2. Which of the following is true
1) $\bar{a}$ and $-\bar{a}$ are collinear
2) Two collinear vectors are always equal in magnitude
3) Two vectors having same magnitude are collinear
4) Two collinear vectors having the same magnitude are equal

3. If $\bar{a}$ and $\bar{b}$ are two non-collinear vectors and $x\bar{a}+y\bar{b}=\bar{0}$, Then
1) $x=0$, but y is not neccessarily zero
2) $y=0$, but x is not necessarily zero
3) $x=0, y=0$ 4) $x\neq 0, y\neq 0$

4. If $\bar{a}$ and $\bar{b}$ are two collinear vectors then which of the following is incorrect ?
1) $x\bar{a}+y\bar{b}=\bar{0}$ and $x+y=0$
2) $\bar{b}=\lambda\bar{a}$, λ is a scalar
3) both the vectors have the same direction, but different magnitudes
4) the respective components of $\bar{a}$ and $\bar{b}$ are proportional

5. If the points $A(\bar{a}), B(\bar{b}), C(\bar{c})$ satisfy the relation $3\bar{a}-8\bar{b}+5\bar{c}=0$ then the points are
1) vertices of an equilateral triangle
2) collinear
3) vertices of a right angled triangle
4) vertices of an isosceles triangle

6. If the points A, B, C, D have the position vectors $\bar{a},\bar{b},\bar{c}$ and $\bar{d}$ respectively such that $(\lambda+\mu+\gamma)\bar{a}=\lambda\bar{b}+\mu\bar{c}+\gamma\bar{d}$ then which of the following is incorrect.
1) Lines AC and BD are parallel
2) Points A, B, C, D are collinear
3) Points A, B, C, D are non collinear
4) Lines AB&CD are parallel

7. Let α,β,γ be distinct real numbers. The points with position vectors $\alpha\bar{i}+\beta\bar{j}+\gamma\bar{k},\ \beta\bar{i}+\gamma\bar{j}+\alpha\bar{k},\ \gamma\bar{i}+\alpha\bar{j}+\beta\bar{k}$
1) are collinear
2) form an equilateral triangle
3) form a scalene triangle
4) form a rightangled triangle

8. If $\overline{AD},\overline{BE},\overline{CF}$ are medians of an equilateral -triangle ABC, then $\overline{AD}+\overline{BE}+\overline{CF}=$
1) $\overline{AB}+\overline{BC}+\overline{CA}$ 2) a zero vector
3) both 1 and 2 4) $2\overline{AF}+3\overline{BF}$

9. In a trapezium, the straight line joining the mid points of the diagonals is half the
1) difference of parallel sides
2) sum of parallel sides
3) difference of non parallel sides
4) sum of non parallel sides

10. If ABCD is a Rhombus whose diagonals cut at the origin O then $\overline{OA}+\overline{OB}+\overline{OC}+\overline{OD}=$
1) $\overline{AB}$ 2) $\overline{O}$ 3) $\overline{AD}$ 4) $\overline{BC}$

11. If the parallelogram ABCD with $\overline{AC}$ as the diagonal is completed, then the position vector of the point D is
1) $\frac{1}{2}(\bar{C}+\bar{A}-\bar{B})$ 2) $\frac{1}{3}(\bar{A}+\bar{B}-\bar{C})$
3) $\bar{A}+\bar{C}-\bar{B}$ 4) $\bar{A}+\bar{B}-\bar{C}$

12. Three non-zero, non-parallel coplanar vectors are always
1) linearly dependent
2) linearly independent
3) either of (1) or (2)
4) cannot be determined

13. If $A(\bar{a}), B(\bar{b})$ and $C(\bar{c})$ be the vertices of a triangle whose circumcentre is the origin then orthocentre is given by
1) $\bar{a}+\bar{b}+\bar{c}$ 2) $\frac{\bar{a}+\bar{b}+\bar{c}}{3}$
3) $\frac{\bar{a}+\bar{b}+\bar{c}}{2}$ 4) $\frac{\bar{a}+\bar{b}+\bar{c}}{4}$

14. Let $\bar{a},\bar{b},\bar{c}$ be three unit vectors such that $3\bar{a}+4\bar{b}+5\bar{c}=\bar{0}$ Then
1) $\bar{a},\bar{b},\bar{c}$ are collinear
2) $\bar{a},\bar{b},\bar{c}$ are pair wise orthogonal
3) $\bar{a},\bar{b},\bar{c}$ are linearly independent
4) $\bar{a},\bar{b},\bar{c}$ are linearly dependent

15. If $\bar{a}$ and $\bar{b}$ are two non-collinear vectors, then the points $l_1\bar{a}+m_1\bar{b}$, $l_2\bar{a}+m_2\bar{b}$ and $l_3\bar{a}+m_3\bar{b}$ are collinear if
1) $\sum l_1(m_2-m_3)=0$ 2) $\sum l_1(m_1-m_3)=0$
3) $\sum l_1(m_1+m_3)=0$ 4) $\sum l_1(m_2+m_3)=0$

16. If θ is an angle given by
$$\cos\theta=\frac{\cos^2\alpha+\cos^2\beta+\cos^2\gamma}{\sin^2\alpha+\sin^2\beta+\sin^2\gamma}$$ where α,β,γ are the angles made by a line with the positive directions of the axes of reference then the measure of θ is
1) $\frac{\pi}{4}$ 2) $\frac{\pi}{6}$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{3}$

17. The direction cosines of two lines are (l_1,m_1,n_1) and (l_2,m_2,n_2). Then the value of $(l_1l_2+m_1m_2+n_1n_2)^2+\sum(m_1n_2-m_2n_1)^2=$
1) 1 2) 0 3) 4 4) 2

18. If I is the centre of a circle inscribed in a triangle ABC, then $|\overline{BC}|\overline{IA}+|\overline{CA}|\overline{IB}+|\overline{AB}|\overline{IC}$ is
1) $\bar{0}$ 2) $\overline{IA}+\overline{IB}+\overline{IC}$
3) $\frac{\overline{IA}+\overline{IB}+\overline{IC}}{3}$ 4) $\frac{\overline{IA}+\overline{IB}+\overline{IC}}{2}$

19. If $\bar{a},\bar{b}$ are non-collinear vectors, then
1) $\bar{a}+\bar{b}$ represents the bisector of the angle between $\bar{a}$ and $\bar{b}$
2) If $|\bar{a}|=|\bar{b}|$, then $\bar{a}+\bar{b}$ bisects the angles between $\bar{a}$ and $\bar{b}$
3) $\bar{a},\bar{b},\bar{a}+\bar{b}$ from an equilateral tria...
4) $\bar{a}-\bar{b},\bar{a}+\bar{b}$ are other two sides of parallelogram for which $\bar{a},\bar{b}$ are two adj... sides.

20. If point O is the centre of a circle circumscribed about a triangle ABC, th... $\overline{OA}\sin 2A+\overline{OB}\sin 2B+\overline{OC}\sin 2C=$
1) $(\overline{OA}+\overline{OB}+\overline{OC})\sin 2A$
2) $(\overline{OA}+\overline{OB}+\overline{OC})\cos 2A$
3) $\bar{0}$ 4) $(\overline{OA}+\overline{OB}+\overline{OC})\tan 2A$

21. The vector equation of the plane pas... through $\bar{a},\bar{b},\bar{c}$ is $\bar{r}=\alpha\bar{a}+\beta\bar{b}+\gamma\bar{c}$ provi...
1) $\alpha+\beta+\gamma=0$ 2) $\alpha+\beta+\gamma=1$
3) $\alpha+\beta=\gamma$ 4) $\alpha^2+\beta^2+\gamma^2...$

KEY

01) 2	02) 1	03) 3	04) 3	05) 2	06...
07) 2	08) 3	09) 1	10) 2	11) 3	12...
13) 1	14) 4	15) 1	16) 4	17) 1	18...
19) 2	20) 3	21) 2			

EXERCISE-I

CRTQ & SPQ LEVEL-I

POSITION VECTOR, UNIT VECTOR AND EQUAL VECTORS

C.R.T.Q Class Room Teaching Questions

1. The vector $(\cos\alpha\cos\beta)\bar{i}+(\cos\alpha\sin\beta)\bar{j}+\sin\alpha\bar{k}$
1) Null vector
2) unit vector
3) parallel to $(\bar{i}+\bar{j}+\bar{k})$
4) a vector parallel to $(2\bar{i}+\bar{j}-\bar{k})$

2. If $\overline{AB} = 2\bar{i} - 3\bar{j} + \bar{k}$, $\overline{CB} = \bar{i} + \bar{j} + \bar{k}$, $\overline{CD} = 4\bar{i} - 7\bar{j}$ then $\overline{AD} =$

1) $5\bar{i} + 11\bar{j} - \bar{k}$ 2) $5\bar{i} - 11\bar{j}$

3) $5\bar{i} + 11\bar{j}$ 4) $-5\bar{i} + 11\bar{j}$

3. The position vectors of the points A,B,C are $\bar{i} + 2\bar{j} - \bar{k}$, $\bar{i} + \bar{j} + \bar{k}$, $2\bar{i} + 3\bar{j} + 2\bar{k}$ respectively. If A is chosen as the origin then the position vectors of B and C are

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

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

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

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

4. The unit vector in the opposite direction of the vector $\bar{a} = -6\bar{i} + 3\bar{j} - 2\bar{k}$ is

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

3) $\frac{1}{7}(6\bar{i} - 3\bar{j} + 2\bar{k})$ 4) $\frac{1}{7}(-6\bar{i} + 3\bar{j} + 2\bar{k})$

5. If $\bar{a} = (2,1,-1)$, $\bar{b} = (1,-1,0)$, $\bar{c} = (5,-1,1)$ then the unit vector parallel to $\bar{a} + \bar{b} - \bar{c}$, but in the opposite direction is

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

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

S.P.Q. Student Practice Questions

6. $\bar{a}$ is a non zero vector and λ is a scalar. Then $\lambda\bar{a}$ is a unit vector if

1) $\lambda = |\bar{a}|$ 2) $\lambda = \pm\frac{1}{|\bar{a}|}$

3) $\lambda = \frac{4}{|\bar{a}|}$ 4) $\lambda = \frac{2}{|\bar{a}|}$

7. Let $\overline{OA} = 2\bar{i} + 4\bar{k}$, $\overline{OB} = 5\bar{i} + 3\sqrt{3}\bar{j} + 4\bar{k}$, $\overline{OC} = -2\sqrt{3}\bar{j} + \bar{k}$, $\overline{OD} = 2\bar{i} + \bar{k}$. Then the value of $\overline{CD}$ in terms of $\overline{AB}$ is

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

8. If the vectors $\bar{a} = x\bar{i} + 2\bar{j} + z\bar{k}$ and $\bar{b} = 2\bar{i} + y\bar{j} + \bar{k}$ are equal, then $(x, y, z) =$

1) (2, 1, 2) 2) (2, 2, 1)

3) (1, 2, 2) 4) (2, 1, 1)

9. The unit vector in the direction of $2\bar{i} + 3\bar{j} + \bar{k}$ is

1) $\pm\frac{1}{\sqrt{14}}(2\bar{i} + 3\bar{j} + \bar{k})$

2) $-\frac{1}{\sqrt{14}}(2\bar{i} + 3\bar{j} + \bar{k})$

3) $\frac{1}{\sqrt{14}}(2\bar{i} + 3\bar{j} + \bar{k})$

4) $\sqrt{14}(2\bar{i} + 3\bar{j} + \bar{k})$

10. If $\bar{a} = 3\bar{i} - 2\bar{j} + \bar{k}$ and $\bar{b} = \bar{i} + 2\bar{j} + 5\bar{k}$ then unit vector in the direction of $\bar{a} - \bar{b}$ is

1) $\frac{1}{\sqrt{34}}(2\bar{i} - 4\bar{j} + 4\bar{k})$

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

3) $\frac{1}{6}(-2\bar{i} - 4\bar{j} - 2\bar{k})$

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

COLLINEAR, LIKE AND UNLIKE VECTORS:

C.R.T.Q Class Room Teaching Questions

11. Let $\bar{a}, \bar{b}$ be two noncollinear vectors. If $\overline{OA}=(x+4y)\bar{a}+(2x+y+1)\bar{b}$, $\overline{OB}=(y-2x+2)\bar{a}+(2x-3y-1)\bar{b}$ and $3\overline{OA}=2\overline{OB}$, then (x,y) =
1) (1,2) 2) (1,-2) 3) (2,-1) 4) (-2,-1)

12. If the vectors $\bar{a}=-2\bar{i}+3\bar{j}+y\bar{k}$ and $\bar{b}=x\bar{i}-6\bar{j}+2\bar{k}$ are collinear, then the value of $x+y$ is ....
1) 4 2) 5 3) -3 4) 3

13. If the position vectors of the points P,Q,R and S are respectively $2\bar{i}+4\bar{k}$, $5\bar{i}+3\sqrt{3}\bar{j}+4\bar{k}$, $-2\sqrt{3}\bar{j}+\bar{k}$ and $2\bar{i}+\bar{k}$, then $\frac{|\overline{PQ}|}{|\overline{RS}|}$ is
1) $\frac{2}{3}$ 2) $\frac{3}{2}$ 3) $\frac{1}{3}$ 4) $\frac{3}{4}$

14. If the vectors $\bar{a}=2\bar{i}+3\bar{j}+6\bar{k}$ and $\bar{b}$ are collinear and $|\bar{b}|=21$, then $\bar{b}$ equals to
1) $\pm 2(2\bar{i}+3\bar{j}+6\bar{k})$ 2) $\pm 3(2\bar{i}+3\bar{j}+6\bar{k})$
3) $\bar{i}+\bar{j}+\bar{k}$ 4) $\pm 21(2\bar{i}+3\bar{j}+6\bar{k})$

15. If the vectors $\bar{a}=(x,-2,5)$ and $\bar{b}=(1,y,-3)$ are collinear then
1) $x=\frac{5}{3}, y=\frac{6}{5}$ 2) $x=\frac{5}{3}, y=\frac{-6}{5}$
3) $x=\frac{-5}{3}, y=\frac{6}{5}$ 4) $x=\frac{-5}{3}, y=\frac{-6}{5}$

16. If $\bar{p}=\bar{i}+a\bar{j}+\bar{k}$ and $\bar{q}=\bar{i}+\bar{j}+\bar{k}$ then $|\bar{p}+\bar{q}|=|\bar{p}|+|\bar{q}|$ is true for
1) $a=-1$ 2) $a=1$
3) all real values of 'a'
4) for no real values of 'a'

S.P.Q. Student Practice Questions

17. The position vectors of the points A, B, C are respectively $\bar{i}+x\bar{j}+3\bar{k}$, $3\bar{i}+4\bar{j}+7\bar{k}$ and $y\bar{i}-2\bar{j}-5\bar{k}$. If A, B and C are collinear, then $|x\bar{i}+y\bar{j}|=$
1) $\sqrt{13}$ 2) $\sqrt{11}$ 3) 3 4) 2

18. Three points whose position vectors are $x\bar{i}+y\bar{j}+z\bar{k}$, $\bar{i}+z\bar{j}$ and $-\bar{i}-\bar{j}$ are collinear, then relation between x, y, z
1) $x-2y=1, z=0$ 2) $x+y=1, z=$
3) $x-y=1, z=0$ 4) $x+2y=1, z=$

19. The position vectors of four points P,Q,R,S are $2\bar{a}+4\bar{c}$, $5\bar{a}+3\sqrt{3}\bar{b}+4\bar{c}$, $-2\sqrt{3}\bar{b}+\bar{c}$ and $2\bar{a}+\bar{c}$ respectively then
1) $\overline{PQ}$ is parallel to $\overline{RS}$
2) $\overline{PQ}$ is not parallel to $\overline{RS}$
3) $\overline{PQ}$ is equal to $\overline{RS}$
4) $\overline{PQ}$ is parallel and equal to $\overline{RS}$

20. If the vectors $2\bar{i}-3\bar{j}+6\bar{k}$, $\bar{b}$ are collinear and $|\bar{b}|=14$ then $\bar{b}=$
1) $\frac{1}{7}(-2\bar{i}+3\bar{j}+6\bar{k})$
2) $\pm(4\bar{i}-6\bar{j}+12\bar{k})$
3) $6\bar{i}-9\bar{j}+18\bar{k}$ 4) $\frac{1}{7}(2\bar{i}-3\bar{j}+6\bar{k})$

21. Let $\bar{a}=\bar{i}+\bar{j}-\bar{k}$, $\bar{b}=5\bar{i}-3\bar{j}-3\bar{k}$, $\bar{c}=3\bar{i}-\bar{j}+2\bar{k}$. If a vector $\bar{r}$ is collinear with $\bar{c}$ and $|\bar{r}|=|\bar{a}+\bar{b}|$, then $\bar{r}$ equals

1) $\pm 3\bar{c}$ 2) $\pm\frac{3}{2}\bar{c}$ 3) $\pm 2\bar{c}$ 4) $\pm\frac{2}{3}\bar{c}$

COPLANAR AND NON COPLANAR VECTORS:

C.R.T.Q Class Room Teaching Questions

22. If $3\bar{i}+3\bar{j}+\sqrt{3}\bar{k}$, $\bar{i}+\bar{k}$, $\sqrt{3}\bar{i}+\sqrt{3}\bar{j}+\lambda\bar{k}$ are coplanar then λ is ...

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

23. If the points $(\alpha-x,\alpha,\alpha),(\alpha,\alpha-y,\alpha)$, $(\alpha,\alpha,\alpha-z)$ and $(\alpha-1,\alpha-1,\alpha-1)$ are coplanar, $\alpha\in R$ then

1) $xy+yz+zx=1$ 2) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1$

3) $\frac{1}{1-x}+\frac{1}{1-y}+\frac{1}{1-z}=1$ 4) x y z = 1

S.P.Q. Student Practice Questions

24. Let $\bar{a}=\bar{i}+\bar{j}$, $\bar{b}=\bar{j}+\bar{k}$ and $\bar{c}=\alpha\bar{a}+\beta\bar{b}$. If the vectors $\bar{i}-2\bar{j}+\bar{k}$, $3\bar{i}+2\bar{j}-\bar{k}$ and $\bar{c}$ are coplanar then $\frac{\alpha}{\beta}=$

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

25. If the vectors $2\bar{i}+3\bar{j}-6\bar{k}, 6\bar{i}-2\bar{j}+3\bar{k}$, $3\bar{i}-6\bar{j}-2\bar{k}$ and $\bar{i}+\bar{j}-\lambda^2\bar{k}$ are coplanar then $31\lambda^2-233$ is

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

TRIANGLE AND PARALLELOGRAM LAW, VECTOR ADDITION

C.R.T.Q Class Room Teaching Questions

26. If the position vectors of the vertices of a triangle are $2\bar{i}-\bar{j}+\bar{k}, \bar{i}-3\bar{j}-5\bar{k}$ and $3\bar{i}-4\bar{j}-4\bar{k}$ then the triangle is

1) Equilateral triangle
2) Isosceles triangle
3) Right angled isosceles triangle
4) Right angled triangle

27. If the vectors $4\bar{i}-7\bar{j}-2\bar{k}, \bar{i}+5\bar{j}-3\bar{k}$ and $3\bar{i}-\lambda\bar{j}+\bar{k}$ form a triangle then $\lambda=$

1) 6 2) -6 3) 12 4) -1

28. Let ABC be a triangle and let D,E be the midpoints of the sides AB, AC respectively,then $\overline{BE}+\overline{DC}=$

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

29. Orthocentre of an equilateral triangle ABC is the origin O. If $\overline{OA}=\bar{a},\overline{OB}=\bar{b},\overline{OC}=\bar{c}$ then $\overline{AB}+2\overline{BC}+3\overline{CA}=$

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

30. ABC is a triangle and P is any point on BC. If $\overline{PQ}$ is the resultant of the vectors $\overline{AP}, \overline{PB}$ and $\overline{PC}$ then ACQB is

1) rectangle 2) square
3) rhombus 4) parallelogram

31. The adjacent sides of a parallelogram are $2\bar{i}+4\bar{j}-5\bar{k}$ and $\bar{i}+2\bar{j}+3\bar{k}$ then the unit vector parallel to a diagonal is

1) $\frac{-\bar{i}+2\bar{j}+8\bar{k}}{\sqrt{69}}$ 2) $\frac{3\bar{i}+6\bar{j}+2\bar{k}}{7}$

3) $\frac{-\bar{i}+2\bar{j}-8\bar{k}}{\sqrt{69}}$ 4) $\frac{-\bar{i}-2\bar{j}+8\bar{k}}{\sqrt{69}}$

S.P.Q. Student Practice Questions

32. The points A(–1, 6, 6) B(–4, 9, 6) C(0, 7, 10) form

1) equilateral triangle
2) right angled triangle
3) right angled isosceles triangle
4) isosceles triangle

33.If $2\bar{i}+3\bar{j}-6\bar{k},\ 6\bar{i}-2\bar{j}+3\bar{k},\ 3\bar{i}-6\bar{j}-2\bar{k}$ represent the sides of a triangle,then the perimeter of the triangle is

1) 6 2) 7 3) 14 4) 21

34. Let ABCD is a parallelogram and $\overline{AC}$, $\overline{BD}$ be its diagonals Then $\overline{AC}+\overline{BD}$ is

1) $2\overline{AB}$ 2) $2\overline{BC}$ 3) $3\overline{AB}$ 4) $3\overline{BC}$

35. If G is the centroid of ΔABC, $\overline{GA}+\overline{BG}+\overline{GC}=$

1) $2\overline{GB}$ 2) $2\overline{GA}$ 3) $\bar{0}$ 4) $2\overline{BG}$

36. The vectors $\bar{a},\bar{b},\bar{c},\bar{d}$ are respectively the p.v's of the points A, B, C, D and P, Q, R, S are the points such that $\overline{AP}=2\overline{PB}$; $\overline{BQ}=2\overline{QC}$; $\overline{CR}=2\overline{RD}$; $\overline{DS}=2\overline{SA}$.

If PQRS is a parallelogram, then $\bar{a}-\bar{b}+\bar{c}-\bar{d}=$

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

37. If $\bar{i}+2\bar{j}+3\bar{k},\ 3\bar{i}+2\bar{j}+\bar{k}$, are sides of a parallelogram, then a unit vector parallel to one of the diagonals is

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

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

SCALAR MULTIPLICATION AND THEIR PROPERTIES:

C.R.T.Q Class Room Teaching Questions

38. The vector $\bar{i}+x\bar{j}+3\bar{k}$ is rotated through an angle θ and doubled in magnitude, then it becomes $4\bar{i}+(4x-2)\bar{j}+2\bar{k}$. The value of x is

1) $\left\{-\frac{2}{3},2\right\}$ 2) $\left\{\frac{1}{3},2\right\}$

3) $\left\{\frac{2}{3},0\right\}$ 4) $\{2,7\}$

S.P.Q. Student Practice Questions

39. The vector $\bar{i}+2x\bar{j}+2\bar{k}$ rotated through an angle θ and doubled in magnitude then it becomes $2\bar{i}+(2x+2)\bar{j}+(6x-2)\bar{k}$. Then the values of x are

1) 1, 1/3 2) -1, 1/3 3) 1,-1/3 4) 0,3

ANGLE BETWEEN TWO VECTORS

C.R.T.Q Class Room Teaching Questions

40. 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

1) $\frac{4}{\sqrt{162}}$ 2) $\frac{11}{\sqrt{162}}$ 3) $\frac{5}{\sqrt{162}}$ 4) $\frac{-5}{\sqrt{162}}$

41. If a vector $\bar{a}$ of magnitude 50 is collinear with vector $\bar{b}=6\bar{i}-8\bar{j}-\frac{15}{2}\bar{k}$ and makes an acute angle with positive z-axis then

1) $\bar{a}=4\bar{b}$ 2) $\bar{a}=-4\bar{b}$

3) $\bar{b}=4\bar{a}$ 4) $\bar{a}=-2\bar{b}$

S.P.Q. Student Practice Questions

42. Unit vector making angles $\frac{\pi}{6},\frac{\pi}{6},\frac{\pi}{3}$ with $\bar{i},\bar{j},\bar{k}$ directions is

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

3) $\frac{1}{\sqrt{3}}\left(\bar{i}-\bar{j}-\bar{k}\right)$

4) impossible to get such a vector

SECTION FORMULA,MID POINT

C.R.T.Q Class Room Teaching Questions

43. If $\bar{a}$ and $\bar{b}$ are position vectors of A and B respectively, then the position vector of a point C in $\overline{AB}$ produced such that $\overline{AC}=2015\,\overline{AB}$ is

1) $2014\bar{a}-2015\bar{b}$ 2) $2014\bar{b}+2015\bar{a}$

3) $2015\bar{b}+2014\bar{a}$ 4) $2015\bar{b}-2014\bar{a}$

44. If $3\bar{a}+4\bar{b}-7\bar{c}=\bar{0}$ then the ratio in which $C(\bar{c})$ divides the join of $A(\bar{a})$ and $B(\bar{b})$ is

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

45. The ratio in which $\bar{i}+2\bar{j}+3\bar{k}$ divides the join of $-2\bar{i}+3\bar{j}+5\bar{k}$ and $7\bar{i}-\bar{k}$ is

1) -3 : 2 2) 1 : 2

3) 2 : 3 4) -4 : 3

46. A point $C=\dfrac{5\bar{a}+4\bar{b}-5\bar{c}}{3}$ divides the line joining $A=\bar{a}-2\bar{b}+3\bar{c}$ and B in the ratio 2:1, then $\overline{AB}$ is

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

3) $\bar{a}+5\bar{b}-7\bar{c}$ 4) $2\bar{a}+3\bar{b}-4\bar{c}$

47. The position vectors of the points A,B,C are respectively $\bar{a},\bar{b},\bar{c}$. If P divides $\overline{AB}$ in the ratio 3:4 and Q divides $\overline{BC}$ in the ratio 2:1 both externally then $\overline{PQ}=$

1) $\bar{b}+\bar{c}-2\bar{a}$ 2) $2(\bar{b}+\bar{c}-2\bar{a})$

3) $4\bar{a}-\bar{b}-\bar{c}$ 4) $\frac{-2\bar{a}-\bar{b}-\bar{c}}{2}$

S.P.Q. Student Practice Questions

48. If $\overline{AO}+\overline{OB}=\overline{BO}+\overline{OC}$ then

1) A is the midpoint of $\overline{BC}$

2) B is the midpoint of $\overline{CA}$

3) C is the midpoint of $\overline{AB}$

4) C divides $\overline{AB}$ in the ratio 1:2

49. The position vectors of P and Q are respectively $\bar{a}$ and $\bar{b}$. If R is a point on $\overline{PQ}$ such that $\overline{PR}=5\overline{PQ}$, then the position vector of R is

1) $5\bar{b}-4\bar{a}$ 2) $5\bar{b}+4\bar{a}$

3) $4\bar{b}-5\bar{a}$ 4) $4\bar{b}+5\bar{a}$

50. If A, B, C are collinear points whose position vectors are $\bar{a},\bar{b},\bar{c}$ respectively satisfying the condition $3\bar{a}+2\bar{c}=5\bar{b}$, then AB : BC =

1) 3 : 2 2) 5 : 3 3) 2 : 3 4) 3 : 5.

51. Let A =(-3,4,-8) ,B=(5,-6,4). Then the coordinates of the point in which the XY-plane or XOY plane divides the line segment $\overline{AB}$ is

1) (7,-8,0) 2) $\left(\frac{7}{3},-\frac{8}{3},0\right)$

3) $\left(\frac{7}{2},-\frac{8}{2},0\right)$ 4) $\left(0,\frac{7}{3},-\frac{8}{3}\right)$

52. Let $A=2\bar{i}+7\bar{j}$, $B=\bar{i}+2\bar{j}+4\bar{k}$, $C=\dfrac{9\bar{i}+30\bar{j}+4\bar{k}}{5}$. Then the ratio in which C divides $\overline{AB}$ internally is

1) 1 : 4 2) 2 : 3 3) 3 : 2 4) 5 : 1

53. Let $A(\bar{a}), B(\bar{b}), C(\bar{c})$ be the vertices of the triangle ABC and let D,E,F be the mid points of the sides BC,CA,AB respectively. If P divides the median AD in the ratio 2:1 then the position vector of P is

1) $\bar{0}$ 2) $\bar{a}+\bar{b}+\bar{c}$
3) $\dfrac{\bar{a}+\bar{b}+\bar{c}}{3}$ 4) $\dfrac{2\bar{a}+\bar{b}+\bar{c}}{3}$

LINEAR COMBINATION, LINEARLY INDEPENDENT AND DEPENDENT VECTORS, DC'S & DR'S

C.R.T.Q Class Room Teaching Questions

54. If a straight line makes an angle $\cos^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$ with each of the positive x, y and z-axis, a vector parallel to that line is

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

55. If $\bar{e}=l\bar{i}+m\bar{j}+n\bar{k}$ is a unit vector ,the maximum value of lm + mn + nl is

1) $-\dfrac{1}{2}$ 2) 0 3) 1 4) $\dfrac{3}{2}$

56. Given $\bar{a}=\bar{i}+2\bar{j}+3\bar{k}, \bar{b}=2\bar{i}+3\bar{j}+\bar{k}$, $\bar{c}=8\bar{i}+13\bar{j}+9\bar{k}$, the linear relation among them if possible is

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

57. If the vectors $\bar{a}+1343\bar{b}+\bar{c}, -\bar{a}+\bar{b}+\bar{c}$ and $\bar{a}+\mu\bar{b}+2\bar{c}$ are linearly dependent then $\mu=$

1) 2014 2) 2015 3) 2016 4) 0

S.P.Q. Student Practice Questions

58. A straight line is inclined to the axes Y and Z at angles 45^0 and 60^0 respectively. The inclination of the line with the X-axis is

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

59. If $\bar{e}=l\bar{i}+m\bar{j}+n\bar{k}$ is a unit vector and $l=\dfrac{1}{3}$, then maximum value of lmn is

1) 1 2) $\dfrac{4}{27}$ 3) $\dfrac{8}{27}$ 4) $\dfrac{3}{2}$

60. If $(x,y,z)\neq 0$ and $(\bar{i}+\bar{j}+3\bar{k})x+(3\bar{i}-3\bar{j}+\bar{k})y+(-4\bar{i}+5\bar{j})z=\alpha(x\bar{i}+y\bar{j}+z\bar{k})$, then $\alpha=$

1) 0, 1 2) −1, 0 3) 0, 2 4) -2

61. If the vectors $\bar{a}+\bar{b}+\bar{c}, \bar{a}+\lambda\bar{b}+2\bar{c}, -\bar{a}+\bar{b}+\bar{c}$ are linearly dependent then $\lambda=$

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

LH & RH SYSTEMS- GEOMETRICAL APPLICATIONS

C.R.T.Q Class Room Teaching Questions

62. The incentre of the triangle formed by the points $\bar{i}+\bar{j}+\bar{k}$, $4\bar{i}+\bar{j}+\bar{k}$ and $4\bar{i}+5\bar{j}+\bar{k}$ is

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

63. If the vectors $\bar{a}=3\bar{i}+\bar{j}-2\bar{k}$, $\bar{c}=4\bar{i}-2\bar{j}-6\bar{k}$ form the sides of the triangle then length of the median bisecting the vector $\bar{c}$ is

1) $\sqrt{12}$ units 2) $\sqrt{6}$ units
3) $2\sqrt{6}$ units 4) $2\sqrt{3}$ units

64. If O is the circumcentre and O' is the orthocentre of a triangle ABC and if $\overline{AP}$ is the circumdiameter then $\overline{AO'}+\overline{O'B}+\overline{O'C}=$

1) $\overline{OA}$ 2) $\overline{O'A}$ 3) $\overline{AP}$ 4) $\overline{AO}$

S.P.Q. Student Practice Questions

65. The position vectors of A,B,C are $\bar{i}+\bar{j}+\bar{k}, 4\bar{i}+\bar{j}+\bar{k}, 4\bar{i}+5\bar{j}+\bar{k}$ Then the position vector of the circumcentre of the triangle ABC is

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

3) $\frac{1}{2}(5\bar{i}+6\bar{j}+2\bar{k})$ 4) $\frac{1}{2}(9\bar{i}+7\bar{j}+3\bar{k})$

66. Let G and G' be the centroids of the triangles ABC and A' B' C' respectively.Then $\overline{AA'}+\overline{BB'}+\overline{CC'}=$

1) $2\overline{GG^1}$ 2) $3\overline{G^1G}$

3) $3\overline{GG^1}$ 4) $\frac{3}{2}\overline{GG^1}$

ANGULAR BISECTORS

C.R.T.Q Class Room Teaching Questions

67. Let O be the origin and A, B be two points. and $\bar{p},\bar{q}$ are vectors represented by $\overline{OA}$ and $\overline{OB}$ and their magnitudes are p,q. The unit vector bisecting the angle AOB is

1) $\dfrac{\frac{\bar{p}}{p}+\frac{\bar{q}}{q}}{\left|\frac{\bar{p}}{p}+\frac{\bar{q}}{q}\right|}$ 2) $\dfrac{\frac{\bar{p}}{p}+\frac{\bar{q}}{q}}{\left|\frac{\bar{p}}{p}-\frac{\bar{q}}{q}\right|}$

3) $\dfrac{\frac{\bar{p}}{p}+\frac{\bar{q}}{q}}{\left|\frac{\bar{p}}{p}+\frac{\bar{q}}{q}\right|}$ 4) $\dfrac{\bar{p}+\bar{q}}{2}$

68. If $\bar{a}$ and $\bar{b}$ are two non-parallel unit vectors and the vector $\alpha\bar{a}+\bar{b}$ bisects the internal angle between $\bar{a}$ and $\bar{b}$, then α is

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

S.P.Q. Student Practice Questions

69. The unit vector bisecting $\overline{OY}$ and $\overline{OZ}$ is

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

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

70. The vector $a\bar{i}+b\bar{j}+c\bar{k}$ is a bisector of the angle between the vectors $\bar{i}+\bar{j}$ and $\bar{j}+\bar{k}$ if

1) $a=b$ 2) $a=c$

3) $a+b=c$ 4) $a=b=c$

REGULAR HEXAGON

C.R.T.Q Class Room Teaching Questions

71. Let ABCDEF be a regular hexagon and $\overline{AB}=\bar{a}, \overline{BC}=\bar{b}, \overline{CD}=\bar{c}$ then $\overline{AE}$ is equal to

1) $\bar{a}+\bar{b}+\bar{c}$ 2) $\bar{b}+\bar{c}$

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

72. Let ABCDEF be a regular hexagon. Then

$\overline{AB}+\overline{AC}+\overline{AD}+\overline{EA}+\overline{FA}=$

1) $2\overline{AB}$ 2) $3\overline{AB}$ 3) $4\overline{AB}$ 4) $\overline{AB}$

S.P.Q. Student Practice Questions

73. Let ABCDEF be a regular hexagon and let $\overline{AB}=\bar{a}$, $\overline{BC}=\bar{b}$, then $\overline{CD}=$

1) $\bar{a}-\bar{b}$ 2) $\bar{a}+\bar{b}$ 3) $\bar{b}-\bar{a}$ 4) $2\bar{a}$

4. Let $\bar{f}(t)=[t]\bar{i}-(t-[t])\bar{j}+[t+1]\bar{k}$ be a vector. Where $[.]$ is a greatest integer function. If $\bar{f}\left(\frac{5}{4}\right)$ and $\bar{i}+\lambda\bar{j}+\mu\bar{k}$ are parallel vectors then $(\lambda,\mu)=$

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

5. The positions vector of three points are $2\bar{a}-\bar{b}+3\bar{c}$, $\bar{a}-2\bar{b}+x\bar{c}$ and $y\bar{a}-5\bar{b}$ where $\bar{a},\bar{b},\bar{c}$ are non-coplanar vectors. If the three points are collinear, then

1) $x=-2, y=\frac{9}{4}$ 2) $x=\frac{-9}{4}, y=2$

3) $x=\frac{9}{4}, y=-2$ 4) $x=-2, y=-2$

6. If $\bar{r}=3\bar{p}+4\bar{q}$ and $2\bar{r}=\bar{p}-3\bar{q}$ then

1) $\bar{r},\bar{q}$ have same direction and $|\bar{r}|<2|\bar{q}|$

2) $\bar{r},\bar{q}$ have opposite direction and $|\bar{r}|>2|\bar{q}|$

3) $\bar{r},\bar{q}$ have opposite direction and $|\bar{r}|<2|\bar{q}|$

4) $\bar{r},\bar{q}$ have same direction and $|\bar{r}|>2|\bar{q}|$

S.P.Q Student Practice Questions

7. P,Q and R are three points with position vectors $\bar{i}+\bar{j}, \bar{i}-\bar{j}$ and $a\bar{i}+b\bar{j}+c\bar{k}$ respectively. If P,Q and R are collinear, then

1) $a=b=c=0$

2) $a=1$, b, c are any real numbers

3) $a=b=c=1$

4) $a=1$, $c=0$ and b is any real number

8. If $10\bar{i}+3\bar{j}$, $12\bar{i}-5\bar{j}$ and $\lambda\bar{i}+11\bar{j}$ are position vectors of three coll... points. Then λ is

1) 4 2) 8 3) 12 4)

9. Let $\bar{a}=(1,1,-1)$, $\bar{b}=(5,-3,-3)$ and $\bar{c}=(3,-1,2)$. If $\bar{r}$ is collinear with $\bar{c}$ and has length $\frac{|\bar{a}+\bar{b}|}{2}$, then $\bar{r}$ equals

1) $\pm 3\bar{c}$ 2) $\pm\frac{3}{2}\bar{c}$

3) $\pm\bar{c}$ 4) $\pm\frac{2}{3}\bar{c}$

10. The vectors $2\bar{i}+3\bar{j}, 5\bar{i}+6\bar{j}$ and $\lambda\bar{i}$... have their initial point at (1,1). The value of λ so that the vectors terminate on one straight line is

1) 3 2) 6 3) 9 4)

SCALAR MULTIPLICATION AND THEIR PROPERTIES

C.R.T.Q Class Room Teaching Questions

11. Let A and B be points with position vectors $\bar{a}$ and $\bar{b}$ with respect to O. If the point 'C' on OA is such that $2\overline{AC}=\overline{CO}$, $\overline{CD}$ is parallel to $\overline{OB}$ and $|\overline{CD}|=3|\overline{OB}|$ then $\overline{AD}$ is

1) $\bar{b}-\frac{\bar{a}}{9}$ 2) $3\bar{b}-\frac{\bar{a}}{3}$

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

SECTION FORMULA, MID POINT

C.R.T.Q Class Room Teaching Questions

12. A point $C=\frac{5\bar{a}+4\bar{b}-5\bar{c}}{3}$ divides the ... joining the points $A=\bar{a}-2\bar{b}+3\bar{c}$ and B in the ratio 2:1, then the position vector of B is

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

13. In quadrilateral ABCD , $\overline{AB}=\bar{a},\overline{BC}=\bar{b},\overline{AD}=\bar{b}-\bar{a}$. If M is the mid point of BC and N is a point on DM such that $DN=\frac{4}{5}DM$, then $\overline{AN}=$

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

14. The median AD of ΔABC is bisected at E and BE is produced to meet the side AC in F. Then the ratio AF : FC
1) 1 : 3 2) 2 : 1 3) 1 : 2 4) 3 : 1

S.P.Q. Student Practice Questions

15. In the $\Delta OAB, M$ is the mid point of AB, C is a point on OM, such that $2\overline{OC}=\overline{CM}$. X is a point on the side OB such that $\overline{OX}=2\overline{XB}$. The line XC is produced to meet OA in Y. Then $\frac{OY}{YA}=$

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

16. In triangle ABC, D and E are points on BC and AC respectively such that $\overline{BD}=2\overline{DC}$ and $\overline{AE}=3\overline{EC}$ Let P be the point of intersection of AD and BE then BP/PE =

1) $\frac{9}{8}$ 2) $\frac{3}{8}$ 3) $\frac{8}{3}$ 4) $\frac{8}{9}$

LINEAR COMBINATION, LINEARLY INDEPENDENT AND DEPENDENT VECTORS, DC'S &DR'S:

C.R.T.Q Class Room Teaching Questions

17. If $\bar{r}=3\bar{i}+2\bar{j}-5\bar{k}$,$\bar{a}=2\bar{i}-\bar{j}+\bar{k}$, $\bar{b}=\bar{i}+3\bar{j}-2\bar{k}$ and $\bar{c}=-2\bar{i}+\bar{j}-3\bar{k}$ such that $\bar{r}=\lambda\bar{a}+\mu\bar{b}+\nu\bar{c}$. Then

1) $\mu,\frac{\lambda}{2},\nu$ are in A.P.
2) λ,μ,ν are in A.P
3) λ,μ,ν are in H.P.
4) λ,μ,ν are in G.P.

18. If $\overline{OA}=3\bar{i}+\bar{j}-\bar{k},|\overline{AB}|=2\sqrt{6}$ and AB has the direction ratios 1,-1,2 then |OB| =
1) $\sqrt{35}$ 2) $\sqrt{41}$ 3) $\sqrt{26}$ 4) $\sqrt{55}$

19. A vector $\bar{e}$ whose magnitude is 10 and making equal angles less than 90^0 with the coordinate axes is

1) $\frac{1}{\sqrt{3}}(\bar{i}+\bar{j}+\bar{k})$ 2) $\frac{10}{\sqrt{3}}(\bar{i}+\bar{j}+\bar{k})$
3) $\frac{10}{\sqrt{3}}(\bar{i}-\bar{j}+\bar{k})$ 4) $\frac{10}{\sqrt{3}}(\bar{i}-\bar{j}-\bar{k})$

S.P.Q. Student Practice Questions

20. If $\bar{r}=3\bar{i}+2\bar{j}-5\bar{k}$, $\bar{a}=2\bar{i}-\bar{j}+\bar{k}$, $\bar{b}=\bar{i}+3\bar{j}-2\bar{k}$ and $\bar{c}=-2\bar{i}+\bar{j}-3\bar{k}$ such that $\bar{r}=l\bar{a}+m\bar{b}+n\bar{c}$, then l-m-n =
1) 0 2) 2
3) 3 4) −2

21. If $\bar{a}=\bar{i}+\bar{j}+\bar{k},\bar{b}=4\bar{i}+3\bar{j}+4\bar{k}$ $\bar{c}=\bar{i}+\alpha\bar{j}+\beta\bar{k}$ be linearly dependent vectors and $|\bar{c}|=\sqrt{3}$ then
1) $\alpha=1,\beta=-1$ 2) $\alpha=1,\beta=\pm1$
3) $\alpha=-1,\beta=\pm1$ 4) $\alpha=\pm1,\beta=1$

22. x-component of $\bar{a}$ is twice its y-component. If the magnitude of the vector is $5\sqrt{2}$ and it makes an angle of 135^0 with z-axis then the vector is
1) $(2\sqrt{3},\sqrt{3},-3)$ 2) $(2\sqrt{6},\sqrt{6},-6)$
3) $(2\sqrt{5},\sqrt{5},-5)$ 4) $(\sqrt{6},\sqrt{6},-6)$

GEOMETRICAL APPLICATIONS

C.R.T.Q Class Room Teaching Questions

23. A vector $\bar{a}$ has components a_1, a_2, a_3 in a right handed rectangular cartesian coordinate system OXYZ. The coordinate system is rotated about z-axis through an angle $\pi/2$. The components of $\bar{a}$ in the new system are

1) $(-a_1, a_2, a_3)$ 2) (a_2, a_1, a_3)
3) $(a_2, -a_1, a_3)$ 4) $(a_2, a_1, -a_3)$

24. Given three vectors $\bar{a}=6\bar{i}-3\bar{j}, \bar{b}=2\bar{i}-6\bar{j}$ and $\bar{c}=-2\bar{i}+21\bar{j}$ such that $\bar{\alpha}=\bar{a}+\bar{b}+\bar{c}$. Then the resolution of the vector $\bar{\alpha}$ into components with respect to $\bar{a}$ and $\bar{b}$ given by

1) $3\bar{a}-2\bar{b}$ 2) $3\bar{b}-2\bar{a}$
3) $2\bar{a}-3\bar{b}$ 4) $\bar{a}-3\bar{b}$

25. If $\bar{a}, \bar{b}, \bar{c}$ are position vectors of vertices A, B, C of ΔABC. If $\bar{r}$ is position vector of a point P such that $\left(|\bar{b}-\bar{c}|+|\bar{c}-\bar{a}|+|\bar{a}-\bar{b}|\right)\bar{r}$ $=|\bar{b}-\bar{c}|\bar{a}+|\bar{c}-\bar{a}|\bar{b}+|\bar{a}-\bar{b}|\bar{c}$ then the point P is

1) Centroid of ΔABC
2) Orthocentre of ΔABC
3) Circumcentre of ΔABC
4) Incentre of ΔABC

26. The position vectors of the vertices of a triangle are $3\bar{i}+4\bar{j}+5\bar{k}, \bar{i}+7\bar{k}$ and $5\bar{i}+5\bar{j}$ The distance between the circumcentre and orthocentre is

1) 0 2) $\sqrt{306}$
3) $2\sqrt{306}$ 4) $\frac{3}{2}\sqrt{306}$

27. The position vectors A, B are $\bar{a}, \bar{b}$ respectively. The position vector of C is $\frac{5\bar{a}}{3}-\bar{b}$. Then

1) C is outside the ΔOAB but inside the angle OBA
2) C is outside the ΔOAB but inside the angle BOA
3) C is outside the ΔOAB but inside the angle COA
4) Inside the triangle OAB

28. If (2, -1, 2) is the centroid of tetrahedron OABC and G_1 the centroid of ΔABC then $|\overline{OG_1}|$

1) 4 2) 1 3) 9/2 4) 3/2

S.P.Q. Student Practice Questions

29. $A_2=a_2\cos\alpha+a_3\sin\alpha=8$, $A_3=-a_2\sin\alpha+a_3\cos\alpha=-4$ with respect to rectangular coordinate system OXYZ, the components of vector $\bar{a}=(2,4,8)$. The system is rotated through an angle of $\frac{\pi}{2}$ about X-axis. The components of $\bar{a}$ in the new system are

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

30. A vector $\bar{a}$ has components 2p and 1 with respect to a rectangular cartesian coordinate system. This system is rotated through a certain angle about the origin in the counter clock - wise sense. If, with respect to the new system $\bar{a}$ has components p + 1 and 1 then

1) $p=0$ 2) $p=0$ or $p=-1/3$
3) $p=-1$ or $p=1/2$
4) $p=1$ or $p=-1/3$

31. If $\bar{a},\bar{b},\bar{c},\bar{d}$ are the position vectors of four points A, B, C, D in a plane such that $|\bar{a}-\bar{d}|=|\bar{b}-\bar{d}|=|\bar{c}-\bar{d}|$ then the point D is the ... of ΔABC

1) centroid 2) circumcentre
3) orthocentre 4) incentre

32. If $\bar{p}$ is the position vector of the orthocentre and $\bar{g}$ is the position vector of the centroid of the triangle ABC when circum-centre is the origin if $\bar{p}=\lambda\bar{g}$ then $\lambda=$

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

33. The position vectors of A,B are $\bar{a},\bar{b}$ respectively and the position vector of C is $\frac{\bar{a}}{2}+\frac{\bar{b}}{3}$.Then

1) C is inside the ΔOAB
2) C is outside the ΔOAB but inside the angle AOB
3) C is outside the ΔOAB but inside the angle OAB
4) can not be said

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

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

ANGULAR BISECTORS

C.R.T.Q Class Room Teaching Questions

35. If $4\bar{i}+7\bar{j}+8\bar{k}$, $2\bar{i}+3\bar{j}+4\bar{k}$ and $2\bar{i}+5\bar{j}+7\bar{k}$ are the position vectors of the vertices A,B and C of triangle ABC, the position vector of the point where the bisector of $\angle A$ meets BC is

1) $\frac{2}{3}(-6\bar{i}-8\bar{j}-6\bar{k})$ 2) $\frac{2}{3}(6\bar{i}+8\bar{j}+6\bar{k})$
3) $\frac{1}{3}(6\bar{i}+13\bar{j}+18\bar{k})$ 4) $2(\bar{i}+\bar{j}+\bar{k})$

36. Let A (4,7,8) B (2,3,4) and C (2,5,7) be the position vectors of the vertices of a Δ ABC. Then the length of internal angular bisector of angle A is

1) $\frac{3}{2}\sqrt{34}$ 2) $\frac{2}{3}\sqrt{34}$
3) $\frac{1}{2}\sqrt{34}$ 4) $\frac{1}{3}\sqrt{34}$

S.P.Q. Student Practice Questions

37. Taking 'O' as origin the position vectors of A,B are $\bar{i}+3\bar{j}-2\bar{k},3\bar{i}+\bar{j}-2\bar{k}$ The vector $\overline{OC}$ is bisecting the angle AOB and 'C' is a point on line $\overline{AB}$ then $\overline{OC}$ is

1) $4(\bar{i}+\bar{j}-\bar{k})$ 2) $2(\bar{i}+\bar{j}-\bar{k})$
3) $(\bar{i}+\bar{j}-\bar{k})$ 4) $6(\bar{i}+\bar{j}-\bar{k})$

38. If the vertices of a ΔABC are A=(1,-1,-3), B=(2,1, -2) and C=(-5, 2,-6), then the length of the internal bisector of angle A is

1) $\frac{3\sqrt{10}}{2}$ 2) $\frac{3\sqrt{10}}{5}$ 3) $\frac{3\sqrt{10}}{7}$ 4) $\frac{3\sqrt{10}}{4}$

REGULAR POLYGON

C.R.T.Q Class Room Teaching Questions

39. If $A_1A_2......A_n$ is a regular polygon. Then the vector $\overline{A_1A_2}+\overline{A_2A_3}+...+\overline{A_nA_1}$ is equal to

1) $\bar{0}$ 2) $n(\overline{A_1A_2})$
3) $n(\overline{OA_1})$ (O is the centre)
4) $(n-1)(\overline{A_1A_2})$

S.P.Q. Student Practice Questions

40. If ABCDE is a regular pentagon and $\overline{AB}+\overline{AE}+\overline{BC}+\overline{DC}+\overline{ED}=(\lambda-1)(\overline{AC})$ then $\lambda=$

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

VECTOR EQUATION OF A LINE AND A PLANE

C.R.T.Q Class Room Teaching Questions

41. Line passing through the points $2\bar a+3\bar b-\bar c$, $3\bar a+4\bar b-2\bar c$ intersects the line passing through the points $\bar a-2\bar b+3\bar c$, $\bar a-6\bar b+6\bar c$ at P. Position vector of P =

1) $2\bar a+\bar b$ 2) $\bar a+2\bar b$

3) $3\bar a+4\bar b$ 4) $\bar a-2\bar b$

42. P is a point on the line through the point A whose position vector is $\bar a$ and the line is parallel to the vector $\bar b$. If $PA=6$, then the position vector of P is

1) $\bar a+6\bar b$ 2) $\bar a\pm\frac{6}{|\bar b|}\bar b$

3) $\bar a-6\bar b$ 4) $\bar b+\frac{6}{|\bar a|}\bar a$

S.P.Q. Student Practice Questions

43. A line passes through the points whose position vectors are $\bar i+\bar j-2\bar k$ and $\bar i-3\bar j+\bar k$. The position vector of a point on it at unit distance from the first point is

1) $\frac{1}{5}(5\bar i+\bar j-7\bar k)$ 2) $\frac{1}{5}(4\bar i+9\bar j-15\bar k)$

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

COPLANAR AND NON COPLANAR VECTORS

C.R.T.Q Class Room Teaching Questions

44. If a is a non-zero scalar, then the vectors $\bar\alpha=a\bar i+2a\bar j-3a\bar k$, $\bar\beta=(2a+1)\bar i+(2a+3)\bar j+(a+1)\bar k$ and $\bar\gamma=(3a+5)\bar i+(a+5)\bar j+(a+2)\bar k$ are

1) coplanar if $a\le 0$ 2) coplanar if a

3) always coplanar 4) never coplanar

45. Let $A=2\bar i+4\bar j-\bar k$, $B=4\bar i+5\bar j+\bar k$. If the centroid G of the triangle ABC is $3\bar i+5\bar j-\bar k$ then the position vector of C

1) $3\bar i-6\bar j+3\bar k$ 2) $3\bar i-6\bar j-3\bar k$

3) $3\bar i-6\bar j+2\bar k$ 4) $3\bar i+6\bar j-3\bar k$

S.P.Q. Student Practice Questions

46. $\bar a$ and $\bar b$ are non collinear vectors. $\bar u=x\bar a+2y\bar b$, $\bar v=-2y\bar a+3x\bar b$ and $\bar w=4\bar a-2\bar b$, are vectors such that $2\bar u-\bar v=\bar w$. Then

1) $x=\frac{4}{7},y=\frac{6}{7}$

2) $x=\frac{10}{7},y=\frac{4}{7}$

3) $x=\frac{8}{7},y=\frac{2}{7}$ 4) $x=6,y=4$

47. A point collinear with (1,-2,-3) and (2,0,0) among the following is

1) (0,4,6) 2) (0,-4,-5)

S.P.Q. Student Practice Questions

3. In a triangle ABC, if $A=(0,0); B=(3,3\sqrt{3}); C=(-3\sqrt{3},3)$ then the vector of magnitude $2\sqrt{2}$ units directed along $\overline{AO}$, where O is the circumcentre of triangle ABC is

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

3) $\overline{i}-\sqrt{3}\overline{j}$ 4) $\overline{i}+2\overline{j}$

COLLINEAR VECTORS

C.R.T.Q Class Room Teaching Questions

4. The vectors $\overline{a}(x)=\cos x\overline{i}+\sin x\overline{j}$, $\overline{b}(x)=x\overline{i}+\sin x\overline{j}$ are collinear for :

1) Unique value of x such that $0<x<\frac{\pi}{6}$

2) Unique value of x such that $\frac{\pi}{6}<x<\frac{\pi}{3}$

3) No value of x

4) Infinitely many values of x in $0<x<\frac{\pi}{2}$

S.P.Q. Student Practice Questions

5. Let a line cut the sides PQ,PS and diagonal PR of a parallelogram at Q_1, R_1 and S_1 respectively such that $PQ_1=\lambda_1 PQ, PR_1=\lambda_3 PR$ and $PS_1=\lambda_2 PS$, then

1) $\frac{1}{\lambda_1}+\frac{1}{\lambda_2}=\frac{-1}{\lambda_3}$ 2) $\frac{1}{\lambda_1}+\frac{1}{\lambda_2}=\frac{1}{\lambda_3}$

3) $\frac{1}{\lambda_1}-\frac{1}{\lambda_2}=\frac{-1}{\lambda_3}$ 4) $\frac{1}{\lambda_1}-\frac{1}{\lambda_2}=\frac{1}{\lambda_3}$

SECTION FORMULA, MID-POINT

C.R.T.Q Class Room Teaching Questions

6. If $\overline{DA}=\overline{a}$; $\overline{AB}=\overline{b}$ and $\overline{CB}=k\overline{a}$ where k > 0 and X, Y are the midpoints of DB and AC respectively such that $|\overline{a}|=17$ and $|\overline{XY}|=4$, then k =

1) $\frac{8}{17}$ 2) $\frac{9}{17}$ 3) $\frac{11}{17}$ 4) $\frac{4}{17}$

7. Let O be the origin of the coordinate system in the Cartesian plane, $\overline{OP}$ and $\overline{OR}$ be vectors making angles 45^0 and 135^0 respectively with the positive directions of the X-axis (i.e., in the counter clock wise). Rectangle OPQR is completed and M is the midpoint of PQ. If the line $\overline{OM}$ meets the diagonal PR at T, and $|\overline{OP}|=3, |\overline{OR}|=4$, then $\overline{OT}$ is

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

3) $\frac{\sqrt{2}}{3}(\overline{i}-5\overline{j})$ 4) $\frac{\sqrt{2}}{3}(\overline{i}+5\overline{j})$

8. If $\overline{b}$ is the vector whose initial point divides the joining $5\overline{i}$ and $5\overline{j}$ in the ratio $\lambda:1$ and terminal point is origin. If $|\overline{b}|\le\sqrt{37}$ then $\lambda\in$

1) $(-\infty,-6]\cup\left[-\frac{1}{6},\infty\right)$

2) $(-\infty,-3)\cup\left[-\frac{1}{4},\infty\right)$

3) $(-\infty,0)\cup\left(\frac{1}{2},\infty\right)$ 4) $\left[-6,-\frac{1}{6}\right]$

9. Let AC be an arc of a circle, subtending a right angle at the centre O. The point B divides the arc AC in the ratio 1:2. If $\overline{OA}=\overline{a}$ and $\overline{OB}=\overline{b}$, then $\overline{OC}$ in terms of $\overline{a}$ and $\overline{b}$ is

1) $\overline{b}-\sqrt{3}\overline{a}$ 2) $2\overline{b}-\overline{a}$

3) $2\overline{b}-\sqrt{3}\overline{a}$ 4) $\overline{b}-\overline{a}$

10. In ΔOAB, E is the mid point of AB and F is a point on OA such that $OF = 2FA$. If C is the point of intersection of OE and BF, then find the ratios OC : CE and BC : CF are

1) 1:4; 3:2 2) 4:1; 3:2
3) 4:1; 1:2 4) 4:1; 2:3

S.P.Q. Student Practice Questions

1. ABCD is a parallelogram and P is a point on the segment $\overline{AD}$ dividing it internally in the ratio 3:1 the line $\overline{BP}$ meets the diagonal AC in Q. Then the ratio AQ:QC is

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

2. In ΔABC, P, Q, R are points on $\overline{BC}, \overline{CA}, \overline{AB}$ respectively, dividing them in the ratio 1:4, 3:2 and 3 : 7. The point S divides AB in the ratio 1:3.

Then $\dfrac{|\overline{AP}+\overline{BQ}+\overline{CR}|}{|\overline{CS}|} =$

1) $\frac{1}{5}$ 2) $\frac{2}{5}$ 3) $\frac{5}{2}$ 4) $\frac{7}{10}$

3. 3 forces are applied to a vertex of a cube which are 1, 2 and 3 in magnitude and are directed along the diagonals of the faces of the cube meeting in that vertex. The magnitude of the resultant of these forces is

1) 3 2) 4 3) 5 4) 6

4. OABCDE is a regular hexagon of side 2 units in the xy-plane O being the origin and OA taken along the x-axis. A point P is taken on a line parallel to z-axis through the centre of hexagon at a distance of 3 units from O. The vector $\overline{AP}$ is

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

15. The triangle ABC is defined by the vertices A = (0,7,10), B = (-1,6,6) and C = (-4,9,6) let D be the foot of the altitude from B to the side AC. Then $\overline{BD}$ is

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

COPLANAR, NON-COPLANAR VECTORS

C.R.T.Q Class Room Teaching Questions

16. The value of λ so that the points P, Q, R, S on the sides OA, OB, OC and AB of a regular tetrahedron are coplanar. When $\frac{OP}{OA}=\frac{1}{3}$; $\frac{OQ}{OB}=\frac{1}{2}$, $\frac{OR}{OC}=\frac{1}{3}$ and $\frac{AS}{AB}=\lambda$ is

1) $\lambda=\frac{1}{2}$ 2) $\lambda=-1$ 3) $\lambda=0$ 4) $\lambda=2$

ANGULAR BISECTORS

C.R.T.Q Class Room Teaching Questions

17. Vectors $\bar{a}=-4\bar{i}+3\bar{k}; \bar{b}=14\bar{i}+2\bar{j}-5\bar{k}$ are laid off from one point. Vector $\bar{d}$, which is being laid off from the same point dividing theagle between vectors $\bar{a}$ and $\bar{b}$ in equal halves and having the magnitude $\sqrt{6}$, is

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

TRIANGLE AND PARALLELOGRAM LAW OF ADDITION OF VECTORS

C.R.T.Q Class Room Teaching Questions

18. A man starts at the origin of the coordinate axes and walks a distance of 3 units in the North-East direction and then walks distance of 4 units in the North-West direction to reach the point P. Then $\overline{OP}$ equals

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

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

S.P.Q. Student Practice Questions

19. ABCDEF be a regular hexagon in the xy plane and $\overline{AB}=4\bar{i}$. Then $\overline{CD}=$

1) $6\bar{i}+2\sqrt{3}\bar{j}$ 2) $2(-\bar{i}+\sqrt{3}\bar{j})$

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

VECTOR EQUATION OF A LINE AND A PLANE

C.R.T.Q Class Room Teaching Questions

20. The equation to the altitude of the triangle formed by (1, 1, 1), (1, 2, 3), (2, -1, 1) through (1, 1, 1) is

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

2) $\bar{r}=(\bar{i}+\bar{j}+\bar{k})+t(3\bar{i}+\bar{j}+2\bar{k})$

3) $\bar{r}=(\bar{i}+\bar{j}+\bar{k})+t(\bar{i}-\bar{j}+2\bar{k})$

4) $|\bar{r}|=5$

21. Image of the point P with position vector $7\bar{i}-\bar{j}+2\bar{k}$ in the line whose vector equation is $\bar{r}=9\bar{i}+5\bar{j}+5\bar{k}+\lambda(\bar{i}+3\bar{j}+5\bar{k})$ has the position vector

1) $-9\bar{i}+5\bar{j}+2\bar{k}$ 2) $9\bar{i}+5\bar{j}-2\bar{k}$

3) $9\bar{i}-5\bar{j}-2\bar{k}$ 4) $9\bar{i}+5\bar{j}+2\bar{k}$

S.P.Q. Student Practice Questions

22. If $A(2\bar{i}-\bar{j}-3\bar{k}), B(4\bar{i}+\bar{j}-\bar{k}), C(\bar{i}-3\bar{j}$ ... and $D(\bar{i}-\bar{j}-2\bar{k})$ then the vec... equation of the plane parallel to $\overline{ABC}$ passing through the centroid of tetrahedron ABCD is

1) $\bar{r}=(2\bar{i}-\bar{j}-\bar{k})+s(2\bar{i}+2\bar{j}+2\bar{k})+t(\bar{i}-$ ...

2) $\bar{r}=(2\bar{i}-\bar{j}-3\bar{k})+s(\bar{i}+\bar{j}+\bar{k})+t(\bar{i}-$ ...

3) $\bar{r}=(2\bar{i}-\bar{j}-\bar{k})+s(\bar{i}+\bar{j}+\bar{k})+t(\bar{i}+2\bar{j}-$ ...

4) $\bar{r}=(2\bar{i}-\bar{j}-\bar{k})+s(\bar{i}+\bar{j}-\bar{k})+t(\bar{i}+2\bar{j}+$ ...

KEY

01) 2	02) 2	03) 1	04) 2	05
06) 2	07) 4	08) 1	09) 3	10
11) 1	12) 2	13) 3	14) 1	15
16) 4	17) 1	18) 4	19) 2	20
21) 2	22) 3			

Hints Solutions

1. $\bar{r}=(t^2+2)\bar{i}+(4t-5)\bar{j}+(2t^2-6t)\bar{k} \Rightarrow$ find

2. $BA^2=OA^2+OB^2=25+25=50$

Then $|\overline{OA}-\overline{OB}|=5\sqrt{2}$

3. Right angled triangle.

$\overline{AO}=\frac{(3-3\sqrt{3})}{2}\bar{i}+\frac{(3\sqrt{3}+3)}{2}\bar{j}$

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

Vector of magnitude $2\sqrt{2}$ units along

$AO=(1-\sqrt{3})\bar{i}+(1+\sqrt{3})\bar{j}$

4. For collinearity, $\frac{cosx}{x}=\frac{sinx}{sinx}$

Observe the following statements.

2. **Assertion (A):** Three vectors are coplanar if one of them is expressible as a linear combination of other two.
Reason(R): Any three coplanar vectors are linearly dependent then which of the following is true.
1) a 2) b 3) c 4) d

3. **Assertion (A):** If $\bar{a}=\bar{i}+\bar{j}+\bar{k}$, $\bar{b}=4\bar{i}+3\bar{j}+4\bar{k}$, $\bar{c}=\bar{i}+\alpha\bar{j}+\beta\bar{k}$ are linearly dependent and $|\bar{c}|=\sqrt{3}$ then $\alpha=\pm1, \beta=1$
Reason(R): For coplanar vectors every vector can be expressed as linear combination of other.
1) a 2) b 3) c 4) d

4. **Assertion (A):** If vectors $\bar{a}$ and $\bar{c}$ are non collinear then the lines
$\bar{r}=6\bar{a}-\bar{c}+\lambda(2\bar{c}-\bar{a})$,
$\bar{r}=(\bar{a}-\bar{c})+\mu(\bar{a}+3\bar{c})$ are coplanar.
Reason(R): There exist λ and μ such that the two values of $\bar{r}$ become same.
1) a 2) b 3) c 4) d

5. **Assertion (A):** If $\bar{a},\bar{b},\bar{c}$ are non coplanar then
$5\bar{a}+6\bar{b}+7\bar{c}$, $7\bar{a}-8\bar{b}+9\bar{c}$,
$3\bar{a}+20\bar{b}+5\bar{c}$ are coplanar.
Reason (R): The system of equations $5x_1+7x_2+3x_3=0$, $6x_1-8x_2+20x_3=0$, $7x_1+9x_2+5x_3=0$ has non zero solutions.
1) a 2) b 3) c 4) d

6. **Statement-1:** If $\bar{r}=(3\bar{i}+\bar{j}-\bar{k})+t(2\bar{i}-\bar{j}+2\bar{k})$ be a line, then the point on the line such that its magnitude 15 units from the point (3, 1, -1) is $(13\bar{i}-4\bar{j}+9\bar{k})$.
Statement-2: The vector equation of the plane passing through (0, 0, 0),(0, 5,0) and (2, 0, 1) is $\bar{r}=5t\bar{j}+s(2\bar{i}+\bar{k})$, $s,t\in R$
1) only I 2) only II
3) Both I and II 4) Neither I nor II

7. **Statement-1:** If OABC is a parallelogram and $\overline{OA}=\bar{a}$, $\overline{OC}=\bar{c}$ then the equation of the side $\overline{BC}$ is $\bar{r}=\bar{c}+t\bar{a}$, $t\in R$
Statement-2: Vector equation of the median through A of triangle ABC with $\bar{a},\bar{b},\bar{c}$ are respectively position vector of the vertices A, B, C is $\bar{r}=(1-t)\bar{a}+t\dfrac{(\bar{b}+\bar{c})}{2}$.
Which of the above statements is/are true.
1) only I 2) only II
3) Both I and II 4) Neither I nor II

8. If D,E,F are the midpoints of sides BC, CA, AB of triangle ABC and G is the centroid then match the following

1) $\overline{AD}+\overline{BE}+\overline{CF}$	a) $\overline{CB}$
2) $\overline{GA}+\overline{GB}$	b) $3\overline{OG}$
3) $\overline{AB}+\overline{CA}$	c) O
4) $\overline{OD}+\overline{OE}+\overline{OF}$	d) $-\frac{2}{3}(\overline{AD}+\overline{BE})$
	e) $3\overline{OE}$

1) c,d,a,b 2) d,b,a,c
3) c,d,e,a 4) b,c,e,a

9. **In $\Delta ABC, D, E, F$ are midpoints of the sides BC, CA and AB respectively. 'O' is the circumcentre 'G' is the centroid. 'H' is the orthocentre and P is any point.**

Match the following.

1) $\overline{PA}+\overline{PB}+\overline{PC}$ a) $\overline{O}$

2) $\overline{GA}+\overline{GB}+\overline{PC}$ b) $\overline{OH}$

3) $\overline{AD}+\frac{2}{3}\overline{BE}+\frac{1}{2}\overline{CF}$ c) $\overline{PD}+\overline{PE}+\overline{PF}$

4) $\overline{OA}+\overline{OB}+\overline{OC}$ d) $\frac{1}{2}\overline{AC}$

1) a, b, c, d 2) c, a, b, d
3) c, a, d, b 4) a, b, d, c

KEY

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

Hints Solutions

1. If $\overline{a},\overline{c}$ are coplanar then $\overline{b}$ also lie on the same plane.
2. Both A and R are true,
3. $\begin{vmatrix}1 & 1 & 1\\ 4 & 3 & 4\\ 1 & \alpha & \beta\end{vmatrix}=0, \sqrt{1+\alpha^2+\beta^2}=\sqrt{3}$
4. Compare the coefficients of $\overline{a}$ and $\overline{c}$. Find λ and μ.
5. In both cases $\begin{vmatrix}5 & 7 & 3\\ 6 & -8 & 20\\ 7 & 9 & 5\end{vmatrix}=0$
6. A = (3, 1, -1) and $\overline{OP}=\overline{r}$

$\overline{AP}=t\left(2\overline{i}-\overline{j}+2\overline{k}\right), \left|\overline{AP}\right|=15 \Rightarrow t=\pm 5$

and the point P =

$\left(3\overline{i}+\overline{j}-\overline{k}\right)+5\left(2\overline{i}-\overline{j}+2\overline{k}\right)$

for II, the equation of the plane passing through origin, $\overline{b}\&\overline{c}$ is $\overline{r}=t\overline{b}+s\overline{c}$

7. For I, the line $\overline{BC}$ parallel to $\overline{OA}$ and passing through $C(\overline{c})$. For II, The medium passing through $A(\overline{a})$ & $\frac{\overline{b}+\overline{c}}{2}$

8. $\overline{OD}=\frac{\overline{OC}+\overline{OB}}{2}, \overline{OE}=\frac{\overline{OA}+\overline{OC}}{2}$

$\overline{OF}=\frac{\overline{OB}+\overline{OA}}{2}, \overline{OG}=\frac{\overline{OA}+\overline{OB}+\overline{OC}}{3}$

9. Let $P=\overline{0}$,

$\overline{OD}=\frac{\overline{OC}+\overline{OB}}{2}, \overline{OE}=\frac{\overline{OA}+\overline{OC}}{2}$

$\overline{OF}=\frac{\overline{OB}+\overline{OA}}{2}$

INTEGER & NUMERICAL

ANSWER TYPE QUESTIONS

1. Let ABC be a triangle whose centroid is G, orthocentre is H and circumcentre is the origin 'O'. If D is any point in the plane of the triangle such that no three of O, A, B and D are collinear satisfying the relation $\overrightarrow{AD}+\overrightarrow{BD}+\overrightarrow{CH}+3\overrightarrow{HG}=\lambda\overrightarrow{HD}$, then what is the value of the scalar "λ"?____

2. If the resultant of three forces $\vec{F}_1=P\hat{i}+3\hat{j}-\hat{k}$, $\vec{F}_2=-5\hat{i}+\hat{j}+2\hat{k}$ and $\vec{F}_3=6\hat{i}-\hat{k}$ acting on a particle has magnitude equal to 5 units, then what is the difference in the values of P?____

3. Let $\vec{a},\vec{b}$ and $\vec{c}$ be unit vectors such that $\vec{a}+\vec{b}-\vec{c}=0$. If the area of triangle formed by vectors $\vec{a}$ and $\vec{b}$ is A, then what is the value of $4A^2$?____

4. Find the least positive integral vaule of x for which the angle between vectors $\vec{a}=x\hat{i}-3\hat{j}-\hat{k}$ and $\vec{b}=2x\hat{i}+x\hat{j}-\hat{k}$ is acute.

5. Vectors along the adjacent sides of parallelogram are $\vec{a}=\hat{i}+2\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}+4\hat{j}+\hat{k}$. Find the length of the longer diagonal of the parallelogram____

6. If vectors $\vec{a}=\hat{i}+2\hat{j}-\hat{k}$, $\vec{b}=2\hat{i}-\hat{j}+\hat{k}$ and $\vec{c}=\lambda\hat{i}+\hat{j}+2\hat{k}$ are coplanar, then find the value of $(\lambda-4)$.____

7. If the points whose position vectors are $2i+j+k$, $6i-j+2k$ and $14i-5j+Pk$ are collinear then the value of P is____

8. If the vectors $2a-b+c$, $a+2b-3c$, $3a+mb+5c$ are linearly dependent, then $m=$____

9. The vectors $2i+3j, 5i+6j, 8i+\lambda j$ have their initial point at (1,1) then the value of λ so that two vectors terminated on one line is____

10. If D, E are the mid points of AB, AC of ΔABC and $\overline{DE}=\lambda\overline{BC}$ then $\lambda=$____

11. In a quadrilateral ABCD, the point P divides DC in the ratio 1 : 2 and Q is the mid point of AC. If $\overline{AB}+2\overline{AD}+\overline{BC}-2\overline{DC}=K\overline{PQ}$, then $K=$____

12. If P is the point of intersection of the diagonols of a parallelogram ABCD and $\overline{OA}+\overline{OB}+\overline{OC}+\overline{OD}=\lambda\overline{OP}$ then $\lambda=$____

13. If ABCDE is a regular pentagon and $\overline{AB}+\overline{AE}+\overline{BC}+\overline{DC}+\overline{ED}+\overline{AC}=\lambda\overline{AC}$ then $\lambda=$____

14. If ABCDEF is a regular hexagon and $\overline{AB}+\overline{AD}+\overline{EA}+\overline{FA}=\lambda\overline{AB}$ then $\lambda=$____

15. Let the vectors $\vec{a},\vec{b},\vec{c}$ be such that $|\vec{a}|=2, |\vec{b}|=4$ and $|\vec{c}|=4$. If the projection of $\vec{b}$ on $\vec{a}$ is equal to the projection of $\vec{c}$ on $\vec{a}$ and $\vec{b}$ is perpen dicular to $\vec{c}$, then the value of $|\vec{a}+\vec{b}-\vec{c}|$ is

Answers

1) 2 2) 6 3) 3 4) 2 5) 7 6) 9 7) 4 8) –4 9) 9 10) 0.5 11) –6 12) 4 13) 3 14) 4 15) 6

Hints & Solutions

1. L.H.S. $=\vec{d}-\vec{a}+\vec{d}-\vec{b}+\vec{h}-\vec{c}+3(\vec{g}-\vec{h})$

$=2\vec{d}-(\vec{a}+\vec{b}+\vec{c})+3\dfrac{(\vec{a}+\vec{b}+\vec{c})}{3}-2\vec{h}$

$=2\vec{d}-2\vec{h}=2(\vec{d}-\vec{h})=2\overline{HD}$, $\lambda=2$

2. Let $\vec{R}$ be the resultant. Then $\vec{R}=\vec{F}_1+\vec{F}_2+\vec{F}_3$ $=(P+1)\hat{i}+4\hat{j}$. Given $|\vec{R}|=5$, therefore

$R^2=25$

$\because (P+1)^2+16=25$ or $P+1=\pm 3$

or $P=2,-4$

3. Given, $\vec{a}+\vec{b}=\vec{c}$

Now vector $\vec{c}$ is along the diagonal of the parallelogram which has adjecent side vectors $\vec{a}$ and $\vec{b}$, since $\vec{c}$ is also a unit vector, triangle formed by vectors $\vec{a}$ and

5. If $\overline{p}=(2,1,3), \overline{q}=(-2,3,1)$, $\overline{r}=(3,-2,4)$ and $\overline{j}$ is the unit vector in the direction of y-axis, then $(2\overline{p}+3\overline{q}-4\overline{r}).\overline{j}=$
1) 18 2) 19 3) 20 4) 21

6. The projection of the vector $\overline{a}=4\overline{i}-3\overline{j}+2\overline{k}$ on the vector making equal angles (acute) with coordinate axes and having magnitude $\sqrt{3}$ is
1) 3 2) $\sqrt{3}$ 3) $2\sqrt{3}$ 4) 1

7. The sum of the length of projections of $p\overline{i}+q\overline{j}+r\overline{k}$ on the coordinate axes, where $p=2, q=3$ *and* $r=1$ is
1) 6 2) 5 3) 4 4) 3

8. Let P = (1,0,-1) Q = (-1,2,0) R = (2,0,-3) S=(3,-2,-1), then the length of the component of RS on PQ is
1) 1/3 2) 2/3 3) 4/3 4) 5/3

9. The vectors $\overline{a},\overline{b},\overline{c}$ are of the same length and taken pair wise, they form equal angles. If $\overline{a}=\overline{i}+\overline{j}$ and $\overline{b}=\overline{j}+\overline{k}$ then the components of $\overline{c}$ are
1) (1, 0, 1) 2) (1, 2, 3)
3) (−1, 1, 2) 4) (−1, 4, 1)

S.P.Q. Student Practice Questions

10. If $\overline{a}=2\overline{i}+\overline{j}+2\overline{k}$ and $\overline{b}=5\overline{i}-3\overline{j}+\overline{k}$, then the projection of $\overline{b}/2$ on $\overline{a}$ is
1) 1 2) 2 3) 3/2 4) 4

11. If $\overline{a}=2\overline{i}+3\overline{j}$ and $\overline{b}=3\overline{j}+4\overline{k}$. Then the vector form of the component of $\overline{a}$ along $\overline{b}$ is
1) $\frac{9(3\overline{j}+4\overline{k})}{10\sqrt{3}}$ 2) $\frac{9(3\overline{j}+4\overline{k})}{25}$
3) $\frac{9(3\overline{j}+4\overline{k})}{\sqrt{13}}$ 4) $3\overline{j}+4\overline{k}$

12. If $\overline{a}=2\overline{i}+\overline{j}+\overline{k}, \overline{b}=\overline{i}+5\overline{j}, \overline{c}=4\overline{i}+4\overline{j}-2\overline{k}$ then the length of the projection of $(3\overline{a}-2\overline{b})$ in the direction of $\overline{c}$
1) 3 2) −3 3) 33 4) −33

13. The angle between $\overline{a}$ and $\overline{b}$ is $\frac{5\pi}{6}$ and the projection of $\overline{a}$ on $\overline{b}$ is $\frac{-6}{\sqrt{3}}$ then
1) 6 2) $\frac{\sqrt{3}}{2}$ 3) 12 4) 4

14. The component of $a\overline{i}+b\overline{j}+c\overline{k}$ on the Y–axis is
1) a 2) b 3) c 4) 0

15. The components of a vector on the co-ordinate axes are 2,1,2. Then the length of the vector is
(1) 3 (2) 1 (3) 2 (4) 5

16. A vector has 3 units length and equal components then the vector is
(1) $\overline{i}+\overline{j}+\overline{k}$ (2) $\sqrt{2}(\overline{i}+\overline{j}+\overline{k})$
(3) $\sqrt{3}(\overline{i}+\overline{j}+\overline{k})$ (4) $\sqrt{5}(\overline{i}+\overline{j}+\overline{k})$

17. The length of the orthogonal projection of a vector $\overline{i}-2\overline{j}+\overline{k}$ on vector $4\overline{i}-4\overline{j}+7\overline{k}$ is
1) $\frac{19}{6}$ 2) $\frac{19}{7}$
3) $\frac{19(4\overline{i}-4\overline{j}+7\overline{k})}{9}$ 4) $\frac{19}{9}$

18. Let $\overline{a}=\overline{i}-\overline{j}+3\overline{k}$ and $\overline{b}=3\overline{i}-5\overline{j}+6\overline{k}$. Then the magnitude of the projection of $2\overline{a}-\overline{b}$ on $\overline{a}+\overline{b}$ is
1) $\frac{22}{\sqrt{133}}$ 2) $\frac{11\sqrt{2}}{\sqrt{10}}$
3) $\frac{22}{\sqrt{10}}$ 4) $\frac{22}{\sqrt{5}}$

19. $\bar{a},\bar{b},\bar{c}$ are three vectors such that $|\bar{a}|=1, |\bar{b}|=2, \quad |\bar{c}|=3$, and $\bar{b},\bar{c}$, are prependicular to each other . If the projection of $\bar{b}$ along $\bar{a}$ is same as that of $\bar{c}$ along $\bar{a}$ then $|\bar{a}-\bar{b}+\bar{c}|$ is equal to

1) $\sqrt{2}$ 2) $\sqrt{7}$ 3) $\sqrt{14}$ 4) 14

20. The vector component of $\bar{a}=2\bar{i}+3\bar{j}+2\bar{k}$ perpendicular to the direction of $\bar{b}=\bar{i}+2\bar{j}+\bar{k}$ is

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

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

21. If $\bar{a}=2\bar{i}+\bar{j}+\bar{k}, \bar{b}=\bar{i}+5\bar{j}$, $\bar{c}=4\bar{i}+4\bar{j}-2\bar{k}$ then the length of the projection of $(3\bar{a}-2\bar{b})$ in the direction of $\bar{c}$

(1) 3 (2) −3 (3) 33 (4) −33

PROPERTIES OF DOT PRODUCT

C.R.T.Q Class Room Teaching Questions

22. If $\bar{a}$ is collinear with $\bar{b}=3\bar{i}+6\bar{j}+6\bar{k}$ and $\bar{a}.\bar{b}=27$. Then $\bar{a}$ is equal to

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

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

23. Let a and b be two unit vectors and θ be the angle between them then $|\bar{a}+\bar{b}|^2-|\bar{a}-\bar{b}|^2=$

1) $\cos\theta$ 2) $2\cos\theta$

3) $3\cos\theta$ 4) $4\cos\theta$

24. The vector $\bar{x}$ which is perpendicular to (2,-3,1) and (1,-2,3) and which satisfies the condition $\bar{x}.(\bar{i}+2\bar{j}-7\bar{k})=10$

1) $3\bar{i}+5\bar{j}+\bar{k}$ 2) $7\bar{i}-5\bar{j}+\bar{k}$

3) $3\bar{i}-5\bar{j}+\bar{k}$ 4) $7\bar{i}+5\bar{j}+\bar{k}$

25. $A=4\bar{i}+5\bar{j}+6\bar{k}, B=5\bar{i}+6\bar{j}+4\bar{k}$ $C=6\bar{i}+4\bar{j}+5\bar{k}$. are the vertices of

1) Scalen triangle

2) Equilateral triangle

3) Right angled triangle

4) Isosceles triangle

26. $\bar{a},\bar{b},\bar{c}$ are three vectors, such that $\bar{a}+\bar{b}+\bar{c}=\bar{0}, |\bar{a}|=1, |\bar{b}|=2, |\bar{c}|=3$, then $(\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a})^2$ is equal to

1) −7 2) 49 3) 7 4) 1

27. If $\bar{A}.(\bar{B}+\bar{C})=\bar{B}.(\bar{C}+\bar{A})=\bar{C}.(\bar{A}+\bar{B})=0$ and $|\bar{A}|=3, |\bar{B}|=4$ and $|\bar{C}|=5$ then $|\bar{A}+\bar{B}+\bar{C}|=$

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

28. If $|\bar{a}|=1, |\bar{b}|=2, |\bar{a}-\bar{b}|^2+|\bar{a}+2\bar{b}|^2=20$, then $(\bar{a},\bar{b})=$

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

29. Let $|\bar{a}|=3$ and $|\bar{b}|=4$. The value of 'μ' for which the vectors $\bar{a}+\mu\bar{b}$ and $\bar{a}-\mu\bar{b}$ are perpendicular is...

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

30. If $\bar{a},\bar{b},\bar{c},\bar{d}$ are the vertices of a square then

1) $\bar{b}-\bar{a}=\bar{c}-\bar{b}$ 2) $\bar{a}+\bar{b}=\bar{c}$

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

31. If $\bar{a}+\bar{b}$ is perpendicular to $\bar{b}$ and $\bar{a}+2\bar{b}$ is perpendicular to $\bar{a}$ then

1) $|\bar{a}|=|\bar{b}|$ 2) $|\bar{a}|=\sqrt{2}|\bar{b}|$

3) $|\bar{b}|=\sqrt{2}|\bar{a}|$ 4) $|\bar{a}|=|\bar{b}|\sqrt{3}$

32. $(\bar{a}-\bar{d}).(\bar{b}-\bar{c})+(\bar{b}-\bar{d}).(\bar{c}-\bar{a})+(\bar{c}-\bar{d}).(\bar{a}-\bar{b})=$
1) $\bar{0}$ (null vector) 2) 0
3) $\bar{a}\bar{b}+\bar{c}.\bar{d}$ 4) $\bar{a}.\bar{c}+\bar{b}.\bar{d}$

33. If $\bar{a},\bar{b},\bar{c}$ are unit vectors, then $|\bar{a}-\bar{b}|^2+|\bar{b}-\bar{c}|^2+|\bar{c}-\bar{a}|^2$ does not exceed
1) 4 2) 9 3) 8 4) 6

34. Dot product of a vector with vectors $3\bar{i}-5\bar{k}, 2\bar{i}+7\bar{j}$ and $\bar{i}+\bar{j}+\bar{k}$ are respectively $-1, 6$ and 5. The vector is
1) $3\bar{i}+\bar{j}+2\bar{k}$ 2) $3\bar{i}+2\bar{k}$
3) $3\bar{i}-2\bar{k}$ 4) $\bar{i}+\bar{j}+\bar{k}$

35. The vector $\bar{b}$ which is collinear with the vector $\bar{a}=(2,1,-1)$ and satisfies the relation $\bar{a}.\bar{b}=3$ is ...
1) $\left(1,\frac{1}{2},\frac{-1}{2}\right)$ 2) $\left(\frac{2}{3},\frac{1}{3},\frac{-1}{3}\right)$
3) $\left(\frac{1}{2},\frac{1}{4},\frac{-1}{4}\right)$ 4) $(1,1,0)$

36. If two adjacent sides of a square are represented by the vectors $x\bar{i}+\bar{j}+4\bar{k}$ and $3\bar{i}+y\bar{j}$ then $xy=$
1) 1 2) 2 3) 3 4) -3

37. ABCD is a rhombus. If $\overline{AC}=\bar{i}+(1+\lambda)\bar{j}+(\lambda-2)\bar{k}$ and $\overline{BD}=(2\lambda-1)\bar{i}+\bar{j}-\bar{k}$, then $\lambda=$
1) 1 2) -1 3) 2 4) -2

38. If the sum of two unit vectors is a unit vector, then the magnitude of their difference is
1) 3 2) $\sqrt{3}$ 3) $\sqrt{13}$ 4) $\sqrt{7}$

S.P.Q. Student Practice Questions

39. In $\Delta ABC, A=\bar{a}, B=\bar{b}, C=\bar{c}$. If $P(\bar{r})$ is any point in the plane of ΔABC such that $\bar{b}.\bar{c}+\bar{a}.\bar{r}=\bar{c}.\bar{a}+\bar{b}.\bar{r}=\bar{a}.\bar{b}+\bar{c}.\bar{r}$ then P is of ΔABC.
1) In-Center 2) Circum Center
3) Ortho Center 4) Centroid

40. If two out of the 3 vectors $\bar{a},\bar{b},\bar{c}$ are unit vectors, $\bar{a}+\bar{b}+\bar{c}=\bar{0}$ and $2(\bar{a}\bar{b}+\bar{b}\bar{c}+\bar{c}\bar{a})+3=0$ then the length of the third vector is
1) 3 2) 2 3) 1 4) 0

41. If $\bar{a},\bar{b},\bar{c}$ are unit vectors such that $\bar{a}+\bar{b}+\bar{c}=\bar{0}$ then $\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}=$
1) 3/2 2) $-3/2$ 3) $2[\bar{a}\,\bar{b}\,\bar{c}]$ 4) 0

42. If the scalar product of the vector $\bar{i}+\bar{j}+\bar{k}$ with the unit vector parallel to the sum of the vectors $2\bar{i}+4\bar{j}-5\bar{k}$ and $x\bar{i}+2\bar{j}+3\bar{k}$ is equal to 1 then x =
1) 0 2) 1 3) 2 4) 3

43. If $\bar{r}=(x+y+2)\bar{i}+(2x-y+3)\bar{j}+(x+2y+7)\bar{k}$ where $\bar{r}.\bar{i}=3$, $\bar{r}.\bar{j}=5$ then $\bar{r}.\bar{k}=$
1) 4 2) 6 3) 9 4) 8

44. If ABCD is a parallelogram and $\overline{AC}^2-\overline{BD}^2=K\overline{AB}\cdot$(Orthogonal projection of $\overline{AD}$ on $\overline{AB}$) then K=
1) 1 2) 2 3) 3 4) 4

45. If the vectors $a\bar{i}-2\bar{j}+\bar{k}, 2a\bar{i}+a\bar{j}-4\bar{k}$ are adjacent sides of a rectangle, then the values of 'a' are
1) 1,2 2) $-1,2$ 3) $1,-2$ 4) $2,-2$

46. If $|\bar{a}+\bar{b}|=1, |\bar{a}-\bar{b}|=7, |\bar{a}|=4$, then $|\bar{b}|=$
1) 1 2) 2 3) 3 4) 5

47. The vector $\bar{b}$ which is collinear with the vector $\bar{a}=(2,-1,2)$ and satisfies the relation $\bar{a}\bar{b}=18$ is
1) $(4,-2,4)$ 2) $(2,1,-1)$
3) $(1,-1,1)$ 4) $(1,1,0)$

48. If $\bar{a},\bar{b},\bar{c}$ are orthogonal and $\bar{r}\bar{a}=2$ then $\bar{r}-(\bar{r}.\bar{b})\bar{b}-(\bar{r}.\bar{c})\bar{c}=$
1) $2\bar{a}$ 2) $-2\bar{a}$ 3) $\bar{a}$ 4) $-\bar{a}$

SCALAR (DOT) PRODUCT
ANGLE BETWEEN TWO VECTORS

C.R.T.Q Class Room Teaching Questions

49. If $|\bar{a}|=|\bar{b}|=|\bar{a}-\bar{b}|$, then the angle between $\bar{a}$ and $\bar{b}$ is
1) $\frac{\pi}{4}$ 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{3}$ 4) $\frac{2\pi}{3}$

50. If $\bar{a}$ and $\bar{b}$ are two unit vectors and θ be the angle between them, then $\sin\left(\frac{\theta}{2}\right)=$
1) $|\bar{a}-\bar{b}|$ 2) $|\bar{a}+\bar{b}|$
3) $\frac{1}{2}|\bar{a}-\bar{b}|$ 4) $\frac{1}{2}|\bar{a}+\bar{b}|$

51. If $\bar{a}=p\bar{i}+3\bar{j}-7\bar{k}, \bar{b}=p\bar{i}-p\bar{j}+4\bar{k}$ and if the angle between a and b is acute, then the values of p lies in
1) $P<-4$ or $p>7$ 2) $(-7,4)$
3) $P\le-4 or p\ge 7$ 4) $[-7,4]$

52. If $\bar{a}+\bar{b}+\bar{c}=0$, $|\bar{a}|=3, |\bar{b}|=5$ and $|\bar{c}|=7$ then the angle between $\bar{a}$ and $\bar{b}$ is
1) 30° 2) 45° 3) 60° 4) 90°

53. If $\bar{a},\bar{b},\bar{c}$ are three unit vectors such that $|\bar{a}+\bar{b}+\bar{c}|=1$ and $\bar{a}\perp\bar{b}$. If $\bar{c}$ makes angles α,β with $\bar{a},\bar{b}$ respectively, then $\cos\alpha+\cos\beta$ is equal to
1) $\frac{3}{2}$ 2) 1 3) -1 4) $\frac{-3}{2}$

54. If $\overline{AB}$ =(3,-2,2), $\overline{BC}$=(-1,0-2) are the adjacent sides of a parallelogram, then the obtuse angle between its diagonals is
1) $\frac{\pi}{4}$ 2) $\pi/2$ 3) $\pi/3$ 4) $\frac{3\pi}{4}$

55. If $\bar{a},\bar{b},\bar{c}$ are three mutually perpendicular vectors such that $|\bar{a}|=|\bar{b}|=|\bar{c}|$ then $(\bar{a}+\bar{b}+\bar{c},\bar{a})=$
1) $\frac{\pi}{3}$ 2) $\cos^{-1}\left(\frac{1}{3}\right)$
3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ 4) $\cos^{-1}\left(\frac{2}{3}\right)$

56. If $\bar{a}$ and $\bar{b}$ are unit vectors inclined to x-axis at angle 30^0 and 120^0, then $|\bar{a}+\bar{b}|$ equals
1) $\sqrt{2/3}$ 2) $\sqrt{2}$ 3) $\sqrt{3}$ 4) 2

57. If $\overline{AB}=-\bar{i}-2\bar{j}-6\bar{k}$, $\overline{BC}=2\bar{i}-\bar{j}+\bar{k}$, $\overline{AC}=\bar{i}-3\bar{j}-5\bar{k}$. Then $\angle B=$
1) $Cos^{-1}\left(\sqrt{\frac{40}{41}}\right)$ 2) $Cos^{-1}\left(\sqrt{\frac{6}{41}}\right)$
3) $Cos^{-1}\left(\frac{6}{41}\right)$ 4) $Cos^{-1}\left(\frac{62}{63}\right)$

58. If $\bar{v}$ and $\bar{w}$ are two mutually perpendicular unit vectors and $\bar{u}=a\bar{v}+b\bar{w}$, where a and b are non zero real numbers, then the angle between $\bar{u}$ and $\bar{w}$ is
1) $\cos^{-1}\left(\frac{b}{\sqrt{a^2+b^2}}\right)$ 2) $\cos^{-1}\left(\frac{a}{\sqrt{a^2+b^2}}\right)$
3) $\cos^{-1}(b)$ 4) $\cos^{-1}(a)$

59. The points O, A, B, C, D are such that $\overline{OA}=\bar{a}, \overline{OB}=\bar{b}, \overline{OC}=2\bar{a}+3\bar{b}$ and $\overline{OD}=\bar{a}-2\bar{b}$. If $|\bar{a}|=3|\bar{b}|$, then the angle between $\overline{BD}$ and $\overline{AC}$ is
1) π 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{6}$

60. If $\bar{a}$=(-1,1,2); $\bar{b}$=(2,1,-1); $\bar{c}$=(-2,1,3) then the angle between $2\bar{a}-\bar{c}$ and $\bar{a}+\bar{b}$ is
1) $\frac{\pi}{4}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{6}$ 4) $\frac{3\pi}{2}$

S.P.Q. Student Practice Questions

61. If $\bar{a}$ and $\bar{b}$ are two unit vectors inclined at an angle θ to each other, then $|\bar{a}+\bar{b}|<1$ if

1) $\theta = \frac{\pi}{6}$ 2) $\theta = \frac{\pi}{2}$

3) $\theta = \frac{\pi}{3}$ 4) $\frac{2\pi}{3} < \theta \le \pi$

62. Let $\bar{e}_1, \bar{e}_2$ be unit vectors which include angle θ. If $\frac{1}{2}|\bar{e}_1 - \bar{e}_2| = \sin(k\theta)$, then k equal to

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

63. If $\bar{a}$ and $\bar{b}$ are two vectors of lengths 2 and 1 respectively and $|\bar{a}-\bar{b}| = \sqrt{3}$ then $(\bar{a},\bar{b}) =$

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

64. The angle between $8(\bar{i}-\bar{k})$ and $\bar{i}+\bar{j}+\bar{k}$ is

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

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

65. Angle between the vectors $\bar{a} = -\bar{i} - 2\bar{j} + \bar{k}$ and $\bar{b} = x\bar{i} + \bar{j} + (x+1)\bar{k}$

1) Obtuse angle 2) Acute angle

3) Right angle 4) Depends on x

66. If $\bar{\alpha}$ and $\bar{\beta}$ are non-zero and different vectors such that $|\bar{\alpha}+\bar{\beta}| = |\bar{\beta}-\bar{\alpha}|$ then the angle between $-\bar{\alpha}$ and $\bar{\beta}$ is

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

67. The acute angles made by the line joining the points $(1,-3,2)$ and $(3,-5,1)$ with the coordinate axes are

1) $\cos^{-1}\left(\frac{2}{3}\right), \cos^{-1}\left(\frac{2}{3}\right), \cos^{-1}\left(\frac{1}{3}\right)$

2) $\cos^{-1}\left(\frac{3}{2}\right), \cos^{-1}\left(\frac{2}{3}\right), \cos^{-1}\left(\frac{2}{3}\right)$

3) $\cos^{-1}\left(\frac{1}{3}\right), \cos^{-1}\left(\frac{3}{2}\right), \cos^{-1}\left(\frac{1}{3}\right)$

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

68. If the angle between the vectors $(x,3,-7)$ and $(x,-x,4)$ is obtuse, the domain of 'x' is

1) $(-4,7)$ 2) $[-4,7]$

3) $R-[-4,7]$ 4) $R-(-4,7)$

69. If $\bar{a},\bar{b},\bar{c}$ are three vectors such that $\bar{a} = \bar{b}+\bar{c}$ and the angle between $\bar{b}$ and $\bar{c}$ is $\frac{\pi}{2}$, then (here $a=|\bar{a}|, b=|\bar{b}|, c=|\bar{c}|$)

1) $a^2 = b^2 + c^2$ 2) $b^2 = c^2 + a^2$

3) $c^2 = a^2 + b^2$ 4) $2a^2 - b^2 = c^2$

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

1) 0 2) $\frac{6}{41}$ 3) $\frac{35}{41}$ 4) 1

71. If $\bar{a} = \bar{i}+2\bar{j}-3\bar{k}$ and $\bar{b} = 3\bar{i}-\bar{j}+2\bar{k}$ then the angle between the vectors $(\bar{a}+\bar{b})$ and $(\bar{a}-\bar{b})$ is

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

72. If the angle between $\bar{a}$ and $\bar{b}$ is 120^0 $|\bar{a}|=3$ and $|\bar{b}|=5$, then $|\bar{a}-\bar{b}|$ is equals to

1) 6 2) 7 3) 9 4) 5

73. If $\bar{a}=2\bar{i}+2\bar{j}-\bar{k}$ and $\bar{b}=6\bar{i}-3\bar{j}+2\bar{k}$ then the angle between $\bar{a}$ and $\bar{b}$ is

1) $cos^{-1}\frac{1}{3}$ 2) $\frac{\pi}{3}$

3) $cos^{-1}\left(\frac{4}{21}\right)$ 4) $cos^{-1}\left(\frac{5\sqrt{7}}{21}\right)$

74. If $\bar{e}_1$ and $\bar{e}_2$ are unit vectors and the vectors $\bar{e}_1+2\bar{e}_2$, $5\bar{e}_1-4\bar{e}_2$ are at right angles, than the angle between $\bar{e}_1$ and $\bar{e}_2$ is

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

75. If $\bar{a},\bar{b},\bar{c}$ are unit vectors satisfying the relation $\bar{a}+\bar{b}+\sqrt{3}\bar{c}=0$, then the angle between $\bar{a}$ and $\bar{b}$ is

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

76. The angle between the vectors $\bar{a}=6\bar{i}+2\bar{j}+3\bar{k}$ and $\bar{b}=2\bar{i}-9\bar{j}+6\bar{k}$ is

1) $\cos^{-1}\left(\frac{2}{3}\right)$ 2) $\cos^{-1}\left(\frac{7}{12}\right)$

3) $\cos^{-1}\left(\frac{12}{77}\right)$ 4) $\cos^{-1}\left(\frac{1}{3}\right)$

77. Angle between $\bar{a}$ and $\bar{b}$ is 120^0. If $|\bar{b}|=2|\bar{a}|$ and the vectors $\bar{a}+x\bar{b}$, $\bar{a}-\bar{b}$ are at right angles , then x is equal to

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

78. Let $A(2,-3,0)\,B(2,-1,1)\,C(0,1,4)$ be the vertices of ΔABC. Then angle between the median $\overline{BD}$ and the base $\overline{AC}$ is

(1) 30° (2) 45° (3) 60° (4) 90°

VECTOR EQUATION OF A PLANE NORMAL FORM

C.R.T.Q Class Room Teaching Questions

79. The cartesian equation of the plane perpendicular to vector $3\bar{i}-2\bar{j}-2\bar{k}$ and passing through the point $2\bar{i}+3\bar{j}-\bar{k}$ is

1) 3x+2y+2z=2 2) 3x-2y+2z=2

3) 3x+2y-2z=2 4) 3x-2y-2z=2

80. The perpendicular distance from origin to the plane 3x - 2y - 2z = 2 is

1) $1/\sqrt{17}$ 2) $2/\sqrt{17}$

3) $3/\sqrt{17}$ 4) $4/\sqrt{17}$

S.P.Q. Student Practice Questions

81. The cartesian equation of the plane passing through the point $(3,-2,1)$ and perpendicular to vector $4\bar{i}+7\bar{j}-4\bar{k}$ is

1) $4x+7y+4z-6=0$

2) $4x+7y-4z+6=0$

3) $4x-7y-4z-6=0$

4) $4x-7y+4z+6=0$

82. The perpendicular distance from origin to the plane $3x-4y-5z=3$ is

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

83. The perpenducular distance from origin to the plane $3x+4y+5z=25$ is

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

ANGLE BETWEEN THE PLANES

C.R.T.Q Class Room Teaching Questions

84. The angle between planes
$\bar{r}.(2\bar{i}-3\bar{j}+4\bar{k})+11=0$ and
$\bar{r}.(3\bar{i}-2\bar{j}-3\bar{k})+27=0$ is

1) $\pi/6$ 2) $\pi/3$ 3) $\pi/4$ 4) $\pi/2$

S.P.Q. Student Practice Questions

85. Angle between the planes $2x-y+2z=3$, $3x+6y+2z=4$ is

1) $\cos^{-1}\left(\frac{4}{21}\right)$ 2) $\cos^{-1}\left(\frac{4}{441}\right)$
3) $\sin^{-1}\left(\frac{4}{21}\right)$ 4) $\sin^{-1}\left(\frac{4}{441}\right)$

86. Angle between the plance $x-y+z=3$, $x+y+z=4$ is

(1) $\cos^{-1}\frac{1}{3}$ (2) $\cos^{-1}\frac{4}{41}$
(3) $\sin^{-1}\frac{4}{27}$ (4) $\sin^{-1}\frac{4}{41}$

87. If the vectors $\bar{i}-2x\bar{j}+3y\bar{k}$ and $\bar{i}-2x\bar{j}-3y\bar{k}$ are perpendicular then the locus of (x,y) is :

(1) A circle (2) An ellipse
(3) A parabola (4) A hyperbola

LOCUS

C.R.T.Q Class Room Teaching Questions

88. The locus of the point equidistant from two given points a and b is given by

1) $[\bar{r}-1/2(\bar{a}+\bar{b})].(\bar{a}-\bar{b})=0$
2) $[\bar{r}-1/2(\bar{a}-\bar{b})].(\bar{a}+\bar{b})=0$
3) $[\bar{r}-1/2(\bar{a}+\bar{b})].(\bar{a}+\bar{b})=0$
4) $[\bar{r}-1/2(\bar{a}-\bar{b})].(\bar{a}-\bar{b})=0$

S.P.Q. Student Practice Questions

89. If the vectors $\bar{i}-2x\bar{j}-3y\bar{k}$ and $\bar{i}+3x\bar{j}-3$ are orthogonal to each other,then th locus of the point (x,y) is

1) Circle 2) Ellipse
3) Hyperbola 4) Pair of lines

APPLICATIONS OF SCALAR PRODUCT IN MECHANICS TO FIND THE WORK DONE

C.R.T.Q Class Room Teaching Questions

90. The force $\bar{F}=3\bar{i}+\bar{j}-\bar{k}$ acts on particle and it moves from the poi $A(2\bar{i}-\bar{j})$ to $B(2\bar{i}+\bar{j})$. The work do by the force $\bar{F}=$

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

S.P.Q. Student Practice Questions

91. The work done by forc $\bar{F}=a\bar{i}+\bar{j}+\bar{k}$ in moving a partic from $(1,1,1)$ to $(2,2,2)$ along a stright line is 5 units. Then $a=$

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

KEY

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

If $\bar{a}=3\bar{i}+\bar{j}+2\bar{k}$ and $\bar{b}=\bar{i}+2\bar{j}+3\bar{k}$ then a unit vector in the direction of the resultant of orthogonal projection of $\bar{b}$ on $\bar{a}$ and the projection of $\bar{b}$ on a line perpendicular to $\bar{a}$ is

1) $\frac{\bar{i}+2\bar{j}+3\bar{k}}{\sqrt{14}}$ 2) $\frac{2\bar{i}+\bar{j}+3\bar{k}}{\sqrt{14}}$

3) $\frac{3\bar{i}+\bar{j}+2\bar{k}}{\sqrt{14}}$ 4) $\frac{\bar{i}+3\bar{j}+2\bar{k}}{\sqrt{14}}$

The projection of the vector $\bar{i}+\bar{j}+\bar{k}$ on the line whose vectro equation is $\bar{r}=(3+t)\bar{i}+(2t-1)\bar{j}+3t\bar{k}$, t being the scalar parameter, is

(1) $\frac{1}{\sqrt{14}}$ (2) 6

(3) $\frac{6}{\sqrt{14}}$ (4) 10

PROPERTIES OF DOT PRODUCT

C.R.T.Q Class Room Teaching Questions

1. If $\bar{a}$ and $\bar{b}$ are non-collinear unit vectors and $|\bar{a}+\bar{b}|=\sqrt{3}$ then $(2\bar{a}+5\bar{b}).(3\bar{a}-\bar{b})=$

1) $\frac{15}{4}$ 2) $\frac{15}{2}$ 3) 15 4) 16

2. If $\bar{a},\bar{b}$ and $\bar{c}$ are perpendicular to $\bar{b}+\bar{c},\bar{c}+\bar{a}$ and $\bar{a}+\bar{b}$ respectively and if $|\bar{a}+\bar{b}|=6$, $|\bar{b}+\bar{c}|=8$ and $|\bar{c}+\bar{a}|=10$, then $|\bar{a}+\bar{b}+\bar{c}|$ is equal to

1) $5\sqrt{2}$ 2) 50 3) $10\sqrt{2}$ 4) 10

9. If $\bar{b}=4\bar{i}+3\bar{j}$ and c are two vectors perpendicular to each other in the XY plane, the vector in the same plane having components 1, 2 along b and c respectively is

1) $(-2\bar{i}+11\bar{j})/5$ 2) $(2\bar{i}+11\bar{j})/5$

3) $(-2\bar{i}-11\bar{j})/5$ 4) $(2\bar{i}-11\bar{j})/5$

10. The perpendicular distance of a corner of unit cube from a diagonal not passing through it is

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

11. If A, B are two points on the curve $y=x^2$ in the xoy plane satisfying $\overline{OA}.\bar{i}=1$ and $\overline{OB}.\bar{i}=-2$ then the length of the vector $2\overline{OA}-3\overline{OB}$ is

1) $\sqrt{14}$ 2) $2\sqrt{51}$

3) $3\sqrt{41}$ 4) $2\sqrt{41}$

12. $\bar{a}$ & $\bar{b}$ are two non-collinear vectors then the value of $\left\{\frac{\bar{a}}{|\bar{a}|^2}-\frac{\bar{b}}{|\bar{b}|^2}\right\}^2$ is equal to

1) $\frac{\bar{a}-\bar{b}}{ab}$ 2) $\left(\frac{\bar{a}-\bar{b}}{ab}\right)^2$

3) $\left(\frac{\bar{a}-\bar{b}}{ab}\right)^3$ 4) $(\bar{a}-\bar{b})^2$

13. If a,b,c are the p^{th},q^{th},r^{th} terms of an HP and $\bar{u}=(q-r)\bar{i}+(r-p)\bar{j}+(p-q)\bar{k}$ $\bar{v}=\frac{\bar{i}}{a}+\frac{\bar{j}}{b}+\frac{\bar{k}}{c}$ then

1) $\bar{u},\bar{v}$ are parallel vectors

2) $\bar{u},\bar{v}$ are orthogonal vectors

3) $\bar{u}.\bar{v}=1$ 4) $\bar{u}\times\bar{v}=\bar{i}+\bar{j}+\bar{k}$

14. If a parallelogram is constructed on the vectors $\bar{a}=3\bar{p}-\bar{q},\bar{b}=\bar{p}+3\bar{q}$ and $|\bar{p}|=|\bar{q}|=2$ and angle between $\bar{p}$ and $\bar{q}$ is $\frac{\pi}{3}$, then the ratio of the lengths of the sides is

1) $\sqrt{7}:\sqrt{13}$ 2) $\sqrt{6}:\sqrt{2}$

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

S.P.Q. Student Practice Questions

15. Let $\bar{u},\bar{v},\bar{w}$ be such that $|\bar{u}|=1,|\bar{v}|=2,|\bar{w}|=3$. If the projection of $\bar{v}$ along $\bar{u}$ is equal to that of $\bar{w}$ along $\bar{u}$ and $\bar{v},\bar{w}$ are perpen-dicular to each other, then $|\bar{u}-\bar{v}+\bar{w}|$ equals
1) 2 2) $\sqrt{7}$ 3) $\sqrt{14}$ 4) 14

16. If $\bar{a}+\bar{b}+\bar{c}=0$, then $\bar{a}\bar{a}+\bar{b}\bar{b}+2\bar{a}\bar{b}-\bar{c}\bar{c}=$
1) $2\left(\bar{b}\bar{c}+\bar{c}\bar{a}\right)$ 2) 0
3) Null vector 4) $-2\left(\bar{b}\bar{c}+\bar{c}\bar{a}\right)$

17. The length of longer diagonal of the parallelogram constructed on $5\bar{a}+2\bar{b}$ and $\bar{a}-3\bar{b}$ if it is given $|\bar{a}|=2\sqrt{2};|\bar{b}|=3$, and $\left(\bar{a},\bar{b}\right)=\pi/4$ is
1) 15 2) $\sqrt{113}$ 3) $\sqrt{593}$ 4) $\sqrt{395}$

18. If $\bar{a},\bar{b},\bar{c}$ are three vectors such that each is inclined at an angle $\frac{\pi}{3}$ with the other two and $|\bar{a}|=1,|\bar{b}|=2,|\bar{c}|=3$ then the scalar product of the vectors $2\bar{a}+3\bar{b}-5\bar{c}$ and $4\bar{a}-6\bar{b}+10\bar{c}$ is
1) 188 2) −334 3) −522 4) −514

SCALAR (DOT) PRODUCT ANGLE BETWEEN TWO VECTORS

C.R.T.Q Class Room Teaching Questions

19. If $\bar{a}=2\bar{m}+\bar{n},\bar{b}=\bar{m}-2\bar{n}$, Angle between the unit vectors m and n is 60^0. a,b are the sides of a parallelogram ,then the lengths of the diagonals are
1) $\sqrt{7},\sqrt{5}$ 2) $\sqrt{13},\sqrt{5}$
3) $\sqrt{7},\sqrt{13}$ 4) $\sqrt{11},\sqrt{13}$

20. In a right angled ΔABC, the hypotenuse $AB = p$ then AB.AC+BC.BA+CA.CB is
1) $2p^2$ 2) $p^2/2$ 3) p^2 4) 0

21. The triangle ABC is defined by the vertices $A=(0,7,10), B=(-1,6,6)$ and $C=(-4,9,6)$. Let D be the foot of the altitude from B to the side AC Then $\overline{DB}=$
1) $\bar{i}+2\bar{j}+2\bar{k}$ 2) $\bar{i}-2\bar{j}-2\bar{k}$
3) $\bar{i}+2\bar{j}-2\bar{k}$ 4) $\bar{i}-2\bar{j}+2\bar{k}$

S.P.Q. Student Practice Questions

22. If $\bar{a},\bar{b},\bar{c}$ are three mutually perpendicular vectors of equal magnitudes then the vector equally inclined to $\bar{a},\bar{b},\bar{c}$
1) $\frac{\bar{i}+\bar{j}+\bar{k}}{\sqrt{3}}$ 2) $\bar{a}-\bar{b}+\bar{c}$
3) $\frac{\bar{a}-\bar{b}-\bar{c}}{\sqrt{3}}$ 4) $\frac{\bar{a}+\bar{b}+\bar{c}}{\sqrt{3}}$

23. If the position vectors of A,B,C,D are respectively $(-6,1,6)(6,-2,3),(-2,-3,-1)$ and $(-5,-9,-7)$ then
1) $\underline{|BCA}$ is a right angle
2) $\underline{|CDA}$ is a right angle
3) $\underline{|ABD}$ is a right angle
4) $\underline{|ACD}$ is a right angle

24. Let $A(2,-3,0)\,B(2,-1,1)\,C(0,1,4)$ be the vertices of ΔABC. Then angle between the median $\overline{BD}$ and the base $\overline{AC}$ is
1) 30^0 2) 45^0 3) 60^0 4) 90^0

25. If ABCDEF is a regular hexagon, then $\overline{AB}.\overline{AF}=...$

1) $\frac{1}{2}BC^2$ 2) $-\frac{1}{2}BC^2$

3) $\frac{1}{2}AC^2$ 4) $-\frac{1}{2}AC^2$

26. $|\bar{b}|=6$, then $\bar{b}-3\bar{c}=\lambda\bar{a}$ if $\lambda=$

1) −9,3 2) −3,6 3) 6,3 4) −3, 4

27. The vectors a,b,c are of same length and taken pairwise they form equal angles. If $\bar{a}=\bar{i}+\bar{j},\bar{b}=\bar{j}+\bar{k}$ then $\bar{c}=$

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

28. If $\bar{a}=-\bar{i}+\bar{j}+\bar{k}$ and $\bar{b}=2\bar{i}+\bar{k}$, then the vector c satisfying the conditions that (i) it is coplanar with a and b (ii) it is perpendicular to b (iii) a.c=7 is

1) $-3/2\bar{i}+5/2\bar{j}+3\bar{k}$ 2) $-3\bar{i}+5\bar{j}+6\bar{k}$

3) $-6\bar{i}+\bar{k}$ 4) $\bar{i}+2\bar{j}+2\bar{k}$

29. If $a+2b+3c=4$ then the least value of $a^2+b^2+c^2$

1) $\frac{2}{7}$ 2) $\frac{3}{7}$ 3) $\frac{5}{7}$ 4) $\frac{8}{7}$

30. Angle between $\bar{a}$ & $\bar{b}$ is 120^0. If $|\bar{b}|=2|\bar{a}|$ and the vectors $\bar{a}+x\bar{b},\bar{a}-\bar{b}$ are right angles. Then x is equal to

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

31. If $\bar{a}=\bar{i}+\bar{j}+\bar{k}$ and $\bar{b}=\bar{i}-\bar{j}$ then the vectors $(\bar{a}.\bar{i})\bar{i}+(\bar{a}.\bar{j})\bar{j}+(\bar{a}.\bar{k})\bar{k},(\bar{b}.\bar{i})\bar{i}+(\bar{b}.\bar{j})\bar{j}+(\bar{b}.\bar{k})\bar{k}$ and $\bar{i}+\bar{j}-2\bar{k}$

1) Are mutually Perpendicular
2) Coplanar
3) Forms a Parallelopiped of volume 2 units
4) Forms a Parallelopiped of volume 3 units

32. $\bar{a},\bar{b},\bar{c}$ are the position vectors of the vertices of a triangle ABC. If $(\bar{a}-\bar{b}).(\bar{c}-\bar{b})=0$, then the position vector of circumcentre is

1) $\frac{(\bar{b}+\bar{c})}{2}$ 2) $\frac{(\bar{a}+\bar{b})}{2}$

3) $\frac{(\bar{a}+\bar{c})}{2}$ 4) $\frac{\bar{a}+\bar{b}+\bar{c}}{2}$

VECTOR EQUTION OF A PLANE-NORMAL FORM

C.R.T.Q Class Room Teaching Questions

33. A plane is at a distance of 8 units from the origin and is perpendicular to the vector $2\bar{i}+\bar{j}+2\bar{k}$ then the equation of the plane is

1) $\bar{r}.(2\bar{i}+\bar{j}+2\bar{k})=8$

2) $\bar{r}.(\bar{i}+2\bar{j}+2\bar{k})=24$

3) $\bar{r}.(2\bar{i}+2\bar{j}+\bar{k})=24$

4) $\bar{r}.(2\bar{i}+\bar{j}+2\bar{k})=24$

S.P.Q. Student Practice Questions

34. The angle between the planes passing through the points A(0, 0, 0), B(1, 1, 1), C(3, 2, 1) & the planes passing through A(0, 0, 0),B(1, 1, 1), D(3, 1, 2) is

1) 90^0 2) 45^0 3) 120^0 4) 30^0

APPLICATION OF SCALAR PRODUCTS IN MECHANICS TO FIND THE WORK DONE

C.R.T.Q Class Room Teaching Questions

35. The point of application of the force (-2,4,7) is displaced from the point (3,-5,1) to the point (5,9,7). But the force is suddenly halved when the point of application moves half the distance. The work done by the force is

1) 70 2) 70.5 3) 75 4) 75.5

5.1 DOT PRODUCT OF VECTORS

5. The position vector of the foot of the perpendicular from (1,-2,-3) to the line $\bar{r}=\bar{i}+\bar{j}+\lambda(2\bar{i}+\bar{j}+\bar{k})$ is

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

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

6. If p^{th}, q^{th}, r^{th} terms of a G.P. are the positive numbers a, b, c then angle between the vectors $\log a^3\bar{i}+\log b^3\bar{j}+\log c^3\bar{k}$ and $(q-r)\bar{i}+(r-p)\bar{j}+(p-q)\bar{k}$ is

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

4) $\sin^{-1}\left(\frac{1}{\sqrt{a^2+b^2+c^2}}\right)$

7. Let $\bar{a},\bar{b},\bar{c}$ be vectors of equal magnitude such that the angle between $\bar{a}$ and $\bar{b}$ is α, $\bar{b}$ and $\bar{c}$ is β and $\bar{c}$ and $\bar{a}$ is γ. Then the minimum value of $\cos\alpha+\cos\beta+\cos\gamma$ is

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

8. Let $\bar{p}$ and $\bar{q}$ be the position vectors of P and Q repectively with respect to 'O' and $|\bar{p}|=p, |\bar{q}|=q$. if R, S, divides PQ Internally and externally in the ratio 2:3 respectively. If OR and OS are perpendicular, then

1) $9p^2=4q^2$ 2) $4p^2=9q^2$

3) 9p=4q 4) 4p=9q

9. The vectors $\bar{X}$ and $\bar{Y}$ satisfy the equations $2\bar{X}+\bar{Y}=\bar{p}, \bar{X}+2\bar{Y}=\bar{q}$ where $\bar{p}=\bar{i}+\bar{j}$ and $\bar{q}=\bar{i}-\bar{j}$. If θ is the angle between $\bar{X}$ and $\bar{Y}$ then

1) $\cos\theta=\frac{4}{5}$ 2) $\sin\theta=\frac{1}{\sqrt{2}}$

3) $\cos\theta=-\frac{4}{5}$ 4) $\cos\theta=-\frac{3}{5}$

10. $A=(2,3,5), B=(-1,3,2)$ and $C=(\lambda,5,\mu)$ are the vertices of a triangle. If the median AM is equally inclined to the coordinates axes, then

1) $\lambda=10,\mu=7$

2) $\lambda=-10,\mu=7$

3) $\lambda=7,\mu=10$

4) $\lambda=-7,\mu=-10$

S.P.Q. Student Practice Questions

11. The vectors $3\bar{a}-5\bar{b}$ and $2\bar{a}+\bar{b}$ are mutually perpendicular and the vectors $\bar{a}+4\bar{b}$ & $-\bar{a}+\bar{b}$ are also mutually perpendicular. Then the acute angle between $\bar{a}$ and $\bar{b}$ is

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

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

12. Let $a=BC, b=CA, c=AB$ be the sides of the triangle ABC. If G is the centroid of ΔABC such that $\overline{GB}$ and $\overline{GC}$ are inclined at an obtuse angle, then

1) $5a^2>b^2+c^2$ 2) $5c^2>a^2+b^2$

3) $5b^2>a^2+c^2$ 4) None of these

13. The position vector of A is $p\bar{i}+\bar{j}$. If A is rotated about O through an angle $\frac{\pi}{6}$ in anti clock wise direction. It coincides with B whose position vector $\bar{i}+q\bar{j}$. The value of p, q are

1) $\sqrt{3},3$ 2) $\sqrt{3},\frac{1}{3}$

3) $\sqrt{3},\sqrt{3}$ or $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$ 4) $\frac{1}{3},\frac{1}{3}$

14. In $\Delta ABC,|\overline{CB}|=a,|\overline{CA}|=b,|\overline{AB}|=c$. CD is median through the vertex C. Then $\overline{CA}.\overline{CD}$ equals

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

15. In triangle ABC if $\overline{AB}=\frac{\bar{u}}{|\bar{u}|}-\frac{\bar{v}}{|\bar{v}|}$ and $\overline{AC}=\frac{2\bar{u}}{|\bar{u}|}$ where $|\bar{u}|\neq|\bar{v}|$ then

1) $1+\sum\cos 2A=0$

2) $\sum\cos 2A=0$

3) $2+\sum\cos 2A=0$

4) $1+\cos 2A+\cos 2B-\cos 2C=0$

16. In a parallelogram ABCD, $|\overline{AB}|=a,|\overline{AD}|=b,$ and $|\overline{AC}|=c$, then $\overline{DB}.\overline{AB}$ has the value

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

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

17. If A is (x_1,y_1) where $x_1=1$ on the curve $y=x^2+x+10$. the tangent at A cuts the x-axis at B. The value of $\overline{OA}.\overline{AB}$ is

1) -148 2) -352

3) 140 4) none of these

GEOMETRICAL INTERPRETATION OF SCALAR PRODUCT

C.R.T.Q Class Room Teaching Questions

18. Let $\bar{a}=2\bar{i}-\bar{j}+\bar{k},\bar{b}=\bar{i}+2\bar{j}-\bar{k}$ and $\bar{c}=\bar{i}+\bar{j}-2\bar{k}$ be three vectors. A vector in the plane of $\bar{b}$ and $\bar{c}$ whose projection on $\bar{a}$ is of magnitude $\sqrt{\frac{2}{3}}$ is

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

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

19. The ΔABC is defined by the vertices $A(1,-2,2)B(1,4,0)$ and $C(-4,1,1)$. Let M be the foot of the altitude drawn from the vertex B to side AC. Then $\overline{BM}=$

1) $\left(\frac{-20}{7},\frac{-30}{7},\frac{10}{7}\right)$

2) $(-20,-30,10)$

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