'F'. Then the moment of the force 'F' about 'O' is given by $\bar r\times\bar F$

If $\bar a=a_1\bar l+a_2\bar m+a_3\bar n,\bar b=b_1\bar l+b_2\bar m+b_3\bar n$.

Where $\bar l,\bar m,\bar n$ form a right handed system of non-coplanar vectors, then

$$\bar a\times\bar b=\begin{vmatrix}\bar m\times\bar n & \bar n\times\bar l & \bar l\times\bar m\\ a_1 & a_2 & a_3\\ b_1 & b_2 & b_3\end{vmatrix}$$

Some useful Results: For any vector $\bar a$,

$|\bar a\times\bar i|^2+|\bar a\times\bar j|^2+|\bar a\times\bar k|^2=2|\bar a|^2$

$\bar a,\bar b,\bar a\times\bar b$ form a right handed system.

$\bar a,\bar b,\ \bar b\times\bar a$ form a left handed system.

If $\bar a,\bar b,\bar c$ are mutually perpendicular vectors then $\bar a\times\bar b,\ \bar b\times\bar c,\ \bar c\times\bar a$ are also mutually perpendicular vectors.

If $\bar a,\bar b,\bar c$ are in right handed system then $\bar a\times\bar b,\ \bar b\times\bar c,\ \bar c\times\bar a$ are also in right handed system.

Concept Based Questions

1. If Magnitude of cross product and dot product of two non zero, non parallel vectors are equal then angle between two vector is
   1) $\frac{\pi}{4}$ 2) $\frac{\pi}{2}$ 3) $\frac{3\pi}{2}$ 4) $\frac{\pi}{3}$

2. $|\bar a\times\bar b|^2+(\bar a.\bar b)^2=$
   1) $|\bar a|^2$ 2) $|\bar b|^2$
   3) $|\bar a|^2|\bar b|^2$ 4) $|\bar a||\bar b|$

3. If $\bar a.\bar b=\bar a.\bar c$ and $\bar a\times\bar b=\bar a\times\bar c$ then
   1) $\bar a$ is perpendicular to $\bar b-\bar c$
   2) either $\bar a=0$ or $\bar b=\bar c$
   3) $\bar a$ is parallel to $\bar b-\bar c$
   4) $\bar a=\bar b=\bar c$

4. If $\bar p=\bar a+\bar b,\ \bar q=\bar a-\bar b,\ |\bar a|=|\bar b|=r$ then $|\bar p\times\bar q|=|\bar b|=r$, then $|\bar p\times\bar q|=$
   1) $\sqrt{r^4-(\bar a.\bar b)^2}$ 2) $2\sqrt{r^4-(\bar a.\bar b)^2}$
   3) $3\sqrt{r^4-(\bar a.\bar b)^2}$ 4) 0

5. Number of unit vectors perpendicular to two non zero vectors $\bar a$ and $\bar b$ are
   1) one 2) two
   3) three 4) infinite

6. If $\bar a,\bar b,\bar c$ are three vectors such that $\bar a+\bar b+\bar c=\bar 0$ then
   1) $\bar a\times\bar b=\bar b\times\bar c=\bar c\times\bar a$
   2) $\bar a\times\bar b=\bar b\times\bar c=\bar c\times\bar a=\bar 0$
   3) $\bar a\times\bar b=\bar b\times\bar c$
   4) $\bar a\times\bar b=\bar 0$

7. Two planes are perpendicular to each other. One of them contains vectors $\bar a,\bar c$ and other contains $\bar b,\bar d$ then $(\bar a\times\bar c).(\bar b\times\bar d)=$
   1) 1 2) 0
   3) $[\bar a\ \bar b\ \bar c]$ 4) $[\bar b\ \bar c\ \bar d]$

8. Let $\bar a,\bar b,\bar c$ are position vectors of a triangle ABC. Then length of perpendicular from vertex 'C' to AB is
   1) $\frac{|\bar a\times\bar b+\bar b\times\bar c+\bar c\times\bar a|}{|\bar a-\bar b|}$ 2) $\frac{|\bar a\times\bar b+\bar b\times\bar c+\bar c\times\bar a|}{|\bar b-\bar c|}$
   3) $\frac{|\bar a\times\bar b+\bar b\times\bar c+\bar c\times\bar a|}{|\bar a-\bar c|}$ 4) $|\bar a\times\bar b+\bar b\times\bar c+\bar c\times\bar a|$

9. Perpendicular distance of any point $\bar a$ on to the line $\bar r=\bar b+t\bar c$ (t is scalar) is
   1) $\frac{(\bar a-\bar b)\times\bar c}{\bar c}$ 2) $\frac{|(\bar a-\bar b)\times\bar c|}{|\bar c|}$
   3) $\frac{|\bar a-\bar b|}{|\bar c|}$ 4) $\frac{|(\bar a-\bar b)\times\bar c|}{|\bar a|}$

EXERCISE-I

CRTQ & SPQ LEVEL-I

R.H & L.H SYSTEM

C.R.T.Q Class Room Teaching Questions

The vector $\bar{a} = 1/7\,(2\bar{i} + 3\bar{j} + 6\bar{k})$,

$\bar{b} = \frac{1}{7}(3\bar{i} - 6\bar{j} + 2\bar{k})$,

$\bar{c} = \frac{1}{7}(6\bar{i} + 2\bar{j} - 3\bar{k})$ form

1) a right handed system
2) a left handed system
3) an orthogonal system
4) an orthonormal system

$\bar{c}$ is a unit Vector orthogonal to $\bar{a}, \bar{b}$ and $\bar{a}, \bar{b}, \bar{c}$ are in R.H.S $\bar{a} = \bar{i} + \bar{j} + \bar{k}, \bar{b} = 2\bar{j} + 2\bar{k}$ then $\bar{c}$ =

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

S.P.Q. Student Practice Questions

If the Vector $\bar{c}$, $\bar{a} = x\bar{i} + y\bar{j} + z\bar{k}, \bar{b} = \bar{j}$ are such that $\bar{a}, \bar{c}, \bar{b}$ form R.H.S then $\bar{c}$ =

1) $z\bar{i} - x\bar{k}$ 2) $x\bar{i} - z\bar{k}$
3) $x\bar{j} - y\bar{k}$ 4) $y\bar{j}$

The unit vector orthogonal to $-\bar{i} + \bar{k}, 2\bar{j} - \bar{k}$ and forming a right handed system with them is

1) $2\bar{i} + \bar{j} + 2\bar{k}$ 2) $\frac{2\bar{i} + \bar{j} + 2\bar{k}}{3}$
3) $-\frac{2\bar{i} + \bar{j} + 2\bar{k}}{3}$ 4) $-\frac{2\bar{i} + \bar{j} + 2\bar{k}}{9}$

PROBLEMS ON VECTOR PRODUCT

C.R.T.Q Class Room Teaching Questions

If $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}, \bar{b} = 3\bar{i} + 4\bar{j} - \bar{k}$ then $|\bar{a} \times \bar{b}|$ =

1) 9 2) $3\sqrt{10}$ 3) $\sqrt{155}$ 4) $5\sqrt{5}$

6. If $|\bar{a}| = 2, |\bar{b}| = 4, (\bar{a}, \bar{b}) = \frac{\pi}{6}$ then $|\bar{a} \times \bar{b}|^2$ =
1) 16 2) 2 3) 775 4) 36

7. If $(2\bar{i} + 6\bar{j} + 27\bar{k}) \times (\bar{i} + \lambda\bar{j} + \mu\bar{k}) = \bar{0}$ then values of λ, μ are
1) 3, 27 2) $3, \frac{27}{2}$ 3) $\frac{27}{2}, 3$ 4) $3, \frac{9}{2}$

8. $(\bar{i} + x\bar{j} + 3\bar{k}) \times (\bar{i} - \bar{j} + \bar{k}) = 5\bar{i} + x\bar{j} - 3\bar{k}$ then x =
1) 2 2) 3 3) –1 4) 0

9. If $|\bar{a}| = 1, |\bar{b}| = 2, (\bar{a}, \bar{b}) = \frac{2\pi}{3}$ then $\{(\bar{a} + 3\bar{b}) \times (3\bar{a} - \bar{b})\}^2$ =
1) 425 2) 375 3) 325 4) 300

10. If $\bar{a} = \bar{i} - 3\bar{j} + 2\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}$ then the length of the component vector of $\bar{a} \times \bar{b}$ along $5\bar{i} - \bar{k}$ is
1) $\sqrt{\frac{1}{13}}$ 2) $\sqrt{\frac{2}{13}}$ 3) $\sqrt{\frac{3}{13}}$ 4) $\sqrt{\frac{4}{13}}$

11. Given that $\bar{a} = 2\bar{i} + 3\bar{j} + 6\bar{k}, \bar{b} = 3\bar{i} - 6\bar{j} + 2\bar{k}$, $\bar{c} = 6\bar{i} + 2\bar{j} - 3\bar{k}$ then $\bar{a} \times \bar{b}$ =
1) $7\bar{c}$ 2) $\bar{c}$ 3) $5\bar{c}$ 4) $4\bar{c}$

12. If $\bar{a} \times \bar{i} + 2\bar{a} - 4\bar{i} - 2\bar{j} + \bar{k} = \bar{0}$ then $\bar{a}$ =
1) $2\bar{j} + \bar{k}$ 2) $2\bar{j} - \bar{k}$
3) $2\bar{i} + \bar{j}$ 4) $2\bar{i} - \bar{j}$

13. If $\bar{a} = 2\bar{i} + 2\bar{j} + \bar{k}$, $\bar{a}.\bar{b} = 14$, $\bar{a} \times \bar{b} = 3\bar{i} + \bar{j} - 8\bar{k}$, then $\bar{b}$ =
1) $5\bar{i} - \bar{j} + 2\bar{k}$ 2) $5\bar{i} + \bar{j} - \bar{k}$
3) $5\bar{i} + \bar{j} + 2\bar{k}$ 4) $5\bar{i} + \bar{j} - 2\bar{k}$

14. If $\bar{a} + \bar{b} + \bar{c} = \bar{0}$ then $\bar{a} \times \bar{b}$ =
1) $\bar{c} \times \bar{b}$ 2) $\bar{b} \times \bar{c}$
3) $\bar{a} \times \bar{c}$ 4) $2\bar{b} \times \bar{c}$

15. If $\bar{a}=\bar{i}+2\bar{j}+3\bar{k}, \bar{b}=-\bar{i}+2\bar{j}+\bar{k}, \bar{c}=3\bar{i}+\bar{j}$ and $\bar{d}$ is normal to both $\bar{a}$ and $\bar{b}$, then $(\bar{c},\bar{d})$

1) $\cos^{-1}\left(\frac{4}{\sqrt{30}}\right)$ 2) $\sin^{-1}\left(\frac{4}{\sqrt{30}}\right)$

3) $\cos^{-1}\left(\frac{2}{\sqrt{30}}\right)$ 4) $\sin^{-1}\left(\frac{2}{\sqrt{30}}\right)$

16. $|\bar{p}|=2, |\bar{q}|=3$ then $\frac{|\bar{p}\times\bar{q}|}{\sin(\bar{p},\bar{q})}=$

1) 6 2) 3/2 3) 2/3 4) 1

S.P.Q. Student Practice Questions

17. If $(2\bar{i}+4\bar{j}+2\bar{k})\times(2\bar{i}-x\bar{j}+5\bar{k})=16\bar{i}-6\bar{j}+2x\bar{k}$ then the value of x is

1) 2 2) -2 3) 0 4) 3

18. If $\bar{a}=3\bar{i}-\bar{j}-2\bar{k}$, $\bar{b}=2\bar{i}+3\bar{j}+\bar{k}$ then $(\bar{a}+2\bar{b})\times(2\bar{a}-\bar{b})=$

1) $25\bar{i}+35\bar{j}-55\bar{k}$ 2) $25\bar{i}-35\bar{j}-22\bar{k}$

3) $-25\bar{i}-35\bar{j}-55\bar{k}$ 4) $-25\bar{i}+35\bar{j}-55\bar{k}$

19. The value of $\bar{i}.\bar{i}+|\bar{i}\times\bar{j}|+\bar{j}.\bar{j}+|\bar{j}\times\bar{k}|+\bar{k}.\bar{k}+|\bar{k}\times\bar{i}|=$

1) 0 2) 2 3) 4 4) 6

20. The value of $|\bar{i}\times\bar{j}+\bar{j}\times\bar{k}+\bar{k}\times\bar{i}|=$

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

PROPERTIES OF VECTOR PRODUCT

C.R.T.Q Class Room Teaching Questions

21. $\bar{a},\bar{b}$ are two vectors such that $|\bar{a}|=3$, $|\bar{b}|=\frac{\sqrt{2}}{3}$. If $\bar{a}\times\bar{b}$ is unit vector then $(\bar{a},\bar{b})=$

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

22. If $|\bar{a}|=2, |\bar{b}|=7$ and $\bar{a}\times\bar{b}=3\bar{i}+2\bar{j}+6\bar{k}$, then $(\bar{a},\bar{b})=$

1) 30^0 2) 60^0 3) 45^0 4) 75^0

23. The sine of the angle between the vectors $\bar{i}+3\bar{j}+2\bar{k}$ and $2\bar{i}-4\bar{j}+\bar{k}$ is

1) $\sqrt{\frac{155}{156}}$ 2) $\sqrt{\frac{115}{116}}$ 3) $\sqrt{\frac{115}{147}}$ 4) $\sqrt{\frac{157}{158}}$

24. If $|\bar{a}|=2, |\bar{b}|=7$ and $\bar{a}\times\bar{b}=3\bar{i}+2\bar{j}+6\bar{k}$, then $\bar{a}.\bar{b}=$

1) $\sqrt{147}$ 2) $\sqrt{145}$ 3) $\sqrt{143}$ 4) $\sqrt{142}$

25. If $\bar{a}=2\bar{i}+2\bar{j}+\bar{k}$, $\bar{b}=5\bar{i}+\bar{j}+2\bar{k}$ then $|\bar{a}\times\bar{b}|^2+(\bar{a}.\bar{b})^2=$

1) 270 2) 120 3) 170 4) 110

26. $\frac{|\bar{a}\times\bar{b}|^2+(\bar{a}.\bar{b})^2}{2a^2b^2}$, where $|\bar{a}|=a, |\bar{b}|=b$ is

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

S.P.Q. Student Practice Questions

27. If $|\bar{a}|=2, |\bar{b}|=5$ and $|(\bar{a}\times\bar{b})|=8$, then $\bar{a}.\bar{b}=$

1) 4 2) 6 3) 8 4) 10

28. If $|\bar{a}|=3, |\bar{b}|=4$ and $\bar{a}.\bar{b}=8$ then $|\bar{a}\times\bar{b}|=$

1) 4 2) 6 3) 8 4) $\sqrt{80}$

29. Given that $\bar{a}=(1,1,1)$ and $\bar{c}=(0,1,-1)$. If $\bar{a}.\bar{b}=3$ and $\bar{a}\times\bar{b}=\bar{c}$ then $\bar{b}=$

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

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

30. $\bar{a}=(\bar{i}+\bar{j}+\bar{k}), \bar{a}.\bar{b}=1, \bar{a}\times\bar{b}=\bar{j}-\bar{k}$, then $\bar{b}=$

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

31. Let $\bar{a}$ and $\bar{b}$ be two unit vectors then $\bar{a}\times\bar{b}$ will also be a unit vector if.
1) $\bar{a}=\bar{b}$ 2) $\bar{a}\perp\bar{b}$
3) $\bar{a}\parallel\bar{b}$ 4) $\bar{a}=m\bar{b}, m>1$

32. $\bar{a}=\bar{i}+\bar{j}$, $\bar{b}=2\bar{i}-\bar{k}$ & $\bar{r}\times\bar{a}=\bar{b}\times\bar{a}$, $\bar{r}\times\bar{b}=\bar{a}\times\bar{b}$ the $\bar{r}=$
1) $-\bar{i}+\bar{j}+\bar{k}$ 2) $3\bar{i}-\bar{j}+\bar{k}$
3) $3\bar{i}+\bar{j}-\bar{k}$ 4) $\bar{i}-\bar{j}-\bar{k}$

33. If $(\bar{a},\bar{b})=\pi$ then $|4\bar{a}\times 5\bar{b}+\bar{b}\times\bar{a}|=$
1) 0 2) $19|\bar{a}||\bar{b}|$
3) $|\bar{a}||\bar{b}|$ 4) $2|\bar{a}||\bar{b}|$

34. If $\bar{a}=\bar{i}+\bar{j}+\bar{k}$, $\bar{b}=2\bar{i}-3\bar{j}+\bar{k}$, then $\frac{\bar{a}\times\bar{b}}{|\bar{a}\times\bar{b}|}+\frac{\bar{b}\times\bar{a}}{|\bar{b}\times\bar{a}|}=$
1) $\bar{0}$ 2) $2\bar{i}+\bar{j}-2\bar{k}$
3) $\bar{i}+\bar{j}+2\bar{k}$ 4) $\bar{i}+2\bar{j}-\bar{k}$

35. If $3\bar{i}\times(3\bar{i}-4\bar{k})+(\bar{i}+2\bar{j})\times\bar{k}=$
1) $2\bar{i}+11\bar{j}$ 2) $2\bar{i}-11\bar{j}$
3) $-2\bar{i}+11\bar{j}$ 4) $\bar{i}+\bar{j}+\bar{k}$

36. $(\bar{a}\times\bar{b})^2+(\bar{a}.\bar{b})^2=169$ and $|\bar{a}|=13$ then $|\bar{b}|=$
1) 16 2) 8 3) 1 4) 12

VECTOR AREA, AREA

C.R.T.Q Class Room Teaching Questions

37. The area of the triangle formed by the points whose position vectors are $-3\bar{i}+\bar{j}$, $5\bar{i}+2\bar{j}+\bar{k}$ and $\bar{i}-2\bar{j}+3\bar{k}$ is
1) $\sqrt{23}$ sq. units 2) $\sqrt{21}$ sq. units
3) $\sqrt{305}$ sq. units 4) $\sqrt{33}$ sq. units

38. The area of the triangle formed by the points A (2,3,4), B (3,4,2) and C (4,2,3) is.
1) $3\sqrt{3}$ 2) $\frac{3\sqrt{3}}{2}$ 3) $\frac{\sqrt{3}}{2}$ 4) $\frac{5\sqrt{3}}{2}$

39. If the adjacent sides of a parallelogram are $\bar{i}+2\bar{j}+3\bar{k}$, and $-3\bar{i}-2\bar{j}+\bar{k}$ then the area of the parallelogram is.
1) $6\sqrt{5}$ 2) $7\sqrt{5}$ 3) $8\sqrt{5}$ 4) $5\sqrt{7}$

40. If $ABCD$ is a quadrilateral such that $\overline{AB}=\bar{i}+2\bar{j}, \overline{AD}=\bar{j}+2\bar{k}$ and $\overline{AC}=2(\bar{i}+2\bar{j})+3(\bar{j}+2\bar{k})$. Then area of the quadrilateral ABCD is
1) $\frac{5\sqrt{21}}{2}$ 2) $\frac{3\sqrt{21}}{2}$ 3) $\frac{\sqrt{21}}{2}$ 4) $\frac{7}{2}$

41. The area of the parallelogram constructed on the Vectors $\bar{a}=\bar{p}+2\bar{q}$ and $\bar{b}=2\bar{p}+\bar{q}$ as sides, where $\bar{p},\bar{q}$ are unit Vectors forming an angle of 60^0 in square units is
1) $\frac{3}{2}$ 2) $\frac{3\sqrt{3}}{2}$ 3) $\frac{3\sqrt{3}}{4}$ 4) $\frac{1}{2}$

42. If the area of the parallelogram whose adjacent sides are $(3\bar{i}-4\bar{j}+\lambda\bar{k})$ and $(2\bar{j}-4\bar{k})$ is $\sqrt{436}$ sq. units and $\lambda\geq 0$, then $\lambda=$
1) 0 2) 4 3) 1 4) 3

43. If the Vectors $3\bar{i}+\bar{j}-2\bar{k}$, $\bar{i}-3\bar{j}+4\bar{k}$ are diagonals of a quadrilateral then the Vector area is
1) $\bar{i}+7\bar{j}-5\bar{k}$ 2) $\bar{i}-7\bar{j}+5\bar{k}$
3) $-\bar{i}+2\bar{j}+5\bar{k}$ 4) $-\bar{i}-7\bar{j}-5\bar{k}$

44. If $\overline{OA}=\bar{a}$, $\overline{OB}=10\bar{a}+2\bar{b}$ and $\overline{OC}=\bar{b}$, where A and C are non collinear points. Let p denote the area of the Quadrillateral OABC and q denote the area of a parallelogram with $\overline{OA}$ and $\overline{OC}$ as adjacent sides. The p/q=
1) 4 2) 6 3) 8 4) 10

45. If $\bar{a}=2\bar{i}-3\bar{j}+\bar{k}, \bar{b}=-\bar{i}+\bar{k}, \bar{c}=2\bar{j}-\bar{k}$, then the area of the parallelogram is having diagonals $\bar{a}+\bar{b}$ and $\bar{b}+\bar{c}$ (in sq.units) is

1) $\sqrt{21}$ 2) $\frac{\sqrt{21}}{2}$ 3) $\sqrt{19}$ 4) $\frac{\sqrt{19}}{2}$

46. ABCD is a quadrilateral and let $\overline{AB}=\bar{a}$, $\overline{AD}=\bar{b}$, $\overline{AC}=m\bar{a}+n\bar{b}$. Then the area of the quadrilateral is

1) $(m+n)(\bar{a}\times\bar{b})$ 2) $2|m+n|(\bar{a}\times\bar{b})$

3) $1/2\,|m+n|\,|\bar{a}\times\bar{b}|$ 4) $3(m+n)\,|\bar{a}\times\bar{b}|$

47. Area of rectangle having vertices A, B, C and D with P.V's $-\bar{i}+\frac{1}{2}\bar{j}+4\bar{k}$, $\bar{i}+\frac{1}{2}\bar{j}+4\bar{k}$, $\bar{i}-\frac{1}{2}\bar{j}+4\bar{k}$ and $-\bar{i}-\frac{1}{2}\bar{j}+4\bar{k}$ respectively is

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

S.P.Q. Student Practice Questions

48. If G is centroid of ΔPQR where $\overline{GP}=2\bar{i}+\bar{j}+3\bar{k}, \overline{GQ}=\bar{i}-\bar{j}+2\bar{k}$ then the area of triangle PQR is

1) $\sqrt{35}$ 2) $\frac{3\sqrt{35}}{2}$ 3) $\frac{\sqrt{35}}{2}$ 4) $\frac{5\sqrt{35}}{2}$

49. The Vector area of the triangle whose adjacent sides are $2\bar{i}+3\bar{j}$ and $-2\bar{i}+4\bar{j}$ is

1) $5\bar{k}$ 2) $7\bar{k}$ 3) $9\bar{k}$ 4) $11\bar{k}$

50. The area of the triangle formed by the points A(1,2,3), B(2,3,1), C(3,1,2) is.

1) $\frac{3\sqrt{3}}{2}$ 2) $3\sqrt{3}$ 3) $\sqrt{3}/2$ 4) $\sqrt{3}$

51. If $\bar{a}, \bar{b}, \bar{c}$ are the vertices of a triangle ABC then $|\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}|=$

1) Area of the triangle ΔABC

2) Two times Area of the triangle ΔABC

3) Three times Area of the triangle ΔABC

4) Four times Area of the triangle ΔABC

52. If $\bar{a}$ and $\bar{b}$ are such that $|\bar{a}|=3, |\bar{b}|=2$, $(\bar{a},\bar{b})=\pi/3$ then the area of the triangle with adjacent sides $\bar{a}+2\bar{b}$ and $2\bar{a}+\bar{b}$ in sq. units is

1) $3\sqrt{3}$ 2) $9\sqrt{3}$ 3) $\frac{9\sqrt{3}}{2}$ 4) $\frac{9}{2}$

53. If $\bar{a}=-\bar{i}+\bar{k}$ and $\bar{b}=2\bar{j}-\bar{k}$ are the adjacent sides of a parallelogram then its vector area is

1) $2\bar{i}+\bar{j}+2\bar{k}$ 2) $-(2\bar{i}+\bar{j}+2\bar{k})$

3) $2\bar{i}-\bar{j}+2\bar{k}$ 4) $2\bar{i}+\bar{j}-4\bar{k}$

54. $\bar{a}=\bar{i}-\bar{j}+3\bar{k}$, $\bar{b}=2\bar{i}-7\bar{j}+\bar{k}$. Area of parallogram whose adjacent sides are $\bar{a},\bar{b}$ is

1) $15\sqrt{2}$ 2) 20 3) $\sqrt{350}$ 4) 30

GEOMETRICAL APPLICATION OF VECTOR PRODUCT

C.R.T.Q Class Room Teaching Questions

55. A unit vector parallel to xy-plane and perpendicular to the vector $4\bar{i}-3\bar{j}+\bar{k}$ is

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

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

56. The unit Vectors orthogonal to $-\bar{i}+2\bar{j}+2\bar{k}$ and making equal angles with x and y axes are

1) $\pm 1/3\,(2\bar{i}+2\bar{j}-\bar{k})$ 2) $\pm 1/3\,(\bar{i}+\bar{j}-\bar{k})$

3) $\pm 1/3\,(2\bar{i}-2\bar{j}-\bar{k})$ 4) $\pm 1/4\,(\bar{i}+\bar{j}-\bar{k})$

57. If $\overline{u}=\overline{a}+\overline{b}, \overline{v}=\overline{a}-\overline{b}, |\overline{a}|=|\overline{b}|=2$ then $|\overline{u}\times\overline{v}|=$

1) $\sqrt{16-(\overline{a}.\overline{b})^2}$ 2) $2\sqrt{16-(\overline{a}.\overline{b})^2}$

3) $3\sqrt{16-(\overline{a}.\overline{b})^2}$ 4) 0

58. Let $\overline{\lambda}=\overline{a}\times(\overline{b}+\overline{c}),\ \overline{\mu}=\overline{b}\times(\overline{c}+\overline{a}),$ $\overline{V}=\overline{c}\times(\overline{a}+\overline{b})$ then

1) $\overline{\lambda}+\overline{\mu}=\overline{V}$ 2) $\overline{\lambda},\overline{\mu},\overline{V}$ are coplanar

3) $\overline{\lambda}+\overline{V}=2\overline{\mu}$ 4) None

59. If $\overline{a},\overline{b},\overline{c}$ are non-coplanar vectors such that $\overline{b}\times\overline{c}=\overline{a},\ \overline{c}\times\overline{a}=\overline{b}$ and $\overline{a}\times\overline{b}=\overline{c}$, then $|\overline{a}+\overline{b}+\overline{c}|=$

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

60. If $\overline{a}\times\overline{i}=\overline{j}$ then $\overline{a}.\overline{i}=$

1) any scalar 2) 0 3) 1 4) 2

61. If $\overline{r}\times\overline{a}=\overline{b}\times\overline{a}, \overline{r}\times\overline{b}=\overline{a}\times\overline{b}$, $\overline{a}\neq 0, \overline{b}\neq 0, \overline{b}\neq\lambda\overline{a}$, $\overline{a}$ is not perpendicular to $\overline{b}$ then $\overline{r}=$

1) $\overline{a}-\overline{b}$ 2) $\overline{a}+\overline{b}$

3) $\overline{a}\times\overline{b}+\overline{a}$ 4) $\overline{a}\times\overline{b}+\overline{b}$

62. If $\overline{r}$ satisfies $\overline{r}\times(\overline{i}+2\overline{j}+\overline{k})=\overline{i}-\overline{k}$, then for any scalar 't', $\overline{r}=$

1) $\overline{i}+t(\overline{i}+2\overline{j}+\overline{k})$ 2) $\overline{j}+t(\overline{i}+2\overline{j}+\overline{k})$

3) $\overline{k}+t(\overline{i}+2\overline{j}+\overline{k})$

4) $\overline{i}-\overline{k}+t(\overline{i}+2\overline{j}+\overline{k})$

63. If $\overline{r}=x\overline{i}+y\overline{j}+z\overline{k}$ then $(\overline{r}\times\overline{i}).(\overline{r}\times\overline{j})+xy$

1) 0 2) 1 3) $\overline{r}$ 4) $|\overline{r}|$

64. Let $\overline{A},\overline{B},\overline{C}$ be unit vectors suppose that $\overline{A}.\overline{B}=\overline{A}.\overline{C}=0$ and angle between $\overline{B}$ and $\overline{C}$ is $\frac{\pi}{6}$, then $\overline{A}=k(\overline{B}\times\overline{C})$ and k =

1) ±2 2) ±4 3) ±16 4) 0

65. A(1,2,5), B(5,7,9), and C(3,2,-1), are given three points. A unit Vector normal to the plane of the triangle ABC.

1) $\frac{15\overline{i}+16\overline{j}-5\overline{k}}{\sqrt{506}}$ 2) $\frac{-15\overline{i}+16\overline{j}-5\overline{k}}{\sqrt{506}}$

3) $\frac{-15\overline{i}+16\overline{j}+5\overline{k}}{\sqrt{506}}$ 4) $\frac{\overline{i}+\overline{j}+\overline{k}}{\sqrt{3}}$

66. A vector of length $\sqrt{7}$ which is perpendi-cular to $2\overline{j}-\overline{k}$ and $-\overline{i}+2\overline{j}-3\overline{k}$ and makes obtuse angle with y-aixs is

1) $\frac{1}{\sqrt{5}}(4\overline{i}-\overline{j}+\sqrt{18}\overline{k})$

2) $\frac{1}{\sqrt{3}}(4\overline{i}-\overline{j}-2\overline{k})$

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

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

67. Let $\overline{a}=\overline{i}+\overline{j}, \overline{b}=2\overline{i}-\overline{k}$. Then the point of intersection of the lines $\overline{r}\times\overline{a}=\overline{b}\times\overline{a}$ and $\overline{r}\times\overline{b}=\overline{a}\times\overline{b}$ is

1) $3\overline{i}+\overline{j}-\overline{k}$ 2) $3\overline{i}-\overline{j}-\overline{k}$

3) $3\overline{i}-3\overline{j}-\overline{k}$ 4) $3\overline{i}+3\overline{j}+\overline{k}$

68. The perpendicular distance of the point (6,-4,4) on to the line joining the points A (2,1,2), B (3,-1,4) is.

1) 1 2) 2 3) 3 4) 4

69. If $\overline{AB}=\overline{b}$ and $\overline{AC}=\overline{c}$ then the length of the perpendicular from A to the line BC is

1) $\left|\frac{\overline{b}\times\overline{c}}{\overline{b}+\overline{c}}\right|$ 2) $\left|\frac{\overline{b}\times\overline{c}}{\overline{b}-\overline{c}}\right|$

3) $\frac{1}{2}\left|\frac{\overline{b}\times\overline{c}}{\overline{b}-\overline{c}}\right|$ 4) $2\left|\frac{\overline{b}\times\overline{c}}{\overline{b}-\overline{c}}\right|$

70. If the projection of Vector $\overline{OA}$ on unit Vector $\overline{OB}$ equals twice the area of ΔOAB in magnitude, then $\angle AOB$ in radian is

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

71. If $\bar{a} = x\bar{i} - y\bar{j}$ and $\bar{b} = y\bar{i} + x\bar{j}$, $|\bar{a}\times\bar{b}| = 5$ then locus of (x, y) is

1) Hyperbola 2) Parabola
3) Ellipse 4) Circle

72. If $\bar{a}$ and $\bar{b}$ are unit vectors such that $|\bar{a}\times\bar{b}| = \bar{a}.\bar{b}$ then $|\bar{a}-\bar{b}|^2 =$

1) 2 2) $2+\sqrt{2}$ 3) $2-\sqrt{2}$ 4) $4\sqrt{2}$

S.P.Q. Student Practice Questions

73. The vector orthogonal to $\bar{a} = 2\bar{i}+\bar{j}-3\bar{k}$, $\bar{b} = \bar{i}-2\bar{j}+\bar{k}$ and having magnitude equal to 5 units is.

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

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

74. If the position Vectors of three points A,B,C are $\bar{i}+\bar{j}+\bar{k}$, $2\bar{i}+3\bar{j}-4\bar{k}$ and $3\bar{i}+2\bar{j}+\bar{k}$ respectively, then the unit vector perpendicular to the plane of the triangle ABC is

1) $\frac{5\bar{i}-10\bar{j}+3\bar{k}}{\sqrt{134}}$ 2) $\frac{5\bar{i}-10\bar{j}-3\bar{k}}{\sqrt{134}}$

3) $\frac{5\bar{i}+10\bar{j}-3\bar{k}}{\sqrt{134}}$ 4) $\frac{5\bar{i}+10\bar{j}+3\bar{k}}{\sqrt{134}}$

75. Given $\bar{a}=\bar{i}+\bar{j}-\bar{k}$, $\bar{b}=-\bar{i}+2\bar{j}+\bar{k}$ and $\bar{c}=-\bar{i}+2\bar{j}-\bar{k}$. A unit vector perpendicular to both $\bar{a}+\bar{b}$ & $\bar{b}+\bar{c}$ is

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

76. The number of vectors of unit length Perpendicular to the Vectors $\bar{a} = (1,1,0)$ and $\bar{b} = (0,1,1)$ is

1) 1 2) 2 3) 3 4) Infinite

77. The unit vector normal to the plane containing $\bar{a} = \bar{i}-\bar{j}-\bar{k}$ and $\bar{b} = \bar{i}+\bar{j}+\bar{k}$ is

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

78. The sine of the angle between the vectors $\bar{i}+3\bar{j}+2\bar{k}$, and $2\bar{i}-4\bar{j}-\bar{k}$,

1) 7/5 2) 5/7 3) 7/6 4) 6/7

79. If $\bar{a}$ and $\bar{b}$ are unit vectors and $|\bar{a}\times\bar{b}| = 1$, then the angle between $\bar{a}$ and $\bar{b}$ is

1) $\pi/4$ 2) $\pi/2$ 3) $\pi/3$ 4) π

80. $|\bar{a}| = |\bar{b}| = 2$, $\bar{p} = \bar{a}+\bar{b}$, $\bar{q} = \bar{a}-\bar{b}$, if $|\bar{p}\times\bar{q}| = 2\left[K-(\bar{a}.\bar{b})^2\right]^{1/2}$ then K=

1) 16 2) 8 3) 4 4) 1

81. If $\bar{i},\bar{j},\bar{k}$ is an orthonormal system of vectors, $\bar{a}$ is a vector and $\bar{a}\times\bar{i}+2\bar{a}-5\bar{j}=\bar{0}$ then $\bar{a} =$

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

82. If $\bar{a} = 2\bar{i}+2\bar{j}+3\bar{k}$, $\bar{b} = -\bar{i}+2\bar{j}+\bar{k}$ and $\bar{c} = 3\bar{i}+\bar{j}+\frac{17}{6}\bar{k}$ then $\bar{a}+t\bar{b}$ is parallel to $\bar{c}$ if t is equalto

1) $-\frac{4}{7}$ 2) 6 3) -3 4) 2

83. If $\bar{a},\bar{b},\bar{c}$ are non-coplanar vectors such that $\bar{a}\times\bar{b}=\bar{c}$, $\bar{b}\times\bar{c}=\bar{a}$, $\bar{c}\times\bar{a}=\bar{b}$, then $|\bar{a}|+2|\bar{b}|-3|\bar{c}|$ is equal to

1) 1 2) 0 3) 2 4) 3

Let $\bar{a},\bar{b},\bar{c}$ be three vectors such that $\bar{a}\times\bar{b}=\bar{c}$ and $\bar{c}\times\bar{a}=\bar{b}$, then

1) $\bar{a}.\bar{b}=|\bar{c}|^2$ 2) $\bar{c}.\bar{a}=|\bar{b}|^2$

3) $\bar{b}.\bar{c}=|\bar{a}|^2$ 4) $\bar{a}\,||\,\bar{b}\times\bar{c}$

Let $\bar{a}$ be a unit vector perpendicular to unit vectors $\bar{b}$ and $\bar{c}$ and if the angle between $\bar{b}$ and $\bar{c}$ is α, then $\bar{b}\times\bar{c}$ is

1) $\pm(\cos\alpha)\bar{a}$ 2) $\pm(\operatorname{cosec}\alpha)\bar{a}$

3) $\pm(\sin\alpha)\bar{a}$ 4) $\pm\tan\alpha$

If $\bar{a}\times\bar{b}=\bar{b}\times\bar{c}$ then

1) $\bar{b}=\bar{a}\times\bar{c}$ 2) $\bar{b}\,||\,\bar{a}-\bar{c}$

3) $\bar{b}||(\bar{a}+\bar{c})$ 4) $\bar{b}=\bar{a}-\bar{c}$

If $\bar{a}=2\bar{i}-\bar{j}+2\bar{k}$, then the value of $|\bar{a}\times i|^2+|\bar{a}\times j|^2+|\bar{a}\times k|^2=$

1) 2 2) 4 3) 6 4) 18

If $\bar{a},\bar{b},\bar{c}$ are the position vectors of points lie on a line then $\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}=$

1) $\bar{0}$ 2) 0 3) 1 4) a

If the vectors $\bar{a},\bar{b},\bar{c}$ from the sides $\overline{BC},\overline{CA},\overline{AB}$ of ΔABC then

1) $\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}=0$

2) $\bar{a}\times\bar{b}=\bar{b}\times\bar{c}=\bar{c}\times\bar{a}$

3) $\bar{a}.\bar{b}=\bar{b}.\bar{c}=\bar{c}.\bar{a}$

4) $\bar{a}\times\bar{b}=\bar{b}\times\bar{c}=\bar{c}\times\bar{a}=\bar{0}$

Point of intersection of the lines $\bar{r}\times\bar{a}=\bar{b}\times\bar{a}$ and $\bar{r}\times\bar{b}=\bar{a}\times\bar{b}$ is

1) $\bar{a}$ 2) $\bar{b}-\bar{a}$

3) $\bar{a}-\bar{b}$ 4) $\bar{a}+\bar{b}$

PHYSICAL APPLICATION OF CROSS PRODUCT

C.R.T.Q Class Room Teaching Questions

91. The moment of a force $\bar{i}+\bar{j}+\bar{k}$ acting through the point $A=-2\bar{i}+3\bar{j}+\bar{k}$ about the point $B=\bar{i}+2\bar{j}+3\bar{k}$ is

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

3) $3\bar{i}+\bar{j}-4\bar{k}$ 4) $3\bar{i}+\bar{j}+4\bar{k}$

92. The torque about the point $3\bar{i}-\bar{j}+3\bar{k}$ of a force $4\bar{i}+2\bar{j}+\bar{k}$ through the point $5\bar{i}+2\bar{j}+4\bar{k}$, is

1) $\bar{i}+2\bar{j}-8\bar{k}$ 2) $\bar{i}+2\bar{j}+8\bar{k}$

3) $\bar{i}-2\bar{j}-8\bar{k}$ 4) $-\bar{i}-2\bar{j}-8\bar{k}$

S.P.Q. Student Practice Questions

93. The moment about the point $\bar{i}+2\bar{j}+3\bar{k}$ of a force represented by $\bar{i}+\bar{j}+\bar{k}$ acting through the point $2\bar{i}+3\bar{j}+\bar{k}$ is

1) $3\bar{i}-3\bar{j}$ 2) $-3\bar{i}+2\bar{j}+\bar{k}$

3) $\bar{i}-3\bar{j}$ 4) $\bar{i}-3\bar{j}+\bar{k}$

KEY

01) 4	02) 4	03) 1	04) 3	05) 3
06) 1	07) 2	08) 1	09) 4	10) 2
11) 1	12) 3	13) 3	14) 2	15) 1
16) 1	17) 2	18) 4	19) 4	20) 3
21) 2	22) 1	23) 3	24) 1	25) 1
26) 2	27) 2	28) 4	29) 1	30) 3
31) 2	32) 3	33) 1	34) 1	35) 1
36) 3	37) 3	38) 2	39) 1	40) 1
41) 2	42) 1	43) 4	44) 2	45) 2

10. If $\bar{a}\times\bar{b}=\bar{c}\times\bar{d}$ and $\bar{a}\times\bar{c}=\bar{b}\times\bar{d}$, then

1) $(\bar{a}+\bar{d})=\lambda(\bar{b}-\bar{c})$

2) $\bar{a}+\bar{d}=\lambda(\bar{b}+\bar{c})$

3) $\bar{a}-\bar{b}=\lambda(\bar{c}+\bar{d})$

4) $\bar{a}+\bar{b}+\bar{c}+\bar{d}=\bar{0}$

VECTOR AREA, AREA

C.R.T.Q Class Room Teaching Questions

11. $\bar{a},\bar{b}$ are such that $|\bar{a}|=\sqrt{3}$, $|\bar{b}|=2$ and $(\bar{a},\bar{b})=\frac{\pi}{3}$. Then the area of the triangle with adjacent sides $\bar{a}+2\bar{b}$ and $2\bar{a}+\bar{b}$ is

1) $5\sqrt{3}$ 2) 15 3) 9/2 4) 15/2

12. ABCD is a quadrilateral with $\overline{AB}=\bar{a}$, $\overline{AD}=\bar{b}$, $\overline{AC}=2\bar{a}+3\bar{b}$. If the area of parallelogram ABCD is p times the area of the parallelogram with AB, AD as adjacent sides, then p is equal to

1) 5 2) 5/2 3) 1 4) 1/2

S.P.Q. Student Practice Questions

13. The area of the parallelogram is $4\sqrt{29}$ sq.u. If one of adjacent side is $3\bar{i}+4\bar{j}$ then the other side is

1) $\bar{i}-4\bar{k}$ 2) $2\bar{i}+4\bar{k}$

3) $-2\bar{j}-4\bar{k}$ 4) $2\bar{i}-4\bar{k}$

14. The area of the parallelogram whose adjacent sides are $\bar{a}$ and $\bar{b}$ is $2\sqrt{10}$ sq.units. If $\bar{a}=3\bar{i}+2\bar{j}+\bar{k}$ then $\bar{b}=$

1) $2\bar{i}+3\bar{j}+\bar{k}$ 2) $\bar{i}+\bar{j}+2\bar{k}$

3) $3\bar{i}+3\bar{j}+\bar{k}$ 4) $3\bar{i}+\bar{k}$

GEOMETRICAL APPLICATION OF CROSS PRODUCT

C.R.T.Q Class Room Teaching Questions

15. If $\bar{a}\times\bar{b}=\bar{c}\times\bar{d}$, $\bar{a}\times\bar{c}=\bar{b}\times\bar{d}$ then

1) $\bar{a}-\bar{d}$ is parallel to $\bar{b}-\bar{c}$

2) $\bar{a}-\bar{b}$ is parallel to $\bar{c}-\bar{d}$

3) $\bar{a}-\bar{c}$ is parallel to $\bar{b}-\bar{d}$

4) $\bar{a}+\bar{b}$ is parallel to $\bar{c}+\bar{d}$

16. If $\bar{a},\bar{b},\bar{c}$ be three vectors such that $|\bar{a}+\bar{b}+\bar{c}|=1, \bar{c}=\lambda(\bar{a}\times\bar{b})$ and $|\bar{a}|=\frac{1}{\sqrt{2}}$, $|\bar{b}|=\frac{1}{\sqrt{3}}, |\bar{c}|=\frac{1}{\sqrt{6}}$, then the angle between $\bar{a}$ and $\bar{b}$ is

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

17. If $\bar{a}\times\bar{b}=\bar{c}$ and $\bar{b}\times\bar{c}=\bar{a}$, then

1) $\bar{a},\bar{b},\bar{c}$ are orthogonal in pairs and $|\bar{a}|=|\bar{c}|$ and $|\bar{b}|=1$

2) $\bar{a},\bar{b},\bar{c}$ are orthogonal to each other

3) $\bar{a},\bar{b},\bar{c}$ are orthogonal in pairs that $|\bar{a}|\neq|\bar{c}|$

4) $\bar{a},\bar{b},\bar{c}$ are orthogonal but $|\bar{b}|\neq 1$

18. $\bar{a}+2\bar{b}+3\bar{c}=\bar{0}$ and $\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}=\ell(\bar{b}\times\bar{c})$, then $\ell=$

1) 2 2) 4 3) 6 4) 8

19. Let $\bar{a},\bar{b},\bar{c}$ be three vectors satisfying $\bar{a}\times\bar{b}=2\bar{a}\times\bar{c}$, $|\bar{a}|=|\bar{c}|=1, \bar{b}=4$ and $|\bar{b}\times\bar{c}|=\sqrt{15}$. If $\bar{b}-2\bar{c}=\lambda\bar{a}$ then λ is

1) 1 2) -1 3) 2 4) ±4

20. If α,β are roots of the equation $x^2+2x+5=0$ and $\bar{a}=(\alpha+\beta)\bar{i}+\alpha\beta\bar{j}$, $\bar{b}=\alpha\beta\bar{i}+(\alpha+\beta)\bar{j}+(\alpha^2+\beta^2)\bar{k}$ then $\bar{a}\times\bar{b}=$

1) $\bar{i}+12\bar{j}+12\bar{k}$ 2) $-30\bar{i}+12\bar{j}-5\bar{k}$

3) $-30\bar{i}-12\bar{j}-21\bar{k}$ 4) $\bar{i}-12\bar{j}+29\bar{k}$

21. If $\bar{x}$ and $\bar{y}$ are two non-collinear vectors and ABC is a triangle with sides a, b, c satisfying $(20a-15b)\bar{x}+(15b-12c)\bar{y}+(12c-20a)(\bar{x}\times\bar{y})=\bar{0}$, then the triangle ABC is
1) an acute angle triangle
2) an obtuse angle triangle
3) a right angle triangle
4) an isosceles triangle

22. The pairs $\bar{a},\bar{b}$ and $\bar{c},\bar{d}$ each determines a plane. Then the planes are parallel if
1) $(\bar{a}\times\bar{c})\times(\bar{b}\times\bar{d})=\bar{0}$
2) $(\bar{a}\times\bar{c}).(\bar{b}\times\bar{d})=0$
3) $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})=\bar{0}$
4) $(\bar{a}\times\bar{b}).(\bar{c}\times\bar{d})=0$

23. The vector equation of the line passing through the point $\bar{i}-2\bar{j}+\bar{k}$ and perpendicular to the vectors $2\bar{i}-3\bar{j}-\bar{k}$, $\bar{i}+4\bar{j}-2\bar{k}$ is
1) $\bar{r}=(\bar{i}-2\bar{j}+\bar{k})+t(\bar{i}-7\bar{j}+\bar{k})$
2) $\bar{r}=(\bar{i}-2\bar{j}+\bar{k})+t(3\bar{i}+\bar{j}-3\bar{k})$
3) $\bar{r}=(\bar{i}-2\bar{j}+\bar{k})+t(10\bar{i}+3\bar{j}+11\bar{k})$
4) $\bar{r}=\bar{i}$

24. Equation of the plane containing the lines $\bar{r}=(\bar{i}-2\bar{j}+\bar{k})+t(\bar{i}+2\bar{j}-\bar{k})$, $\bar{r}=(\bar{i}+2\bar{j}-\bar{k})+s(\bar{i}+\bar{j}+3\bar{k})$ is
1) $\bar{r}\cdot(7\bar{i}-4\bar{j}-\bar{k})=14$
2) $\bar{r}\cdot(\bar{i}+2\bar{j}-\bar{k})=10$
3) $\bar{r}\cdot(\bar{i}+\bar{j}+3\bar{k})=20$
4) $\bar{r}\cdot(\bar{i}-2\bar{j}+\bar{k})=27$

25. A unit vector perpendicular to the lines $\frac{x+1}{3}=\frac{y+2}{1}=\frac{z+1}{2}$ and $\frac{x-2}{1}=\frac{y+2}{2}=\frac{z-3}{3}$ is
1) $\frac{-\bar{i}+7\bar{j}+7\bar{k}}{\sqrt{99}}$
2) $\frac{-\bar{i}-7\bar{j}+5\bar{k}}{5\sqrt{3}}$
3) $\frac{-\bar{i}+7\bar{j}+5\bar{k}}{5\sqrt{3}}$
4) $\frac{7\bar{i}-7\bar{j}-\bar{k}}{\sqrt{99}}$

26. $\bar{a}$ and $\bar{c}$ are unit vectors and $|\bar{b}|=4$ with $\bar{a}\times\bar{b}=2\bar{a}\times\bar{c}$. The angle between $\bar{a}$ and $\bar{c}$ is $\cos^{-1}\left(\frac{1}{4}\right)$. Then $\bar{b}-2\bar{c}=\lambda\bar{a}$, if λ is
1) 1 2) $\frac{1}{4}$ 3) -4 4) $-\frac{1}{4}$

27. If $\bar{a}$ is a non zero vector and $\bar{a}.\bar{b}=\bar{a}.\bar{c}, \bar{a}\times\bar{b}=\bar{a}\times\bar{c}$, then
1) $\bar{a}//\bar{b}$
2) $\bar{b}=\bar{c}$
3) $\bar{b}\neq\bar{c}$
4) $\bar{a}\neq\bar{b}$ and $\bar{a}=\bar{c}$

S.P.Q. Student Practice Questions

28. If A (1, 2, 3), B (2, 3, 1), C (3, 1, 2) then the length of the altitude through C is
1) 3 2) $3\sqrt{3}$ 3) $3\sqrt{2}$ 4) $3/\sqrt{2}$

29. The angle between two diagonals of the parallelogram with Vectors $2\bar{i}+\bar{j}$ and $\bar{k}-2\bar{j}$ as adjacent sides is.
1) $\frac{\pi}{2}$ 2) $\frac{\pi}{6}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{4}$

30. If $\bar{p},\bar{q}$ are two non-collinear and non-zero vectors such that $(b-c)\,\bar{p}\times\bar{q}+(c-a)\bar{p}+(a-b)\bar{q}=0$ where a, b, c are the lengths of the sides of triangle then the triangle is
1) right angled
2) obtuse angled
3) equilateral
4) isosceles

31. If the position vectors of the three points A,B,C, are $\bar{i}+\bar{j}+\bar{k}, 2\bar{i}+3\bar{j}-4\bar{k}$ and $7\bar{i}+4\bar{j}+9\bar{k}$, then the unit vector perpendicular to the plane of the triangle ABC is
1) $(31\bar{i}-38\bar{j}-9\bar{k})/2486$
2) $(31\bar{i}-38\bar{j}+9\bar{k})/\sqrt{2486}$
3) $(31\bar{i}-38\bar{j}-9\bar{k})/\sqrt{2486}$
4) $(31\bar{i}+38\bar{j}+9\bar{k})/2486$

4. $\bar{A}=2\bar{i}+\bar{k}, \bar{B}=\bar{i}+\bar{j}+\bar{k}$ and $\bar{C}=4\bar{i}-3\bar{j}+7\bar{k}$,then the Vector $\bar{R}$ satisfying the conditions $\bar{R}\times\bar{B}=\bar{C}\times\bar{B}$ and $\bar{R}.\bar{A}=0$

1) (-1, -8, 2) 2) (1,-8,-2)
3) (-2,8,4) 4) (1,0,-2)

5. Let $\bar{a}=-\bar{i}-\bar{k}, \bar{b}=-\bar{i}+\bar{j}$ and $\bar{c}=\bar{i}+2\bar{j}+3\bar{k}$ be three given vectors. If $\bar{r}$ is a vecor such that $\bar{r}\times\bar{b}=\bar{c}\times\bar{b}$ and $\bar{r}.\bar{a}=0$ then $\bar{r}.\bar{b}=$

1) -7 2) 9 3) -8 4) 5

6. If $\bar{r}\times\bar{b}=\bar{c}\times\bar{b}, \bar{r}.\bar{a}=0, \bar{a}=2\bar{i}+3\bar{j}-\bar{k}$, $\bar{b}=3\bar{i}-\bar{j}+\bar{k}, \bar{c}=\bar{i}+\bar{j}+3\bar{k}$ then $\bar{r}=$

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

7. If $\bar{a}$ and $\bar{b}$ are unit vectors and $\bar{c}$ satisfies $2(\bar{a}\times\bar{b})+\bar{c}=\bar{b}\times\bar{c}$ then the maximum value of $|(\bar{a}\times\bar{c}).\bar{b}|$ is

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

S.P.Q. Student Practice Questions

8. If $\bar{a}$ and $\bar{b}$ are vectors such that $|\bar{a}+\bar{b}|=\sqrt{29}$ and $\bar{a}\times(2\bar{i}+3\bar{j}+4\bar{k})=(2\bar{i}+3\bar{j}+4\bar{k})\times\bar{b}$ then possible value of $(\bar{a}+\bar{b}).(-7\bar{i}+2\bar{j}+3\bar{k})$ is

1) 0 2) 3 3) 4 4) 8

9. If $\bar{a}=\bar{i}+\bar{j}+\bar{k}$ and $\bar{b}=3\bar{i}+4\bar{j}$ and $\bar{a}\times\bar{b}=x\bar{i}+y\bar{j}+\sin\theta\bar{k}$ then $(x,y,\theta)=$

1) $\left(4,3,n\pi+(-1)^n\frac{\pi}{2}, n\in Z\right)$
2) $\left(-4,3,n\pi+(-1)^n\frac{\pi}{2}, n\in Z\right)$
3) $\left(-3,-4,n\pi+(-1)^n\frac{\pi}{6}, n\in Z\right)$
4) $\left(3,4,n\pi+(-1)^n\frac{\pi}{2}, n\in Z\right)$

10. Given $\bar{a}+m\bar{b}+n\bar{c}=0$. The value of $\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}$ is $\bar{0}$ then

1) $m+n=1$ 2) $m+n=-1$
3) $m+mn=1$ 4) $m-2n=1$

11. Let $\bar{u}=\bar{i}+\bar{j}, \bar{v}=\bar{i}-\bar{j}, \bar{w}=\bar{i}+2\bar{j}+3\bar{k}$. If $\bar{n}$ is a unit vector such that $\bar{u}.\bar{n}=0, \bar{v}.\bar{n}=0$ then $|\bar{w}.\bar{n}|=$

1) 0 2) 1 3) 2 4) 3

12. Let $\bar{a}(2,1,-1), \bar{b}(1,2,1), \bar{c}(2,-1,3)$ and $\bar{d}(3,-1,2)$ be four vectors. The projection of the vector $\bar{a}+\bar{c}$ on the vector $(\bar{b}-\bar{d})\times\bar{c}$ is

1) $\sqrt{2}$ 2) $\sqrt{3}$ 3) $\sqrt{6}$ 4) $\sqrt{7}$

13. Let $\bar{a},\bar{b}$ be two non collinear unit vectors. If $\bar{\alpha}=\bar{a}-(\bar{a}.\bar{b})\bar{b}, \bar{\beta}=\bar{a}\times\bar{b}$ then

1) $|\bar{\alpha}|=|\bar{\beta}|$ 2) $|\bar{\alpha}|^2=|\bar{\beta}|$
3) $|\bar{\beta}|^2=|\bar{\alpha}|$ 4) $|\bar{\alpha}|=2|\bar{\beta}|$

VECTOR AREA, AREA

C.R.T.Q Class Room Teaching Questions

14. P and Q are the mid-points of the non-parallel sides BC and AD of a trapezium ABCD, then $\Delta APD=$

1) $2\Delta CQB$ 2) $\frac{1}{2}\Delta CQB$
3) ΔCQB 4) $4\Delta CQB$

S.P.Q. Student Practice Questions

15. For any four points P, Q, R, S, $|\overline{PQ}\times\overline{RS}-\overline{QR}\times\overline{PS}+\overline{RP}\times\overline{QS}|$ is equal to 4 times the area of the triangle

1) PQR 2) QRS 3) PRS 4) PQS

2. Arrange the following in ascending order

A) $|\bar{a}\times\bar{b}|$ if $\bar{a}=2\bar{i}-\bar{j}+\bar{k}, \bar{b}=3\bar{i}+4\bar{j}-\bar{k}$

B) $|\bar{a}\times\bar{b}|$ if $\bar{a}=\bar{i}+\bar{j}+\bar{k}$, $\bar{b}=2\bar{i}-3\bar{j}+\bar{k}$

C) $|\bar{a}\times\bar{b}|$ if $|\bar{a}|=2$, $|\bar{b}|=4$, $(\bar{a},\bar{b})=\pi/6$

D) $|\bar{a}\times\bar{b}|$ if $|\bar{a}|=5$, $|\bar{b}|=6$, $|\bar{a}.\bar{b}|=24$

1) B,A,C,D 2) D,A,C,B

3) C,B,A,D 4) B,C,A,D

3. **Assertion (A):** Three points with position vectors $\bar{a},\bar{b},\bar{c}$ are collinear if $\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}=\bar{0}$

Reason (R): Three points A, B, C are collinear iff $\overline{AB}=t\overline{BC}$, where t is scalar.

1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are individually true and R is not the correct explanation of A
3) A is true but R is false
4) A is false but R is true

4. **Statement-1:** If vertices of a triangle ABC are $A(\bar{a}), B(\bar{b}), C(\bar{c})$ then length of altitude through A is $\dfrac{|\bar{a}\times\bar{b}+\bar{b}\times\bar{c}+\bar{c}\times\bar{a}|}{|\bar{b}-\bar{c}|}$

Statement-2: Area of triangle is $\Delta=\frac{1}{2}|\overline{AB}\times\overline{AC}|$

1) Statement-1 is true, statement-2 is true, Statement-2 is a correct explanation for Statement-1.
2) Statement-1 is true, statement-2 is true, Statement-2 is not a correct explanation for statement-1.
3) Statement-1 is true, statement-2 is false
4) Statement-1 is false, statement-2 is true

5. **Statement-1:** The perpendicular distance from (1, 4, -2) to the line joining (2, 1, -2), (0, -5, 1) is $\frac{3\sqrt{26}}{7}$.

Statement-2: The perpendicular distance from a point P to the line joining the points A, B is $\dfrac{|\overline{AP}\times\overline{AB}|}{|\overline{AB}|}$

1) Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.
2) Statement-1 is true, statement-2 is true, Statement-2 is not a correct explanation for statement-1.
3) Statement-1 is true, statement-2 is false
4) Statement-1 is false, statement-2 is true

6. **Statement-1:** The torque about the point $2\bar{i}+\bar{j}-\bar{k}$ of a force represented by $4\bar{i}+\bar{k}$ acting through the point $\bar{i}-\bar{j}+2\bar{k}$ is $-2\bar{i}+13\bar{j}+8\bar{k}$

Statement-2: The torque of a force $\bar{F}$ about a point P is $\bar{r}\times\bar{F}$ where $\bar{r}$ is the vector from the point P to any point $\bar{a}$ on the line of action L of $\bar{F}$.

1) Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.
2) Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1.
3) Statement-1 is true, statement-2 is false
4) Statement-1 is false, statement-2 is true

Let the vectors $\overline{PQ},\overline{RS},\overline{ST},\overline{TU}$ and $\overline{UP}$ represent the sides of a regular hexagon.

Statement-I : $\overline{PQ}\times\left(\overline{RS}+\overline{ST}\right)\neq\overline{0}$

Statement-II: $\overline{PQ}\times\overline{RS}=\overline{0}$ and $\overline{PQ}\times\overline{ST}\neq\overline{0}$. Then

1) I is true, II is true and II is correct explanation of I

2) I is true, II is true and II is not correct explanation of I

3) I is true, II is false

4) I is false, II is true

Asserition(A): If $\overline{a}\times\overline{b}=\overline{c}\times\overline{d}$ and $\overline{a}\times\overline{c}=\overline{b}\times\overline{d}$ then $\overline{b}-\overline{c}$ is parallel to $\overline{a}-\overline{d}$

Reason (R): If cross product of two non-zero vectors is zero vector then those two vectors are parallel

1) Both A and R are true and R is the correct explanation of A

2) Both A and R are true but R is not correct explanation of A

3) A is true but R is false

4) A is false but R is true

Statement-I: Let $\overline{p}$ be position vector of point P and Let the line passing through the point A with position vector $\overline{a}$ and parallel to the vector $\overline{b}$ then perpendicular distance from P to a line is $=\dfrac{\left|\overline{AP}\times\overline{b}\right|}{\left|\overline{b}\right|}$

Statement-II: Vector equation of the line passing through two points A and B with position vector $\overline{a}$ and $\overline{b}$ is $(\overline{r}-\overline{a})\times(\overline{b}-\overline{a})=\overline{0}$

Which of the above is / are True

1) only I is true

2) only II is true

3) both I and II true

4) neitehr I nor II are true

10. **Asserition(A):** A vector perpendicular to both $\overline{i}+\overline{j}+\overline{k}$ and $2\overline{i}+\overline{j}+3\overline{k}$ is $2\overline{i}-\overline{j}-\overline{k}$

Reason (R): Every vector perpendicular to plane containing $\overline{a},\overline{b}$ is equal to $\overline{a}\times\overline{b}$

1) Both A and R are true and R is the correct explanation of A

2) Both A and R are true but R is not correct explanation of A

3) A is true but R is false

4) A is false but R is true

11. **Statement-I:** If $\overline{a}$, $\overline{b}$ are two unit vectors $(\overline{a},\overline{b})=\theta$. Then $\left|\overline{a}\times\overline{b}\right|$ is maximum when θ is maximum.

Statement-II: If $\overline{a},\overline{b}$ are two unit vectors $(\overline{a},\overline{b})=\theta$ then $\left|\overline{a}.\overline{b}\right|$ is maximum when θ is minimum

1) only I is true

2) Only II is true

3) Both I and IIare true

4) Neither I nor II are true

KEY

01) 4	02) 3	03) 1	04) 1	05) 1
06) 1	07) 3	08) 1	09) 3	10) 3
11) 2				