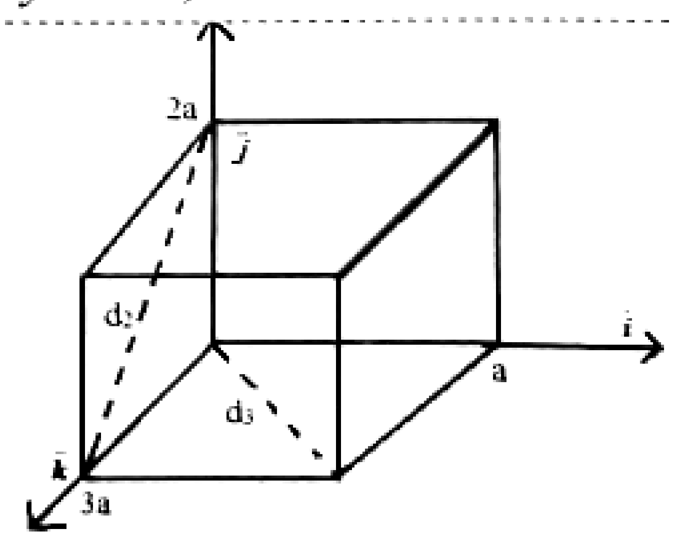
$$-2x+5y+14z=3$$

$$3x-2y+4z=4$$

On solving ,we get

$$x=-2,\ y=-3, z=1$$

198.



Let side length=1 unit

$$d_1 = \frac{a(\bar{i}+\bar{j})}{\sqrt{2}}$$

$$d_2 = \frac{2a(\bar{j}+\bar{k})}{\sqrt{2}}$$

$$d_3 = \frac{3a(\bar{i}+\bar{k})}{\sqrt{2}}$$

$$d_1 + d_2 + d_3 = \frac{a}{\sqrt{2}}(4\bar{i}+3\bar{j}+5\bar{k})$$

$$|d_1 + d_2 + d_3| = \frac{a}{\sqrt{2}}5\sqrt{2}$$

$$= 5a$$

199. $\bar{a} = \lambda\bar{b} \rightarrow (1)$

take $\bar{a}.\bar{b} = 27$

$\Rightarrow \lambda = 1/3$

From (1) $\bar{a} = \bar{i} + 2\bar{j} + 2\bar{k}$

$\Rightarrow |\bar{a}| = 3$

200. $|\bar{a}| = |\bar{b}| = |\bar{c}| = 1$

$\bar{a}.\bar{b} = \bar{a}.\bar{c} = 0$

and $\bar{b}.\bar{c} = \frac{1}{2}$

201. $\overline{BA} = 2\bar{i} + 4\bar{j} + 8\bar{k}$

$\overline{BA} \times \bar{F} = 4\bar{i} + 6\bar{j} - 4\bar{k}$

$\Rightarrow 2\lambda = -4$

202. $|\overline{AB}| \neq |\overline{DC}|$

203. $\overline{OM} = \frac{\bar{b}+\bar{c}}{2}, \overline{ON} = \frac{\bar{c}+\bar{d}}{2}$,

In || gm, $\bar{a} + \bar{c} = \bar{b} + \bar{d}$

$$\overline{AM} + \overline{AN} = \frac{\bar{b}+\bar{c}-2\bar{a}+\bar{c}+\bar{d}-2\bar{a}}{2}$$

$$= \frac{\bar{a}+\bar{c}+2\bar{c}-2\bar{a}-2\bar{a}}{2}$$

$$= \frac{3}{2}(\bar{c}-\bar{a})$$

204. O,G are collinear

$$\Rightarrow |\overline{OG}|^2 = R^2 - \frac{1}{9}(a^2+b^2+c^2)$$

205. $|\bar{a}+\bar{b}+\bar{c}|^2 = 0$

$|\bar{a}|^2 + |\bar{b}|^2 + |\bar{c}|^2 + 2(\bar{a}.\bar{b} + \bar{b}.\bar{c} + \bar{c}.\bar{a}) = 0$

206. $\overline{OD} = |\overline{OD}|\left(\frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}\right)$

$$= \sqrt{6}\frac{(\bar{i}+\bar{j}+2\bar{k})}{\sqrt{6}}$$

$$= \bar{i} + \bar{j} + 2k$$

207. $\frac{p}{1} = \frac{-2}{q} = \frac{5}{-3}$

208. Orthocentre = centroid = O

$$\frac{\bar{a}+\bar{b}+\bar{c}}{3} = 0$$

$\bar{a} + \bar{b} = -\bar{c}$

209. $\bar{r}.\bar{a} = 9$

$\Rightarrow 2x + 3y + z = 9$

$\bar{r}.\bar{b} = 7$

$\Rightarrow 4x + y = 7$

$\bar{r}.\bar{c} = 6$

$\Rightarrow x - 3y - 7z = 6$

Now use option verification

210. $(\bar{b}-\bar{a})^2 + (\bar{d}-\bar{c})^2 = 4R^2$

$|\bar{b}|^2 + |\bar{a}|^2 + |\bar{d}|^2 + |\bar{c}|^2 - 2(\bar{a}.\bar{b} + \bar{c}.\bar{d}) = 4R^2$

$R^2 + R^2 + R^2 + R^2 - 2(\bar{a}.\bar{b} + \bar{c}.\bar{d}) = 4R^2$

$\Rightarrow (\bar{a}.\bar{b} + \bar{c}.\bar{d}) = 0$

211. Use $|\bar{a}\times\bar{b}|^2 + |\bar{a}.\bar{b}|^2 = |\bar{a}|^2|\bar{b}|^2$

212. $\bar{b} = \lambda\bar{a}$

$|\bar{b}| = \lambda|\bar{a}|$

$\Rightarrow \lambda = 3$

$\bar{b} = 3\bar{a}$

213. $\overline{AC} + \overline{BD} = P\overline{AD}$

Take 'A' as origin

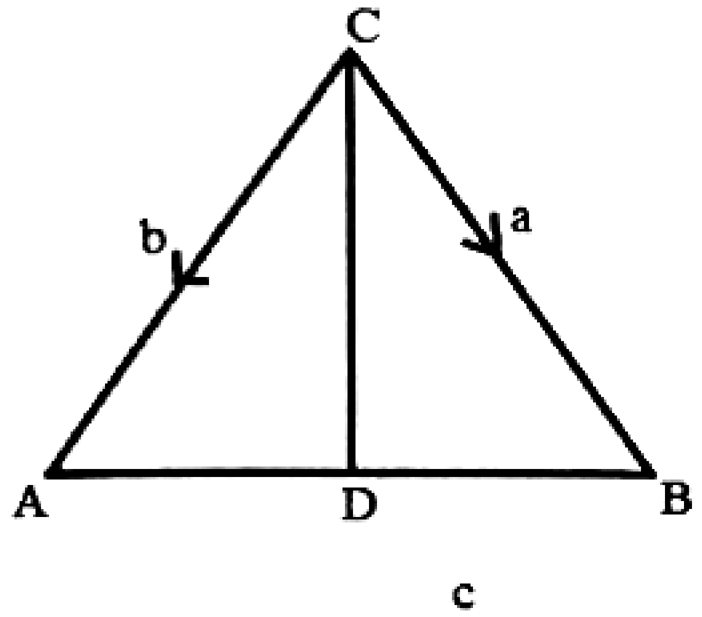
$\bar{c}+\bar{d}-\bar{b}=p\bar{d}$

$\bar{c}-\bar{b}=(p+1)\bar{d}$

$\lambda\bar{d}=(p+1)\bar{d}$

$\lambda=p+1$

214.



$\overline{CD}=\overline{CA}+\overline{AD}$

$=\overline{CA}+\frac{1}{2}\overline{AB}$

$\overline{CD}.\overline{CA}=\left|\overline{CA}\right|^2+\frac{1}{2}\overline{AB}.\overline{CA}$

$=b^2+\frac{1}{2}cb\cos(\pi-A)$

$=b^2-\frac{1}{2}bc\cos A$

$=b^2-\frac{1}{2}bc\left(\frac{b^2+c^2-a^2}{2bc}\right)$

$=\frac{1}{4}\left(3b^2+a^2-c^2\right)$

215. $\bar{b}=x\bar{i}+y\bar{j}+z\bar{k}$

$\bar{a}.\bar{b}=3$

$\Rightarrow x+y+z=3\rightarrow(1)$

take $\bar{c}=\bar{a}\times\bar{b}$

$\Rightarrow y=z, x-z=1, -x+y=-1\rightarrow(2)$

from (1) and (2)

$y=2/3,\ z=2/3,\ x=5/3$

216. Take 'p'as origin

$\overline{PQ}=\bar{a}, \overline{PS}=\bar{b}-\bar{a}$

$\overline{QR}=\bar{b}$

$\Rightarrow \overline{PR}=\bar{a}+\bar{b}$

$\overline{PM}=\frac{\bar{a}+\bar{b}+\bar{a}}{2}$

$=\bar{a}+\frac{\bar{b}}{2}$

and SX:XM = 4:1

$\overline{PX}=\frac{3\left(\bar{a}+\frac{\bar{b}}{2}\right)+\bar{b}-\bar{a}}{5}$

$=\frac{3}{5}\left(\bar{a}+\bar{b}\right)$

take $\overline{SM}=m\left(4\bar{a}-\bar{b}\right)$

$\left(\bar{a}+\frac{\bar{b}}{2}\right)-\left(\bar{b}-\bar{a}\right)=m\left(4\bar{a}-\bar{b}\right)$

$m=1/2$

$\overline{SX}=n\left(4\bar{a}-\bar{b}\right)$

$\frac{3}{5}\left(\bar{a}+\bar{b}\right)-\left(\bar{b}-\bar{a}\right)=n\left(4\bar{a}-\bar{b}\right)$

$n=2/5$

$\therefore m+n=\frac{9}{10}$

217. $\overline{OC}=\frac{\overline{OB}+\overline{OA}}{2}$

$2\overline{OC}=\overline{OB}+\overline{OA}$

take

$\overline{PA}+\overline{PB}=\overline{OA}+\overline{OB}-2\overline{OP}$

$=2\overline{OC}-2\overline{OP}$

$=2\overline{PC}$

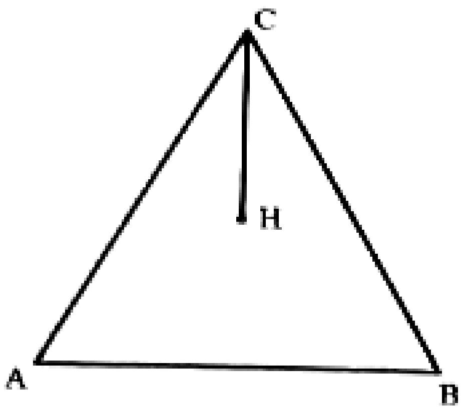
218. $\bar{P}=5\bar{a}+2\bar{b}$

$\bar{q}=\bar{a}-3\bar{b}$

$d_1=6\bar{a}-\bar{b}, d_2=-4\bar{a}-5\bar{b}$

$\left|d_1\right|=15, \left|d_2\right|=\sqrt{593}$

219.



$\overline{OA} = -\bar{i} + 3\bar{j}$

$\overline{OB} = 2\bar{i} + 5\bar{j}$

$\overline{OH} = \bar{i} + 2\bar{j}$

$\overline{OC} = a\bar{i} + b\bar{j}$

take $\overline{CH}.\overline{AB} = 0$

$\Rightarrow 3a + 2b - 7 = 0$

Use option verification

220. $\bar{b} - 2\bar{c} = \lambda\bar{a}$

Squaring on both sides

$|\bar{b}|^2 + 4|\bar{c}|^2 - 4|\bar{b}||\bar{c}|\cos\theta = \lambda^2|\bar{a}|^2$

$\Rightarrow \lambda = 4$

221. $\bar{a} + \bar{b} = 2\bar{i} + (x+1)\bar{j} + 2\bar{k}$

$|\bar{a} + \bar{b}| = |\bar{a}| + |\bar{b}|$

$\sqrt{8 + (x+1)^2} = \sqrt{2 + x^2} + \sqrt{3}$

Use option verification

222. Take $x\bar{a} + y\bar{b} + z\bar{c} = 0$

$\Rightarrow x + 2y + 8z = 0$

$2x + 3y + 13z = 0$

$3x + y + 9z = 0$

On solving we get

$x = -2k, y = -3k, z = k$

$\frac{xy}{z^2} = 6$

223. *Let* $\bar{x} = p\bar{i} + q\bar{j} + r\bar{k}$

take $\bar{x}.\bar{a} = 0$

$3p + 2q + 2r = 0$

take $\bar{x}.\bar{b} = 0$

$18p - 22q - 5r = 0$

Use option verification

224. Take ccross product with $\bar{a}$,

$\bar{a} \times (\bar{x} \times \bar{a}) = \bar{a} \times \bar{b}$

$(\bar{a}.\bar{a})\bar{x} - (\bar{a}.\bar{x})\bar{a} = \bar{a} \times \bar{b}$

$3\bar{x} - (\bar{a}.\bar{x})\bar{a} = \bar{a} \times \bar{b} \rightarrow (1)$

take $|\bar{x} \times \bar{a}| = |\bar{b}|$

$|\bar{x}||\bar{a}|\sin\theta = |\bar{b}|$

S.B.S

$\sin^2\theta = 2/3$

$1 - \cos^2\theta = 2/3$

$\cos^2\theta = 1/3 \rightarrow (2)$

$\bar{a}.\bar{x} = |\bar{a}||\bar{x}|\cos\theta$

$= \pm 1 \rightarrow (3) \quad (\because \textit{from}(2))$

From (1) & (3)

$3\bar{x} \mp \bar{a} = \bar{a} \times \bar{b}$

$\bar{x} = \frac{1}{3}(\bar{a} \times \bar{b} \pm a)$

225. $\bar{a} = \lambda\bar{i} + 3\bar{j} + 5\bar{k}$

$\bar{b} = 2\lambda\bar{i} - \lambda\bar{j} + \bar{k}$

take $\bar{a}.\bar{b} = 0$

226. *Let* $A(x_1, y_1, z_1)$

$B(x_2, y_2, z_2)$

$C(x_3, y_3, z_3)$

G_1 *divides* OG *in* $3:1$

$(2, -1, 2) = \left(\frac{x_1 + x_2 + x_3}{4}, \frac{y_1 + y_2 + y_3}{4}, \frac{z_1 + z_2 + z_3}{4}\right)$

$x_1 + x_2 + x_3 = 8$

$y_1 + y_2 + y_3 = -4$

$z_1 + z_2 + z_3 = 8$

$\therefore \overline{OG} = \frac{8}{3}\bar{i} - \frac{4}{3}\bar{j} + \frac{8}{3}\bar{k}$

227. $|\bar{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$ *rational*

$|\bar{b}| = 6$ *rational*

$\bar{a}.\bar{b} =$ *irrational*

$\sqrt{2}a_1 + 3\sqrt{2}a_2 + 4a_3 = irrational$

$\sqrt{2}(a_1 + 3a_2) + 4a_3 = irrational$

$\Rightarrow a_3 = 0$

$\Rightarrow \bar{a} = a_1\bar{i} + a_2\bar{j}$

228. Given $|\bar{e_1}| = |\bar{e_2}| = 1$ *and* $|\bar{e_1} + \bar{e_2}| = \sqrt{3}$

Squaring on both sides

$|\bar{e_1}|^2 + |\bar{e_2}|^2 + 2(\bar{e_1}.\bar{e_2}) = 3$

$\Rightarrow \bar{e_1}.\bar{e_2} = \frac{1}{2}$

Consider $(2\bar{e_1} - 5\bar{e_2}).(3\bar{e_1} + \bar{e_2})$

$= 6|\bar{e_1}|^2 + 2(\bar{e_1}.\bar{e_2}) - 15(\bar{e_1}.\bar{e_2}) - 5|\bar{e_2}|^2$

$= 6(1) - 13\left(\frac{1}{2}\right) - 5(1)$

$= -\frac{11}{2}$

229. Let

$\overline{OA} = \bar{a}, \overline{OB} = \bar{b}, \overline{OC} = \bar{c}, \overline{OD} = \bar{d}$

Consider Area of $\Delta ABC = \frac{1}{2}|\overline{AB} \times \overline{AC}|$

$= \frac{1}{2}|(\bar{b} - \bar{a}) \times (\bar{c} - \bar{a})|$

$= \frac{1}{2}|\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{c} \times \bar{a}| \rightarrow (1)$

Consider $|\overline{AB} \times \overline{CD} + \overline{BC} \times \overline{AD} + \overline{CA} \times \overline{BD}|$

$= |(\bar{b} - \bar{a}) \times (\bar{d} - \bar{c}) + (\bar{c} - \bar{b}) \times (\bar{d} - \bar{a}) + (\bar{a} - \bar{c}) \times (\bar{d} - \bar{b})|$

$= 2|\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{c} \times \bar{a}|$

Given $|\overline{AB} \times \overline{CD} + \overline{BC} \times \overline{AD} + \overline{CA} \times \overline{BD}|$

$= \lambda(Area\ of\ \Delta ABC)$

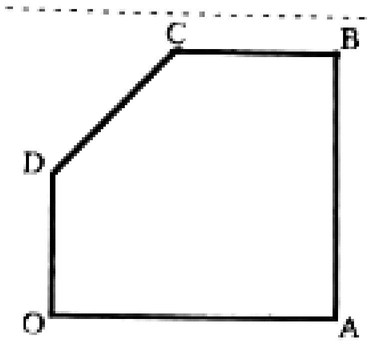
$\Rightarrow 2|\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{c} \times \bar{a}| = \lambda\frac{1}{2}|\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{c} \times \bar{a}|$

$\Rightarrow \lambda = 4$

230. $\bar{a} + \bar{b}$ is angular bisector incase of rhombus

$|\bar{a}| = |\bar{b}|$

231.



$\overline{OA} = \bar{a}, \overline{OB} = \bar{b}, \overline{OC} = \bar{c}, \overline{OD} = \bar{d}$

$\overline{OA} = 2\overline{CB}$

$\overline{OA} = 2(\overline{OB} - \overline{OC})$

$\bar{a} = 2\bar{b} - 2\bar{c}$

$2\bar{c} = 2\bar{b} - \bar{a} \rightarrow (1)$

$3\overline{OD} = \overline{AB}$

$3\overline{OD} = \bar{b} - \bar{a}$

$\bar{a} = \bar{b} - 3\bar{d} \rightarrow (2)$

Consider $\overline{AD} + \overline{OC} + \overline{DC}$

$= \bar{d} - \bar{a} + \bar{c} + \bar{c} - \bar{d}$

$= 2\bar{c} - \bar{a}$

$= 2\bar{b} - \bar{a} - \bar{a}(\because from(1))$

$= 2\bar{b} - 2\bar{a}$

$= 2\bar{b} - 2(\bar{b} - 3\bar{d})(\because from(2))$

$= 2\bar{b} - 2\bar{b} + 6\bar{d}$

$= 6\bar{d}$

232. $\overline{PQ} = \overline{OQ} - \overline{OP}$

$= 3\bar{i} + 4\bar{j}$

$\overline{SR} = \overline{OR} - \overline{OS}$

$= (5 - a)\bar{i} + (7 - b)\bar{j}$

$5 - a = 3$, $7 - b = 4$

$5 - 3 = a$, $7 - 4 = b$

$a = 2$, $b = 3$

233. $\bar{c} = \frac{(\bar{a}.\bar{b})\bar{b}}{|\bar{b}|^2}$

$\bar{c} = \frac{18}{25}\bar{b}$

$|\bar{c}| = \frac{18}{25}$

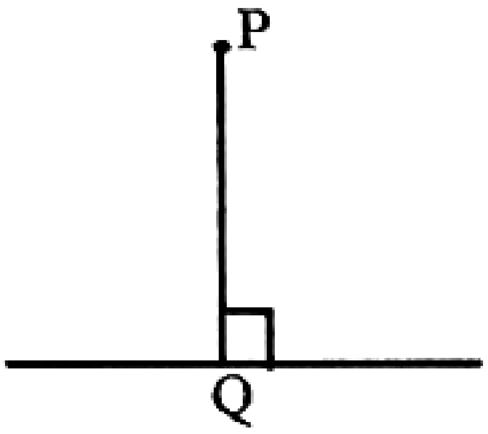
234. $\overline{OP}=5\bar{i}+\bar{j}+3\bar{k}$

$\bar{r}=\left(3\bar{i}+7\bar{j}+\bar{k}\right)+t\left(\bar{j}+\bar{k}\right)$

$Q=\left(3\bar{i}+7\bar{j}+\bar{k}\right)+t\left(\bar{j}+\bar{k}\right)$

$\overline{PQ}=-2\bar{i}+(6+t)\bar{j}+(t-2)\bar{k}\rightarrow(1)$

$\bar{a}=\bar{j}+\bar{k}$



$\overline{PQ}\perp\bar{a}_2$

$-2(0)+(6+t)(1)+(t-2)(1)=0$

$t=-2$

$(1)\Rightarrow\overline{PQ}=-2\bar{i}+4\bar{j}-4\bar{k}$

$\left|\overline{PQ}\right|=\sqrt{4+16+16}$

$=6$

235. $Let\ \overline{OA}=\bar{i}-2\bar{j}+3\bar{k}$

$\overline{OB}=2\bar{i}+3\bar{j}-4\bar{k}$

$\overline{OC}=-3\bar{i}+\bar{j}-5\bar{k}$

$\overline{OD}=a\bar{i}-2\bar{j}+4\bar{k}$

$\overline{AB}=\bar{i}+5\bar{j}-7\bar{k}$

$\overline{AC}=-4\bar{i}+3\bar{j}-8\bar{k}$

$\overline{AD}=(a-1)\bar{i}+\bar{k}$

$Given\ \left[\overline{AB}\quad\overline{AC}\quad\overline{AD}\right]=0$

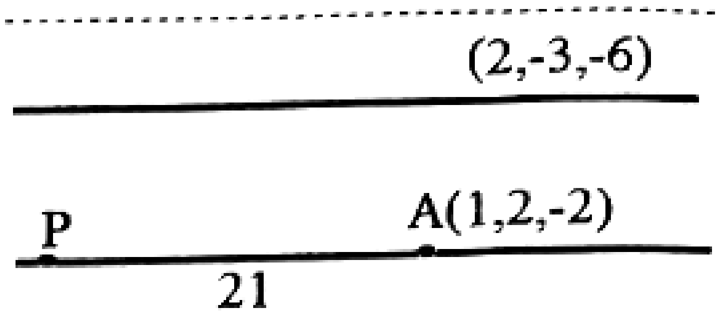
$$\begin{vmatrix}1 & 5 & -7\\ -4 & 3 & -8\\ a-1 & 0 & 1\end{vmatrix}=0$$

$3-5(8a-12)-7(-3a+3)=0$

$19a=42$

$a=\dfrac{42}{19}$

236.



$Equation\ of\ \overline{AP}\ is\ \dfrac{x-1}{2}=\dfrac{y-2}{-3}=\dfrac{z+2}{-6}=\lambda$

$P=\left[2\lambda+1,\ -3\lambda+2,\ -6\lambda-2\right]$

$Given\ AP=21$

$\sqrt{(2\lambda+1-1)^2+(-3\lambda+2-2)^2+(-6\lambda-2+2)^2}=21$

$|7\lambda|=21$

$\lambda=3\quad(or)\quad\lambda=-3$

$If\ \lambda=3\ \ then\ \ p=(7,-7,-20)$

$If\ \lambda=-3\ then\ \ p=(-5,11,16)$

$Position\ vector\ of\ p=-5\bar{i}+11\bar{j}+16\bar{k}$

237conceptual

238. conceptual

239. $l=\left(\bar{i}-2\bar{j}+\bar{k}\right).\left(\bar{i}+3\bar{j}-2\bar{k}\right)$

$l=1-6-2$

$l=-7$

$m=\left(\bar{i}+3\bar{j}-2\bar{k}\right).\left(\bar{i}+\bar{j}+\bar{k}\right)$

$=1+3-2$

$m=2$

$m\bar{b}+l\bar{a}=2\left(\bar{i}-2\bar{j}+\bar{k}\right)-7\left(\bar{i}+\bar{j}+\bar{k}\right)$

$=-5\bar{i}-11\bar{j}-5\bar{k}$

$Consider\ \left[m\bar{b}+l\bar{a}\quad\bar{b}\quad\bar{d}\right]$

$$=\begin{vmatrix}-5 & -11 & -5\\ 1 & -2 & 1\\ 2 & 1 & -1\end{vmatrix}$$

$=-63$

240. $\overline{AB}=\overline{OB}-\overline{OA}$

$=4\bar{i}+7\bar{j}-6\bar{k}$

$\overline{CD}=\overline{OD}-\overline{OC}$

$=-8\bar{i}-14\bar{j}+12\bar{k}$

Let θ be the angle between $\overline{AB}$ and $\overline{CD}$

$$\cos\theta = \frac{\overline{AB}.\overline{AD}}{|\overline{AB}||\overline{AD}|}$$

$$= \frac{-202}{\sqrt{101}\sqrt{404}}$$

$$\cos\theta = -1$$

$$\cos\theta = \cos\pi$$

$$\theta = \pi$$

241. Given $\overline{AB} = x\overline{AC} + y\overline{AD}$

$$\overline{OB} - \overline{OA} = \lambda(\overline{OC} - \overline{OA}) + y(\overline{OD} - \overline{OA})$$

$$\bar{i}(\lambda - 2) + 4\bar{j} + 5\bar{k} = \bar{i}(-6x - 3y) + \bar{j}(2x - 3y) + \bar{k}(3x + 4y)$$

$$\lambda - 2 = -6x - 3y \rightarrow (1)$$

$$4 = 2x - 3y \rightarrow (2)$$

$$5 = 3x + 4y \rightarrow (3)$$

From (2) and (3) we get $x = \frac{31}{17}, y = \frac{-2}{17}$

$$(1) \Rightarrow \lambda = \frac{-146}{17}$$

$$Consider\ 17(\lambda + 9) = 17\left(\frac{-146 + 153}{7}\right) = 7$$

242. conceptual

243. Given $\bar{a} = \bar{i} + \bar{j} + \bar{k}$

let $\bar{b} = x\bar{i} + y\bar{j} + z\bar{k}$

$$(\bar{a}, \bar{b}) = 1 \Rightarrow x + y + z = 1$$

$$\cos(\bar{a}.\bar{b}) = \frac{1}{3} \Rightarrow x^2 + y^2 + z^2 = 1$$

Required number of possible vectors $= {}^{n+r-1}C_{r-1}$

$$= {}^{1+3-1}C_{3-1}$$

$$= {}^3C_2$$

$$= 3$$

244. $$\cos\theta = \frac{|a - 4 - 3|}{\sqrt{a^2 + 4 + 9}\sqrt{1 + 4 + 1}}$$

245. Given $|\bar{a}| = \sqrt{8 + p^2}, |\bar{b}| = 7$

$$\bar{a}.\bar{b} = 4, |\bar{a} \times \bar{b}| = 5\sqrt{17}$$

$$W.K.T.\ \frac{(\bar{a} \times \bar{b})^2 + (\bar{a}.\bar{b})^2}{|\bar{a}|^2 |\bar{b}|^2} = 1$$

$$(5\sqrt{17})^2 + (4)^2 = (8 + p^2)(49)$$

$$425 + 16 = (8 + p^2)(49)$$

$$441 = (8 + p^2)(49)$$

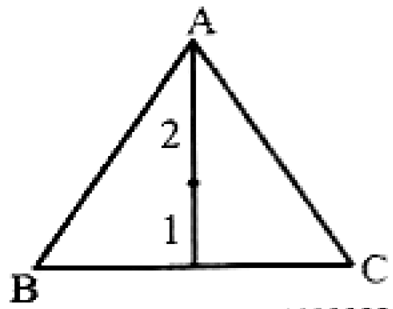
$$9 = 8 + p^2$$

$$p = \pm 1$$

246. $\overline{OB} - \overline{OA} = 2\bar{i} + 2\bar{j} + \bar{k} \rightarrow (1)$

$$\overline{OC} - \overline{OA} = 2\bar{i} + 4\bar{j} + 4\bar{k} \rightarrow (2)$$

$$(1) - (2) \Rightarrow \overline{BC} = 2\bar{j} + 3\bar{k}$$



$$\overline{AD} = \frac{1}{2}\sqrt{2a^2 + 2b^2 - c^2}$$

$$= \frac{1}{2}\sqrt{2(9) + +2(36) - 13}$$

$$= \frac{1}{2}\sqrt{77}$$

$$\overline{AG} = \frac{2}{3}\overline{AD}$$

$$= \frac{2}{3}\left(\frac{1}{2}\right)\sqrt{77}$$

$$= \frac{\sqrt{77}}{3}$$

$$Consider\ \frac{27}{7}|\overline{AG}|^2 + 5$$

$$= \frac{27}{7}\left(\frac{77}{9}\right) + +5$$

$$= 33 + 5$$

$$= 38$$

247. $\bar{i}-2\bar{j}+5\bar{k}=\bar{i}(\alpha+\beta+2\gamma)+\bar{j}(\alpha+2\beta-\gamma)+\bar{k}(\alpha+3\beta+\gamma)$

$\alpha+\beta+2\gamma=1\rightarrow(1)$

$\alpha+2\beta-\gamma=-2\rightarrow(2)$

$\alpha+3\beta+\gamma=5\rightarrow(3)$

Solving (1) ,(2) and (3) we get

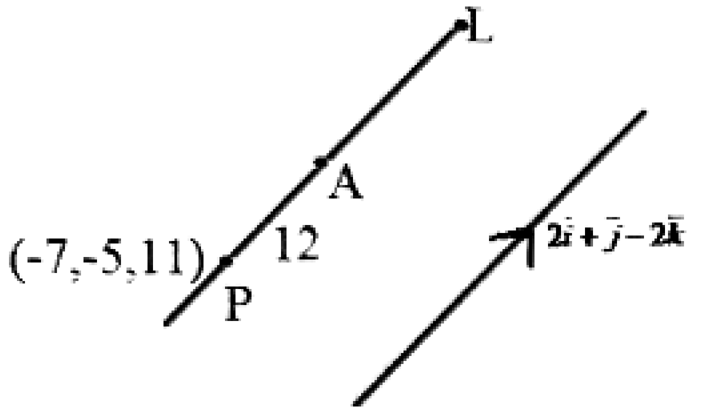
$\alpha=-6, \beta=3, \gamma=2$

Consider $\alpha^2-\beta^2+\gamma^2$

$=36-9+4$

$=31$

248.



Equation of L is $\frac{x+7}{2}=\frac{y+5}{1}=\frac{z-11}{-2}$

$=\lambda$

$A=(2\lambda-7, \lambda-5, -2\lambda+11)$

Given $AP=12$

$\Rightarrow 3|\lambda|=12$

$\lambda=\pm 4$

If $\lambda=4$ *then* $A=(1,-1,3)$

If $\lambda=-4$ *then* $A=(-15,-9,19)$

$\overline{OA}=-15\bar{i}-9\bar{j}+19\bar{k}$

249. *Let* $\bar{a}=2\bar{i}-\bar{j}+2\bar{k}$

$\bar{b}=a\bar{i}+4\bar{j}+b\bar{k}$

Let θ be the angle between the vectors

$$\cos\theta=\frac{\bar{a}.\bar{b}}{|\bar{a}|.|\bar{b}|}$$

$$\cos\theta=\frac{2a-4+2b}{\sqrt{4+1+4}\sqrt{a^2+16+b^2}}$$

$$\cos\theta=\frac{2(a-2+b)}{3\sqrt{a^2+16+b^2}}$$

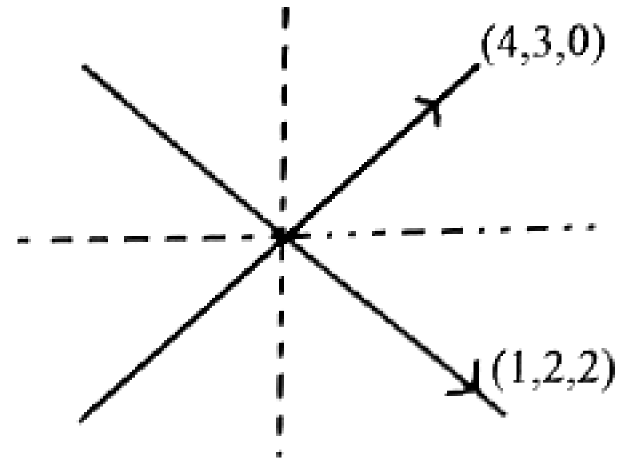
$$\frac{2}{3}=\frac{2(a-2+b)}{3\sqrt{a^2+16+b^2}}$$

$a^2+16+b^2=(a-2+b)^2$

$2a+2b+6=ab$

$2(a+b+3)=ab$

250.



Let $\bar{a}=4\bar{i}+3\bar{j}$

$\bar{b}=\bar{i}+2\bar{j}+2\bar{k}$

Internal angular bisector

$$=\lambda\left(\widehat{a+\hat{b}}\right)$$

$$=\lambda\left(\frac{\bar{a}}{|\bar{a}|}+\frac{\bar{b}}{|\bar{b}|}\right)$$

$$=\lambda\left(\frac{4\bar{i}+3\bar{j}}{5}+\frac{\bar{i}+2\bar{j}+2\bar{k}}{3}\right)$$

$$=\frac{\lambda}{15}\left(17\bar{i}+19\bar{j}+10\bar{k}\right)$$

External angular bisector

$$=\lambda(\widehat{a-\hat{b}})$$

$$=\lambda\left(\frac{4\bar{i}+3j}{5}-\left(\frac{\bar{i}+2\bar{j}+2\bar{k}}{3}\right)\right)$$

$$=\frac{\lambda}{15}\left(7\bar{i}-\bar{j}-10\bar{k}\right)$$

251. $\overline{AB}=\overline{OB}-\overline{OA}$

$=-3\bar{i}+2\bar{j}$

$\overline{AC}=\overline{OC}-\overline{OA}$

$=-2\bar{i}-\bar{j}+3\bar{k}$

$\overline{AD}=\overline{OD}-\overline{OA}$

$=\bar{i}+3\bar{j}+(a+2)\bar{k}$

Volume of tetrahedron $=\frac{1}{6}\left[\overline{AB}\quad\overline{AC}\quad\overline{AD}\right]$

$$\frac{20}{3}=\frac{1}{6}\begin{vmatrix}-3 & 2 & 0\\ -2 & -1 & 3\\ 1 & 3 & a+2\end{vmatrix}$$

$$40=3a+33+4a+14$$

$$7a=-7$$

$$a=-1$$

Integral value of a = -1

252. $\overline{OA}=2\bar{i}-\bar{j}+\bar{k}$

$$\overline{OB}=\bar{i}-3\bar{j}-5\bar{k}$$

$$\overline{OC}=\frac{2(\bar{i}-3\bar{j}-5\bar{k})+3\left(2\bar{i}-\bar{j}+\bar{k}\right)}{2+3}$$

$$=\frac{8\bar{i}-9\bar{j}-7\bar{k}}{5}$$

$$\overline{OM}=\frac{\overline{OA}+\overline{OB}}{2}$$

$$=\frac{3\bar{i}-4\bar{j}-4\bar{k}}{2}$$

Consider 5(position vector of c)

-2(position vecor of M)

=

$$5\left[\frac{8\bar{i}-9\bar{j}-7\bar{k}}{5}\right]-2\left[\frac{3\bar{i}-4\bar{j}-4\bar{k}}{2}\right]$$

$$=5\bar{i}-5\bar{j}-3\bar{k}$$

253. *Given $\bar{A},\bar{B},\bar{C}$ are collinear points*

$$\overline{AB}=\lambda\left(\overline{AC}\right)$$

$$\left(\overline{OB}-\overline{OA}\right)=\lambda\left(\overline{OC}-\overline{OA}\right)$$

$$-5\bar{a}+7\bar{b}-9\bar{c}=\lambda\left[(x-1)\bar{a}-7\bar{b}+(z-3)\bar{c}\right]$$

$$-5=\lambda\left(x-1\right)\rightarrow(1)$$

$$7=-7\lambda\rightarrow(2)$$

$$-9=\lambda(z-3)\rightarrow(3)$$

From (1) ,(2) and (3) , We get

$x=6,\lambda=-1,z=12$

254. Equation of plane passing through the points $(1,-2,-3)$,$(3,-1,4)$,$(-3,2,-5)$ *is*

$$\begin{vmatrix}x-1 & y+2 & z+3\\ 3-1 & -1+2 & 4+3\\ -3-1 & 2+2 & -5+3\end{vmatrix}=0$$

$$\begin{vmatrix}x-1 & y+2 & z+3\\ 2 & 1 & 7\\ -4 & 4 & -2\end{vmatrix}=0$$

$$(x-1)[(-2-28)-(y+2)(-4+28)]+(z+3)(8+4)=0$$

$$(x-1)(-30)-(y+2)(24)+(z+3)(12)=0$$

$$-5(x-1)-4(y+2)+2(z+3)=0$$

$$-5x+5-4y-8+2z+6=0$$

$$5x+4y-2z-3=0$$

By option verification

$$5(-1)+9(4)+14(-2)-3$$

$$=-5+36-28-3$$

$$=36-36$$

$$=0$$

255. conceptual

256. *Let* $\bar{a}=11\bar{i}-2\bar{j}+\alpha\bar{k}$

$$\bar{b}=2\bar{i}+4\bar{j}-2\bar{k}$$

$$given\,(\bar{a},\bar{b})=\frac{\pi}{2}$$

$$\cos\frac{\pi}{2}=\frac{\bar{a}.\bar{b}}{|\bar{a}||\bar{b}|}$$

$$22-8-2\alpha=0$$

$$14=2\alpha$$

$$\alpha=7$$

257. *Let* $\bar{a}=2\bar{i}+3\bar{j}-4\bar{k}$

$$\bar{b}=-\bar{i}+2\bar{j}+\bar{k}$$

$$\bar{a}\times\bar{b}=\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 2 & 3 & -4\\ -1 & 2 & 1\end{vmatrix}$$

$$=11\bar{i}+2\bar{j}+7\bar{k}$$

$$\left|\bar{a}\times\bar{b}\right|=\sqrt{121+4+49}$$

$$=\frac{\sqrt{174}}{2}$$

$$Area=\frac{1}{2}\left|\bar{a}\times\bar{b}\right|=\sqrt{\frac{87}{2}}$$

258. $\overline{OA}=\bar{a}\ ,\overline{OB}=\bar{b}\ ,\overline{OC}=\bar{C}$

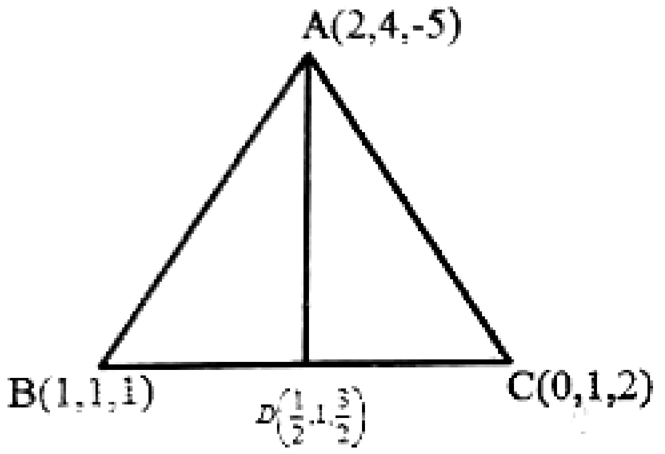
$$\overline{OD}=\frac{2\left(\bar{c}\right)+3\left(\bar{b}\right)}{2+3}$$

$$\overline{OE}=\frac{2\left(\bar{a}\right)+1\left(\bar{c}\right)}{2+1}$$

$$\overline{OD}=\frac{3\left(\frac{2\bar{a}+\bar{c}}{3}\right)+5\left(\frac{2\bar{c}+3\bar{b}}{5}\right)}{3+5}$$

$$=\frac{2\bar{a}+3\bar{b}+3\bar{c}}{8}$$

259.



$$\overline{AD}=\overline{OD}-\overline{OA}$$

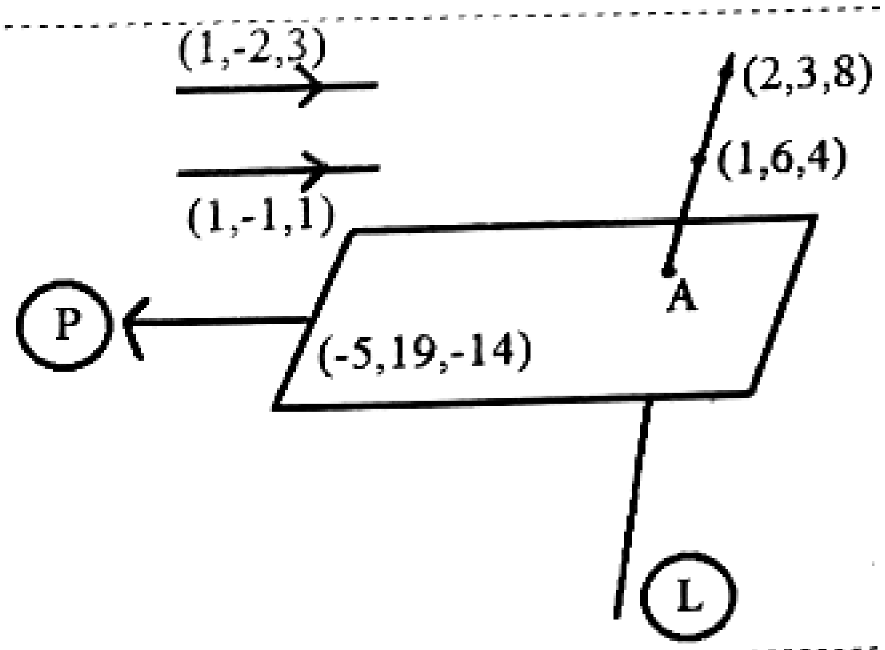
$$=\left(\frac{-3}{2},-3,\frac{13}{2}\right)$$

Unit vector along the median drawn through the vertex A is

$$\pm\frac{\left(\overline{AD}\right)}{\left|\overline{AD}\right|}=\frac{\pm\left(\frac{-3}{2}\bar{i}-3\bar{j}+\frac{13}{2}\bar{k}\right)}{\sqrt{\frac{9}{4}+9+\frac{169}{4}}}$$

$$=\frac{\pm\left(-3\bar{i}-6\bar{j}+13\bar{k}\right)}{\sqrt{214}}$$

260.



$$\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 1 & -2 & 3\\ 1 & -1 & 1\end{vmatrix}=\bar{i}\left(-2+3\right)-\bar{j}(1-3)+\bar{k}(-1+2)$$

$$=\bar{i}+2\bar{j}+\bar{k}$$

Equation of plane p is

$$1(x+5)+2(y-19)+1(z+14)=0$$

$$x+2y+z-19=0\rightarrow(1)$$

Equation of L is

$$\frac{x-2}{1}=\frac{y-3}{-3}=\frac{z-8}{4}=\lambda$$

$$A=(\lambda+2,\ -3\lambda+3,4\lambda+8)$$

clearly A lies on (1)

$$\lambda+2+2(-3\lambda+3)+4\lambda+8-19=0$$

$$-\lambda-3=0$$

$$\lambda=-3$$

$$\therefore A=(-3+2,-3(-3)+3,\ 4(-3)+8)$$

$$=(-1,12,-4)$$

$$\overline{OA}=-\bar{i}+12\bar{j}-4\bar{k}$$

261. $Given\left|\bar{a}\right|=\left|\bar{b}\right|=\left|\bar{c}\right|=1$

$$\left|\bar{a}-\bar{b}\right|^2+\left|\bar{a}-\bar{c}\right|^2=10$$

$$\left|\bar{a}\right|^2+\left|\bar{b}\right|^2-2\left(\bar{a}.\bar{b}\right)+\left|\bar{a}\right|^2+\left|\bar{c}\right|^2-2\left(\bar{a}.\bar{c}\right)=10$$

$$\Rightarrow\bar{a}.\bar{b}+\bar{a}.\bar{c}=-3$$

Consider $\left|\bar{a}+2\bar{b}\right|^2+\left|2\bar{a}+\bar{c}\right|^2$

$$\left|\bar{a}\right|^2+4\left|\bar{b}\right|^2+4\left(\bar{a}.\bar{b}\right)+4\left|\bar{a}\right|^2+\left|\bar{c}\right|^2+4\left(\bar{a}.\bar{c}\right)$$

$$=10+4\left[(\bar{a}.\bar{b})+\left(\bar{a}.\bar{c}\right)\right]$$

$$=10+4(-3)$$

$$=-2$$

Statement I is false

Consider $\left|2\bar{a}+3\bar{b}\right|^2+\left|3\bar{a}+2\bar{c}\right|^2$

$$=4\left|\bar{a}\right|^2+9\left|\bar{b}\right|^2+12\left(\bar{a}.\bar{b}\right)+9\left|\bar{a}\right|^2+4\left|\bar{c}\right|^2+12\left(\bar{a}.\bar{c}\right)$$

$$=26+12\left[\left(\bar{a}.\bar{b}\right)+\left(\bar{a}.\bar{c}\right)\right]$$

$$=26+12(-3)$$

$$=-10$$

Statement II is false.

262. $\begin{vmatrix} \bar{i} & \bar{j} & \bar{k} \\ 2 & 3 & 4 \\ 1 & 1 & -1 \end{vmatrix}$

$= \bar{i}(-3-4) - \bar{j}(-2-4) + \bar{k}(2-3)$

$= -7\bar{i} + 6\bar{j} - \bar{k}$

$dr's$ of line$(-7, 6, -1)$

Equation of line is $\frac{x-16}{-7} = \frac{y+9}{6} = \frac{z-0}{-1} = \lambda$

$x = -7\lambda + 16, y = 6\lambda - 9, z = -\lambda$

$\therefore \bar{r} = (-7\lambda + 16)\bar{i} + (6\lambda - 9)\bar{j} + (-\lambda)\bar{k}$

263. $\overline{OA} = \bar{a}, \overline{OB} = \bar{b}, \overline{OC} = \bar{c}$

$\overline{OD} = \frac{3\bar{c} + \bar{b}}{4}$

$\overline{OE} = \frac{4\left(\frac{3\bar{c}+\bar{b}}{4}\right) + 1(\bar{a})}{4+1}$

$\overline{OE} = \frac{\bar{a} + \bar{b} + 3\bar{c}}{5}$

$\overline{OE} = \frac{3(\overline{OF}) + 2(\overline{OB})}{3+2}$

$\frac{\bar{a} + \bar{b} + 3\bar{c}}{5} = \frac{3(\overline{OF}) + 2(\overline{OB})}{5}$

$\overline{OF} = \frac{1}{3}(\bar{a} - \bar{b} + 3\bar{c})$

264. Given $\left(\frac{7}{3}+\beta\right)\bar{i} - \bar{j} + (\alpha+\gamma)\bar{k} = \bar{i}\left(\frac{5}{3}\alpha+1\right) + \bar{j}\left(\frac{5}{3}+2\beta+\gamma\right) + \bar{k}\left(\frac{-5}{3}+\beta+3\right)$

$\frac{7}{3} + \beta = \frac{5}{3}\alpha + 1$

$5\alpha - 3\beta - 4 = 0 \to (1)$

$-1 = \frac{5}{3} + 2\beta + \gamma$

$6\beta + 3\gamma + 8 = 0 \to (2)$

$\alpha + \gamma = \frac{-5}{3} + \beta + 3$

$3\alpha - 3\beta + 3\gamma - 4 = 0 \to (3)$

From (1), (2) and (3) We get $\alpha = 0, \beta = \frac{-4}{3}, \gamma = 0$

Consider $5\alpha - 9\beta + 13\gamma = 5(0) - 9\left(\frac{-4}{3}\right) + 13(0)$

$= 12$

265. Given $\bar{r} = (2\bar{i} + \bar{j} + 2\bar{k}) + \lambda(-\bar{i} - 3\bar{k}) + \mu(\bar{i} - \bar{j} + 2\bar{k})$

Which is of the form $\bar{r} = \bar{a} + \lambda\bar{b} + \mu\bar{c}$

Let $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$, $\bar{a} = 2\bar{i} + \bar{j} + 2\bar{k}$,

$\bar{b} = -\bar{i} - 3\bar{k}, \bar{c} = \bar{i} - \bar{j} + 2\bar{k}$

Required equation is $(\bar{r} - \bar{a}).(\bar{b} \times \bar{c}) = 0$

$\begin{vmatrix} x-2 & y-1 & z-2 \\ -1 & 0 & -3 \\ 1 & -1 & 2 \end{vmatrix} = 0$

$(x-2)(-3) - (y-1)(-2+3) + (z-2)(1) = 0$

$\Rightarrow 3x + y - z = 5$

266. $|\bar{a}| = \sqrt{6}, |\bar{b}| = \sqrt{11}$

W.K.T. $\bar{a}.\bar{b} = |\bar{a}||\bar{b}|\cos\theta$

$\bar{x} = \left(\frac{\sqrt{6}\sqrt{11}\cos\theta}{11}\right)(\bar{i} - \bar{j} + 3\bar{k})$

$= \sqrt{\frac{6}{11}}\cos\theta(\bar{i} - \bar{j} + 3\bar{k})$

$\bar{y} = \left(\frac{\sqrt{6}\sqrt{11}\cos\theta}{6}\right)(2\bar{i} + \bar{j} - \bar{k})$

$= \sqrt{\frac{11}{6}}\cos\theta(2\bar{i} + \bar{j} - \bar{k})$

Consider $x^2 + y^2$

$\frac{6}{11}\cos^2\theta(1+1+9) + \frac{11}{6}\cos^2\theta(4+1+1)$

$= \cos^2\theta(6+11)$

$= 17\cos^2\theta$

267. $\cos\theta = \frac{|0+5+0|}{\sqrt{1+4}\sqrt{25+16}}$

$\cos\theta = \frac{5}{\sqrt{5}\sqrt{41}}$

$\cos\theta = \frac{\sqrt{5}}{\sqrt{41}}$

$\theta = \cos^{-1}\left(\sqrt{\frac{5}{41}}\right)$

268. $Volume = Base\,area \times Height$

$$\left[\bar{a}\ \bar{b}\ \bar{c}\right] = \left|\bar{a}\times\bar{b}\right|\times h$$

$$h = \frac{\left[\bar{a}\ \bar{b}\ \bar{c}\right]}{\left|\bar{a}\times\bar{b}\right|}$$

269. $x+2y+3=4x+6y+10$

$3x+4y+7=0......(1)$

$5x-y+2=2x-10y-4$

$3x+9y+6=0......(2)$

From (1) and (2) $x=\dfrac{-13}{5}\quad y=\dfrac{1}{5}$

270. ΔABC is equilateral

$\Rightarrow orthocentre = centroid$

271. $$\pi_1 = \begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 1 & 2 & 0\\ 0 & 3 & -2\end{vmatrix} = -4\bar{i}+2\bar{j}+3\bar{k}$$

$$\pi_2 = \begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 0 & 1 & 2\\ -2 & 0 & 3\end{vmatrix} = 3\bar{i}-4\bar{j}+2\bar{k}$$

now find angle between π_1 *and* π_2

272. $\bar{a}\times\left(\bar{b}\times\bar{c}\right)$ is $\perp^r$ to a and $\bar{b}\times\bar{c}$

Required vector $=\bar{a}\times\left(\bar{b}\times\bar{c}\right)$

273. $\overline{OG}=\dfrac{\overline{OA}+\overline{OB}+\overline{OC}}{3}=-2\bar{j}$

$BC^2+CA^2+AB^2+9\left(OG^2\right)$

274. $\overline{OA}=7\bar{i}-4\bar{j}+5\bar{k}$

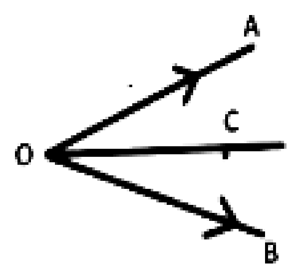
$G_1 = Centriod\ of\ BCD$

$G = Centriod\ of\ ABCD$

$\overline{OG_1}=-\bar{i}+4\bar{j}-3\bar{k}$

$\overline{OG}=\dfrac{3\overline{OG_1}+\overline{OA}}{4}$

275.



$\hat{a}=\dfrac{\bar{i}+2\bar{j}-2\bar{k}}{3}$

$\hat{b}=\dfrac{-2\bar{i}-3\bar{j}+6\bar{k}}{7}$

$\overline{OC}=\sqrt{42}\dfrac{\hat{a}+\hat{b}}{\left|\hat{a}+\hat{b}\right|}$

$=\bar{i}+5\bar{j}+4\bar{k}$

276. $\bar{a}.\bar{b}=-7$

$\cos\theta=\dfrac{-7}{14}=\dfrac{-1}{2}\Rightarrow\theta=120^0$

$\dfrac{\left|\bar{a}\times\bar{b}\right|}{\left|\bar{a}.\bar{b}\right|}=\dfrac{14.\frac{\sqrt{3}}{2}}{7}=\sqrt{3}$

277.

$\bar{a}=2\bar{i}+3\bar{j}+6\bar{k}$

$\cos\theta=\dfrac{4}{21}$

$\dfrac{4}{\cancel{7}\left|\bar{b}\right|}=\dfrac{4}{2\cancel{1}}$

$\left|\bar{b}\right|=3$

$\left|\bar{a}+\bar{b}\right|=\sqrt{16}$

Now take option verification

278. $\bar{r}=x\bar{i}+y\bar{j}+z\bar{k}$ *plane is* $\bar{r}.\bar{m}=q\Rightarrow 2x+6y-9z=-1$

$p=\dfrac{\left|2+12-27+1\right|}{11}=\dfrac{12}{11}$

$q=\dfrac{1}{11}$

$p-q=1$

279. $\overline{OA}=2\bar{i}-3\bar{j}+2\bar{k}$

$\overline{OB}=3\bar{i}-\bar{j}-2\bar{k}$

$\overline{OC}=\dfrac{2\left(\overline{OB}\right)+3\left(\overline{OA}\right)}{2+3}$

$\overline{OP}=2\bar{i}-\bar{j}+\bar{k}$

Then find $\left|\overline{CP}\right|$

280. $\frac{2x+y}{2}=\frac{3}{1}=\frac{9}{y-x}$

$2x+y=6$

$3y-3x=9$

by solving we get $x=1$, $y=4$

281. $\left(\bar{a}\times\bar{b}\right).\bar{c}=\left(\bar{a}\times\bar{b}\right).\bar{d}$

282. $\bar{a}=\bar{i}+2\bar{j}+3\bar{k}$

$\bar{b}=\bar{i}-2\bar{j}-3\bar{k}$

A1 is the area of the quadrilateral having $\bar{a},\bar{b}$ as its diagonals $=\left|\bar{a}\times\bar{b}\right|=2\sqrt{13}$

$$a\times b=\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 1 & 2 & 3\\ 1 & -2 & -3\end{vmatrix}$$

$$=2\left(3\bar{j}-2\bar{k}\right)$$

A2 is The are of the Parallelogram having $\bar{a},\bar{b}$ as its two adjacent sides

$\frac{1}{2}\left|\bar{a}\times\bar{b}\right|=\sqrt{13}$

283. $$\frac{1}{2}\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ 3 & -1 & \lambda\\ \lambda & 1 & -3\end{vmatrix}=\frac{\sqrt{195}}{2}$$

$\Rightarrow\lambda^2=-24\left(Not\ possible\right)\left(or\right)\lambda^2=4$

$\therefore$ '2' distinct values for λ

284. $$\bar{r}=\frac{-(3\bar{a}-2\bar{b})\left|\bar{r}\right|}{\left|3\bar{a}-2\bar{b}\right|}$$

285. $\overline{OG}=\bar{i}$

$\overline{OA}=2\bar{i}+\bar{j}+\bar{k},\overline{OB}=2\bar{i}+4\bar{j}-4\bar{k}$

$wkt\ \overline{OA}+\overline{OB}+\overline{OC}=3\overline{OG}$

$\Rightarrow\overline{OC}=-\bar{i}-5\bar{j}+3\bar{k}$

$Now\ AG^2+BG^2+CG^2$

$\Rightarrow\ 3+33+38=74$

286. $\bar{a}+\bar{b}=(t-2)\bar{i}+7\bar{j}$

$\left|\bar{a}+\bar{b}\right|=25$

$t_1=26,t_2=-22$

Now

$t_1+t_2=26-22$

$=4$

287. By using formula.

$\bar{a}-\frac{(\bar{a}.\bar{b})\bar{b}}{\left|\bar{b}\right|^2}(req.vector)$

$=-\bar{i}+7\bar{j}+10\bar{k}$

288. $\bar{r}=x\bar{a}+y\bar{b}$

$\bar{r}=(2x+3y)\bar{i}+(-3x+2y)\bar{j}+(-5x-5y)\bar{k}$

$and\ \bar{r}.\bar{c}=0\Rightarrow x-4y=0$

$\left|\bar{r}\right|=\sqrt{94}\Rightarrow 846y^2=94$

$y=\frac{1}{3}$

$Now\left|\bar{r}.\bar{b}\right|=138.y$

$=138.\frac{1}{3}$

$=46$

289. $\bar{a}+\bar{b}+\bar{c}+\bar{d}=m\bar{d}-\bar{c}+\bar{c}+\bar{d}$

$\bar{a}+\bar{b}+\bar{c}+\bar{d}=n\bar{d}-\bar{d}+\bar{a}+\bar{d}$

$\bar{a}\left(n+1\right)=\left(m+1\right)\bar{d}$

$n=-1,\ m=-1$

$\therefore\bar{a}+\bar{b}+\bar{c}+\bar{d}=0\rightarrow 1$

Consider $3\bar{a}+2\bar{b}+2\bar{c}+\bar{d}$

$=\bar{a}+\bar{a}+\bar{b}+\bar{c}+\bar{a}+\bar{b}+\bar{c}+\bar{d}$

$=\bar{a}+\bar{a}+\bar{b}+\bar{c}+0$

$=\bar{a}-\bar{d}\ (\because from 1)$

290. Given $\overline{OA}=2\bar{i}+\bar{j}-\bar{k}$

$\overline{OB}=\bar{i}-3\bar{j}+5\bar{k}$

$\overline{OC}=-3\bar{i}+4\bar{j}+4\bar{k}$

$\overline{AB}=-\bar{i}-4\bar{j}+6\bar{k}$

$|\overline{AB}|=\sqrt{53}$

$\overline{BC}=-4\bar{i}+7\bar{j}-\bar{k}$

$|\overline{BC}|=\sqrt{66}$

$\overline{CA}=5\bar{i}-3\bar{j}-5\bar{k}$

$|\overline{CA}|=\sqrt{59}$

$\therefore ABC$ is scalene triangle

291. $\bar{r}=(1-t)(\bar{i}-9\bar{k})+t(7\bar{j}+\bar{k})$

$\bar{r}=(1-t)\bar{i}+7t\bar{j}+(t-9+9t)\bar{k}$

$L\equiv\bar{r}=(1-t)\bar{i}+7t\bar{j}+(10t-9)\bar{k}$

$\pi\equiv(r-\bar{a}).\hat{n}=0$

$\pi\equiv(r-(6\bar{i}+\bar{j})).(\bar{i}+\bar{j}+\bar{k})=0$

$((x-6)\bar{i}+(y-1)\bar{j}+z\bar{k}).(\bar{i}+\bar{j}+k)=0$

$x-6+y-1+z=0$

$x+y+z-7=0$

$(a,b,c)=(1,1,1)$

$\frac{x-1}{-1}=t\ ,\ \frac{y}{7}=t\ ,\ \frac{z+9}{10}=t$

$(l,m,n)=(-1,7,10)$

$$\sin\theta=\frac{|-1+7+10|}{\sqrt{1+1+1}\sqrt{1+49+100}}$$

$$\sin\theta=\frac{16}{\sqrt{3}\ \ 5\sqrt{6}}$$

$$=\frac{8\sqrt{2}}{15}$$

292. Required vector $=\frac{\overline{AB}\times\overline{AC}}{|\overline{AB}\times\overline{AC}|}$

293. Given $\bar{a}+\bar{b}+\bar{c}=0$

$\bar{a}=-(\bar{b}+\bar{c})$

$\bar{a}=-4\bar{i}+3\bar{j}$

Clearly $\bar{a}\times\bar{b}=\bar{b}\times\bar{c}=\bar{c}\times\bar{a}=3\bar{i}+4\bar{j}-\bar{k}$

$|\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}|=|3(3\bar{i}+4\bar{j}-\bar{k})|$

$=3\sqrt{26}$

$=\sqrt{234}$

294. $\overline{OA}=2\vec{i}+3\vec{j}-\vec{k}$ *and* $\overline{OB}=\vec{i}-\vec{j}+2\vec{k}$

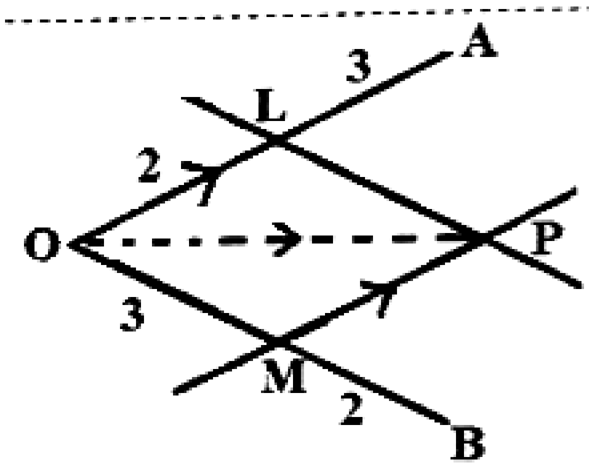
$\overline{AB}=\overline{OB}-\overline{OA}=-\vec{i}-4j+3\vec{k}$

$|\overline{AB}|=\sqrt{1+16+9}=\sqrt{26}$

unit vector along $\overline{BA}$ in the direction $\overline{AB}$ is

$\frac{1}{\sqrt{26}}(-\vec{i}-4\vec{j}+3\vec{k})$.

295.



$\overline{OA}=-3\vec{i}-3\vec{j}+4\vec{k},\overline{OB}=4\vec{i}-4\vec{j}-3\vec{k}$

$\overline{OL}=\frac{2}{5}(-3\vec{i}-3\vec{j}+4\vec{k})$

$\overline{OM}=\frac{3}{5}(4\vec{i}-4\vec{j}-3\vec{k})$

$\overline{OP}=\overline{OL}+\overline{OM}\ (OLMP\ \|\ \text{gm})$

$=\frac{1}{5}(6\vec{i}-18\vec{j}-\vec{k})$

$|\overline{OP}|=\frac{1}{5}\sqrt{36+324+1}$

$=\frac{1}{5}\sqrt{361}=\frac{19}{5}$

296. $\vec{i}\times(\vec{a}\times\vec{i})+\vec{j}\times(\vec{a}\times\vec{j})+\vec{k}\times(\vec{a}\times\vec{k})=2\vec{a}$

$Given \Rightarrow [2\vec{a}]^2=440$

$\Rightarrow |\vec{a}|^2=110$

$\Rightarrow \lambda^2+61=110$

$\Rightarrow \lambda^2=110-61=49$

$\Rightarrow \lambda=7$

297. The vector equation of the plane is

$\Rightarrow \vec{r}.\vec{q}=\vec{p}.\vec{q}$

$\Rightarrow \vec{r}.\frac{\vec{q}}{|\vec{q}|}=\vec{p}.\frac{\vec{q}}{|\vec{q}|}\rightarrow (1)$

$\therefore$ Perpenduclar distance from $(0,0,0)$ to plane (1)

is $(4\vec{i}-\vec{j}+\vec{k}).\frac{9\vec{i}-2\vec{j}+6\vec{k}}{\sqrt{81+4+36}}$

$=\frac{36+2+6}{11}$

$=\frac{44}{11}=4.$

298. $\vec{a}-\vec{b}+\vec{c}=11\vec{i}+(y-6)\vec{j}-2\vec{k}$

$|\vec{a}-\vec{b}+\vec{c}|=\sqrt{141}$

$\Rightarrow 121+(y-6)^2+4=141$

$\Rightarrow y=10,2$

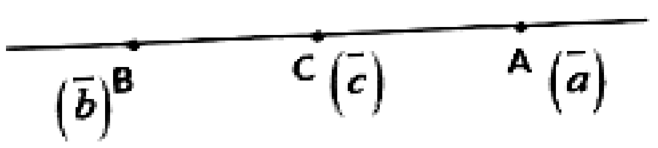
$\therefore |y_1-y_2|=|10-2|=8$

299. $\bar{a}=i+2j-3k, \bar{b}=2i-3j-5k$

$\bar{a}-\bar{b}=i+5j+2k$

$\therefore |\bar{a}-\bar{b}|>|\bar{b}|-|\bar{a}|$

300.



Given points $\overline{OA}=i-j+2k=\bar{a}$

$\overline{OB}=i+2j-2k=\bar{b}$

$\overline{AB}=3j-4k$

Let $\overline{OC}=\bar{c}$

Equation of lines AB is $\bar{r}=\bar{b}+t(\overline{AB})$

$\bar{r}-\bar{b}=t\overline{AB}$

Take $\bar{r}=\bar{c}\Rightarrow \bar{c}-\bar{b}=t\overline{AB}$

$\overline{BC}=t\overline{AB}$

$|\overline{BC}|=|t||AB|$

$10=|t|(5)$

$|t|=2$

$t=\pm 2$

The P.V of C is

$\bar{c}=b+t\overline{AB}$

$=i+2j-2k\pm 2(3j-4k)$

$=i+8j-10k$ or $i-4j+6k$

301. $volume=2 \Rightarrow \frac{1}{6}[\bar{a}\ \bar{b}\ \bar{c}]=2$

$$\Rightarrow \begin{vmatrix}1 & -\lambda & 1\\ \lambda & -1 & -1\\ 1 & 1 & \lambda\end{vmatrix}=12$$

$\Rightarrow \lambda^3+\lambda-10=0 \Rightarrow \lambda=2\ (\lambda\in z)$

$|\lambda\bar{i}-3\lambda\bar{j}+3\bar{k}|=|2\bar{i}-6\bar{j}+3\bar{k}|=7$

302. $$(\bar{a}\times\bar{b}).(\bar{b}\times\bar{c})=\begin{vmatrix}\bar{a}.\bar{b} & \bar{a}.\bar{c}\\ \bar{b}.\bar{b} & \bar{b}.\bar{c}\end{vmatrix}$$

$$=\begin{vmatrix}-23 & 31\\ 50 & -58\end{vmatrix}$$

$=-216$

303. $$Normal\ to\ \pi_1\ is \begin{vmatrix}i & j & k\\ 1 & 1 & 0\\ 0 & 1 & 1\end{vmatrix}$$

$=i(1-0)-j(1-0)+k(1)$

$=i-j+k=\overline{n_1}$

$$Normal\ to\ \pi_2\ is \begin{vmatrix}i & j & k\\ 1 & -1 & 0\\ 1 & 1 & -1\end{vmatrix}$$

$=i+j+2k=\overline{n_2}$

$\therefore \bar{a} \parallel \overline{n_1} \times \overline{n_2}$

$\bar{a} = t\left(\overline{n_1} \times \overline{n_2}\right)$

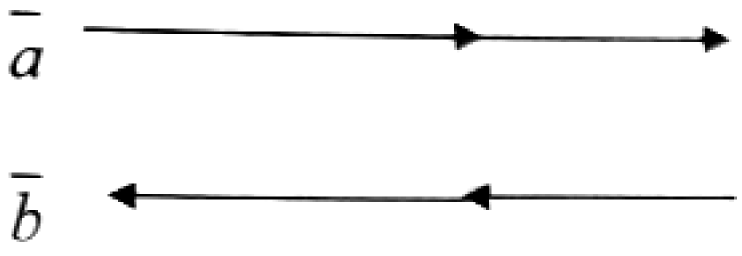
$= t(-3i - j + 2k)$

$|\bar{a}| = |t|\sqrt{9+1+4}$

$t = \pm 1$

$\therefore \bar{a} = \pm(-3i - j + 2k)$

304. Since t < 0



Unlike vectors

Clearly. $|\bar{a}| \le |\bar{b}|$ or $|\bar{a}| > |\bar{b}|$

305. $\bar{a}, \bar{b}, \bar{c}$ lies on same plane

$\therefore \bar{c} = x\bar{a} + y\bar{b}$ $(\because L.C)$

306. $2(\bar{a} \times \bar{b}) + 12(\bar{a} \times \bar{b}) = xi + yj + z\bar{k}$

$14\left(\bar{a} \times \bar{b}\right) = xi + yj + z\bar{k}$

$\bar{a} \times \bar{b} = 25\bar{i} + 50\bar{j} + 25\bar{k}$

$\therefore x + y + z = 14(25+50+25) = 1400$

307. $|\bar{a} - \bar{b}| = 1$

S.O.B.S

$|\bar{a}|^2 + |\bar{b}|^2 - 2\bar{a}.\bar{b} = 1$

$\Rightarrow (\bar{a}, \bar{b}) = 60^0$

W.K.T. $|\bar{a} + \bar{b}|^2 + |\bar{a} - \bar{b}|^2 = 2\left[|\bar{a}|^2 + |\bar{b}|^2\right]$

$\Rightarrow |\bar{a} + \bar{b}|^2 = 4 - 1 = 3$

$\Rightarrow |\bar{a} + \bar{b}| = \sqrt{3}$

Now, $2|\bar{a} + \bar{b}|.\cos\frac{\theta}{2}$

$= 2\sqrt{3}\,\frac{\sqrt{3}}{2} = 3$

308. $\begin{vmatrix} 2 & 3 & -1 \\ 4 & -1 & 3 \\ p & 1 & -1 \end{vmatrix} = 0$

$p = -\frac{1}{2}$

$|\bar{a} \times \bar{c}| = \frac{3\sqrt{10}}{2}$

309. Diagonals are bisect each other

Mid pt of AC=Mid pt of BD

Then C=(1,0,1)

Let P and Q are trisection pts of AC

P divides AC in the ration 1:2

$P = \left(\frac{1+4}{3}, \frac{2}{3}, \frac{1}{3}\right)$

$\therefore \overline{OP} = \frac{1}{3}\left(5\bar{i} + 2\bar{j} + \bar{k}\right)$

310. Let $\overline{OA} = \bar{a} + \bar{b} + \bar{c}$, $\overline{OB} = \bar{a} - \bar{b} + \overline{3c}$

$\overline{OC} = 2\bar{a} - \bar{b} + \bar{c}$ and $\overline{OD} = \bar{a} - \overline{2b} + \overline{4c}$

equation of $\overline{AB}$ is $\bar{r} = \bar{a} + \bar{b} + \bar{c} + t\left(-2\bar{b} - 2\bar{c}\right) \to (1)$

equation of $\overline{CD}$ is $\bar{r} = \overline{2a} - \bar{b} + \bar{c} + s\left(\overline{-a} - \bar{b} + \overline{3c}\right) \to (2)$

at the point of intersection the value of $\bar{r}$ is equal

$\Rightarrow \bar{a} + \bar{b} + \bar{c} + t\left(-2\bar{b} + 2\bar{c}\right) = \overline{2a} - \bar{b} + \bar{c} + s\left(\overline{-a} - \bar{b} - \overline{3c}\right)$

compare b.s $\bar{a}$ coefficients

$1 = 2 - s \Rightarrow s = 1$

$\bar{r} = 2\bar{a} - \bar{b} + \bar{c} + 1\left(-\bar{a} - \bar{b} + 3\bar{c}\right)$

$= \bar{a} - 2\bar{b} + 4\bar{c}$

311. The equation of the req plane

$\bar{r}.\left(i - 2\bar{j} + 3\bar{k} + \lambda\left(3\bar{i} + \bar{j} - 2\bar{k}\right)\right) = 5 + 7\lambda$

$\Rightarrow \left(xi + yj + z\bar{k}\right).(3\lambda + 1)i + (\lambda - 2)j + (-2\lambda + 3)\bar{k}$

$= 7\lambda + 5$

$\Rightarrow (3\lambda + 1)x + (\lambda - 2)y + (3 - 2\lambda) = 7\lambda + 5$

$\Rightarrow 6\lambda + 2 - 3\lambda + 6 + 3 - 2\lambda = 7\lambda + 5$

$\Rightarrow \boxed{\lambda = 1}$

req. plane is

$\bar{r}.\left(4\bar{i} - \bar{j} + \bar{k}\right) = 12$

312. $\bar{a}.\bar{b}=0$, $\bar{b}.\bar{c}=0$

$\left|\bar{a}+\bar{b}+\bar{c}\right|=4\sqrt{3}$

s.o.b.s

$\Rightarrow\left|\bar{a}\right|^2+\left|\bar{b}\right|^2+\left|\bar{c}\right|^2+2\bar{a}.\bar{b}+2\bar{b}.\bar{c}+2\bar{c}.\bar{a}=48$

$\Rightarrow 4+9+25+0+0+2.\left|\bar{c}\right|\left|\bar{a}\right|\cos\left(\bar{a},\bar{c}\right)=48$

$\Rightarrow 2.2.5.\cos\left(\bar{a},\bar{c}\right)=10$

$\Rightarrow\cos\left(\bar{a},\bar{c}\right)=\frac{1}{2}$

$\boxed{\left(\bar{a},\bar{c}\right)=\frac{\pi}{3}}$

313. $\bar{d}=x\left(\bar{b}\times\bar{c}\right)-\frac{7}{9}\left(\bar{c}\times\bar{a}\right)+z\left(\bar{a}\times\bar{b}\right)$

taking dot product with $\bar{a}$

$\bar{d}.\bar{a}=x\left(\bar{b}\times\bar{c}\right).\bar{a}-\frac{7}{9}\left(\bar{c}\times\bar{a}\right).\bar{a}+z\left(\bar{a}\times\bar{b}\right).\bar{a}$

$\bar{d}.\bar{a}=x[a\ b\ c]-0+0$

$x=\frac{\bar{d}.\bar{a}}{[a\ b\ c]}=\frac{2}{9}$

314. $\overline{OP}=\bar{i}+2\bar{j}-7\bar{k}$

$\overline{OQ}=5\bar{i}-3\bar{j}+4\bar{k}$

$\overline{PQ}=\overline{OQ}-\overline{OP}=4\bar{i}-5\bar{j}+11\bar{k}$

let $\overline{OC}=\bar{k}$ is vector on $Z-axis$

$\cos\theta=\frac{\overline{PQ}.\overline{OC}}{\left|\overline{PQ}\right|\left|\overline{OC}\right|}$

$=\frac{11}{\sqrt{16+25+121}\sqrt{1}}$

$\cos\theta=\frac{11}{\sqrt{162}}$

315. $\left|\bar{a}\right|=\left|\bar{b}\right|=\left|\bar{c}\right|=1$

$\bar{a}$ perpendicular $\bar{b}\Rightarrow\bar{a}.\bar{b}=0$

$\left(\bar{c}.\bar{a}\right)=\alpha,\left(\bar{c},\bar{b}\right)=\beta$

Given $\left|\bar{a}+\bar{b}+\bar{c}\right|=1$

squaring on both sides

$\bar{a}^2+\bar{b}^2+\bar{c}^2+2\left(\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}\right)=1$

$1+1+1+2\left[0+\cos\beta+\cos\alpha\right]=1$

$\therefore\cos\alpha+\cos\beta=-1$

316. Let

$\bar{a}=x\bar{i}+y\bar{j}+z\bar{k}$

$\bar{a}\times\bar{i}=\bar{j}+\bar{k}$

$\begin{vmatrix}\bar{i} & \bar{j} & \bar{k}\\ x & y & z\\ 1 & 0 & 0\end{vmatrix}=\bar{j}+\bar{k}$

$\bar{i}(0-0)-\bar{j}(0-z)+\bar{k}(0-y)=\bar{j}+\bar{k}$

$z\bar{j}-y\bar{k}=\bar{j}+\bar{k}$

$z=1,\ y=-1$

$\bar{a}.\bar{i}=1$

$\rightarrow x=1$

$\therefore\bar{a}=\bar{i}-\bar{j}+\bar{k}$

vector equation of the line is

$\bar{r}=\bar{i}+\bar{j}+\bar{k}+t\bar{a}$

$\bar{r}=\bar{i}+\bar{j}+\bar{k}+t\left(\bar{i}-\bar{j}+\bar{k}\right)$

$=(t+1)\bar{i}+(1-t)\bar{j}+(t+1)\bar{k}$

317. Given $\overline{OA}=\bar{a},\overline{OB}=\bar{b},\overline{OC}=\frac{\bar{a}}{2}+\frac{\bar{b}}{3}$

Now, $\overline{OC}=\frac{3\bar{a}+2\bar{b}}{6}<\frac{3\bar{a}+2\bar{b}}{5}$

318. $\left|\bar{a}-\bar{b}\right|^2+\left|\bar{a}+2\bar{b}\right|^2=20$

$\cos\left(\bar{a},\bar{b}\right)=\frac{-1}{2}=\cos\frac{2\pi}{3}$

$\therefore(\bar{a},\bar{b})=\frac{2\pi}{3}$

319. $\bar{a}.\bar{b}=0, |a|=8, |b|=3$

$|a-2b|^2=|a|^2+4|b|^2-8\bar{a}.b$

$|a-2b|=10$

320. $(\lambda-1)\bar{a}+2\bar{b}$ and $3\bar{a}+\lambda\bar{b}$

are collinear vectors

$\frac{\lambda-1}{3}=\frac{2}{\lambda}\Rightarrow\lambda^2-\lambda=6$

$\lambda^2-\lambda-6=0$

$(\lambda+2)(\lambda-3)=0$

$\therefore\lambda=\{-2,3\}$

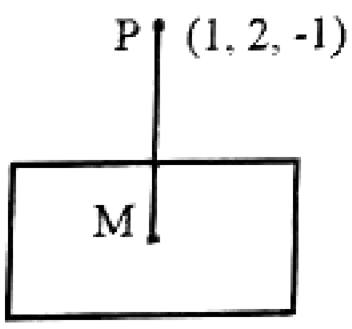
321. Required plane

$4(x-3)+7(y+2)+(-4)(z-1)=0$

$4x-12+7y+14-4z+4=0$

$4x+7y-4z+6=0$

Distance from $(1,2,-1)$



$=\frac{|4+14+4+6|}{\sqrt{16+49+16}}=\frac{28}{9}$

322. $p=q+r$

$ai+bj+ck=(d+3)i+4j+2k$

$a=d+3,\ b=4,\ c=2$

$AB\times AC=\begin{vmatrix} i & j & k \\ d & 3 & 4 \\ 3 & 1 & -2 \end{vmatrix}=-10i+(2d+12)j+(d-9)k$

$\frac{1}{2}|AB\times AC|=\frac{1}{2}\sqrt{100+(2d+12)^2+(d-9)^2}=5\sqrt{6}$

$d=5,-11$

$a=8, b=4, c=2$

$|a|+|b|+|c|=14$

323. $(\bar{c}.\bar{c})(\bar{a}.\bar{c})=(\bar{c}.\bar{c})$

$(\bar{a}.\bar{c})=1$

$(\bar{a}.\bar{c})\bar{b}-(\bar{a}.\bar{b})\bar{c}+(\bar{a}.\bar{b})\bar{b}=(4-2\beta-\sin\alpha)\bar{b}+(\beta^2-1)\bar{c}$

$(1+\bar{a}.\bar{b})\bar{b}-(\bar{a}.\bar{b})\bar{c}=(4-2\beta-\sin\alpha)\bar{b}+(\beta^2-1)\bar{c}$

$\bar{a}.\bar{b}=1-\beta^2........(1)$

$1+\bar{a}.\bar{b}=4-2\beta-\sin\alpha.......(2)$

$From\ (1)\&(2),$

$\beta^2-2\beta+2=\sin\alpha$

$(\beta-1)^2+1=\sin\alpha$

Which is possible only when $\beta=1, \alpha=\frac{\pi}{2}$

324. $\overline{OP}=\frac{2\overline{OB}+\overline{OA}}{2+1}$

$\overline{OP}=\hat{i}+\hat{j}-\hat{k}$

$\overline{PC}=\overline{OC}-\overline{OP}=3\hat{i}+2\hat{j}+6\hat{k}$

$l=3/7\ ,\ m=2/7\ ,\ n=6/7$

$l+3m+2n=3$

325. $A(1,-1,0),\ B(0,1,-1)$

The equation of line AB is

$\frac{x-1}{-1}=\frac{y+1}{2}=\frac{z}{-1}$

$P(2,1,0)\quad Q(0,2,-1)\quad R(1,0,2)$

The equation of plane PQR is

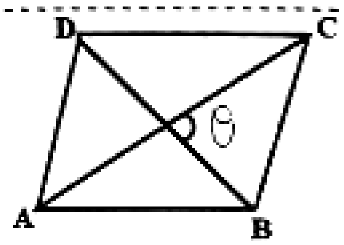
$$\begin{vmatrix} x-2 & y-1 & z \\ -2 & 1 & -1 \\ -1 & -1 & 2 \end{vmatrix} = 0$$

$x+5y+3z-7=0$

By option verification

$(x,y,z)=\left(\frac{-5}{6},\frac{16}{6},\frac{-11}{6}\right)$ satisfies

326.



$\overline{BC}=2\overline{i}+\overline{j}+\overline{k}=a$

$\overline{CD}=\overline{i}+2\overline{j}-2\overline{k}=b$

$\overline{AC}=\overline{i}-\overline{j}+3\overline{k}$

$\overline{BD}=3\overline{i}+3\overline{j}-\overline{k}$

$$\cos\theta=\frac{\overline{AC}.\overline{BD}}{|\overline{AC}||\overline{BD}|}$$

$\cos\theta=-3/\sqrt{209}$

$$\tan\theta=\frac{-10\sqrt{2}}{3}$$

327. $(a,b,c)=(1,2,-3)$

$(x_1,y_1,z_1)=(3,-4,5)$

$\Rightarrow a(x-x_1)+b(y-y_1)+c(z-z_1)=0$

$x+2y-3z+20=0$

328. $[\overline{a}\ \overline{b}\ \overline{c}]=61$

$$\begin{vmatrix} \lambda & 3 & 4 \\ 3 & -1 & \lambda \\ \lambda & 1 & -3 \end{vmatrix}=61$$

$2\lambda^2+7\lambda-22=0$

$(\lambda-2)(2\lambda+11)=0$

$\lambda=2, \lambda=-11/2$ (is not integer)

$\therefore \lambda=2$

one possible value

329. Given $|\overline{a}|=4, |\overline{b}|=5, \quad |\overline{a}-\overline{b}|=3$

S.O.B.S

$16+25+2(4)(5)\cos(\overline{a},\overline{b})=9$

$40\cos\theta=-32$

$$\cos\theta=\frac{-8}{10}$$

$$\cos\theta=-\frac{4}{5}$$

$$\cot^2\theta=\left(\frac{4}{3}\right)^2=\frac{16}{9}$$

330. $A=(1,2,3), B=(3,7,-2), C=(6,7,7), D=(-1,0,-1)$

Centroids of $\Delta ABD=(x_1 y_1, z_1)=(1,3,0)$

Centroid of $\Delta ACD=(x_2,y_2,z_2)=(2,3,3)$

Equation of required line seagment is

$\overline{r}=(1-t)\overline{a}+t\overline{b}$

$= (1-t)(\bar{i}+3\bar{j}) + t(2\bar{i}+3\bar{j}+3\bar{k})$

$= (1+t)\bar{i}+3\bar{j}+3t\bar{k}$

331. Given $|\bar{a}|=3, \ |\bar{b}|=5, \ |\bar{c}|=7$

Given $\bar{a}+\bar{b}+\bar{c}=0$

$\bar{a}+\bar{b}=-\bar{c}$

S.0.B.S

$9+25+2(3)(5)\cos(\bar{a},\bar{b})=49$

$30\cos(\bar{a},\bar{b})=15$

$\cos(\bar{a},\bar{b})=\frac{1}{2}$

$(\bar{a},\bar{b})=60^0=\frac{\pi}{3}$

332. $2\bar{i}-\bar{j}+3\bar{k}, \ -12\bar{i}-j-3\bar{k}, \ -\bar{i}+2\bar{j}-4\bar{k}$

$\lambda\bar{i}+2\bar{j}-\bar{k}$ are coplanar

$\left[\overline{AB} \ \ \overline{AC} \ \ \overline{AD}\right]=0$

$$\begin{vmatrix} -14 & 0 & -6 \\ -3 & 3 & -7 \\ \lambda-2 & 3 & -4 \end{vmatrix}=0$$

$-14(-12+21)-0-6(-9-3\lambda+6)=0$

$-126+18+18\lambda=0$

$\Rightarrow \lambda=6$

333. $\bar{a}=\bar{i}+2\bar{j}-2\bar{k}, \ \bar{b}=2\bar{i}-\bar{j}-2\bar{k}$

$$x=\frac{(\bar{a}.\bar{b})\bar{b}}{|\bar{b}|^2}=\frac{2-2+4}{(3)^2}(2\bar{i}-\bar{j}-2\bar{k})=\frac{4}{9}(2i-\bar{j}-2\bar{k})$$

$$y=\frac{(\bar{b}.\bar{a})\bar{a}}{|\bar{a}|^2}=\frac{2-2+4}{9}(\bar{i}+2\bar{j}-2\bar{k})=\frac{4}{9}(\bar{i}+2\bar{j}-2\bar{k})$$

$$|x-y|=\left|\frac{4}{9}(\bar{i}-3\bar{j})\right|$$

$$=\frac{4}{9}\sqrt{10}$$

334. Given vectors are coplanar

$\left[\overline{AB} \ \overline{AC} \ \overline{AD}\right]=0$

$$\Rightarrow \begin{vmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 2 & \lambda-1 \end{vmatrix} = 0 \Rightarrow \lambda=\frac{1}{3}$$

$\overline{OE}=6\lambda\bar{i}-3\bar{j}+6\bar{k}$

$=2\bar{i}-3\bar{j}+6\bar{k}$

$Now \ |\overline{OE}|=\sqrt{4+9+36}=7$

335. $\bar{\gamma}=(1-t)(\bar{a}-\bar{b}+\bar{c})+t(\bar{b}-\bar{c})\}$

$\bar{\gamma}=(1-t)\bar{a}+(2t-1)\bar{b}+(1-2t)\bar{c}$..........(1)

$\bar{\gamma}=(1-l-m)(2\bar{a}-\bar{b})+l(2\bar{b}-\bar{c})+m(2\bar{c}-\bar{a})$

$\bar{\gamma}=(2-2l-3m)\bar{a}+(3l+m-1)\bar{b}+(-l+2m)\bar{c}$......(2)

From (1) & (2),we get

t=0

$\therefore p.o.I = (\bar{a}-\bar{b}+\bar{c})$

336. $|\bar{a}| = 3$

and $\bar{a}.\bar{b} = -4$, $\bar{a}.\bar{c} = -13$

$$\bar{p} = \frac{\bar{a}.\bar{b}}{|\bar{a}|^2}(\bar{a}) = \frac{-4}{9}(\bar{i}-2\bar{j}+2\bar{k})$$

$$\bar{q} = \frac{(\bar{a})(\bar{a}.\bar{c})}{|\bar{a}|^2} = \frac{-13}{9}(\bar{i}-2\bar{j}+2\bar{k})$$

Then $13\bar{p} = 4\bar{q}$

337. $\bar{a} = \bar{i}+2\bar{j}+3\bar{k}$

$\bar{b} = 3\bar{i}-\bar{j}+5\bar{k}$ *and* $\bar{r}.\bar{b} = 0$

$\bar{c} = \bar{i}-4\bar{j}-2\bar{k}$

$\bar{r}.\bar{c} = 0$

$\bar{r}.\bar{a} = 11$

$\Rightarrow 3x - y + 5z = 0$

$x - 4y - 2z = 0$

$x + 2y + 3z = 11$

Solving we get

$x = 22,\ y = 11,\ \ z = -11$

$\bar{\gamma} = 22\bar{i} + 11\bar{j} - 11\bar{k}$

By option verification

$\bar{i}\ \ \overline{-j} + \bar{k}$ *is* $\perp''$ *to* $\bar{r}$