ABHINAV ACADEMY

UDUPI

CET25M10 VECTOR ALGEBRA

Class 12 - Mathematics

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 75**

1. The scalar projection of the vector $3\hat{i} - \hat{j} - 2\hat{k}$ on the vectors $\hat{i} - 2\hat{j} - 3\hat{k}$ is **[1]**

   a) $\frac{7}{2}$ b) $\frac{7}{\sqrt{14}}$

   c) $\frac{6}{13}$ d) $\frac{7}{14}$

2. If a unit vector $\vec{a}$ makes angles $\frac{\pi}{3}$ $with$ $\hat{i}$ $\frac{\pi}{4}$ $with$ $\hat{j}$ and an $acute$ $angle$ θ $with$ $\hat{k}$, then find θ **[1]**

   a) $2\frac{\pi}{3}$ b) $\frac{\pi}{10}$

   c) $\frac{\pi}{3}$ d) $\frac{\pi}{5}$

3. The vector $\vec{b} = 3\hat{i} + 4\hat{k}$ is to be written as the sum of a vector $\vec{\alpha}$ parallel to $\vec{a} = \hat{i} + \hat{j}$ and a vector $\vec{\beta}$ perpendicular to $\vec{a}$. Then $\vec{\alpha} =$ **[1]**

   a) $\frac{2}{3}(i + j)$ b) $\frac{3}{2}(i + j)$

   c) $\frac{1}{2}(i + j)$ d) $\frac{1}{3}(i + j)$

4. Let $|\vec{a}|$ = 7, $|\vec{b}|$ = 11 and $|\vec{a} + \vec{b}| = 10\sqrt{3}$. **[1]**

   What is the angle between $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$?

   a) None of these b) $\frac{\pi}{6}$

   c) $\frac{\pi}{2}$ d) $\frac{\pi}{3}$

5. The sine of the angle between the vectors $\vec{a} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + 2\hat{k}$ is: **[1]**

   a) $\frac{4}{\sqrt{21}}$ b) $\sqrt{\frac{5}{21}}$

   c) $\sqrt{\frac{3}{21}}$ d) $\frac{5}{\sqrt{21}}$

6. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 2, respectively, having $\vec{a} \cdot \vec{b} = \sqrt{6}$ **[1]**

   a) $\frac{\pi}{5}$ b) $\frac{\pi}{3}$

   c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

7. The scalar product of two nonzero vectors $\vec{a}$ and $\vec{b}$ is denoted by **[1]**

   a) $\overrightarrow{ab}$ b) $\vec{a}.\vec{b}$

   c) $\overrightarrow{a} \times \overrightarrow{b}$ d) ab

8. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$. **[1]**

   a) $11\sqrt{2}$ b) $11\sqrt{3}$

   c) $15\sqrt{3}$ d) $15\sqrt{2}$

9. The angle between the vectors $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + \hat{k}$ is **[1]**

a) $\cos^{-1}\frac{3}{5}$ b) $\frac{3}{\sqrt{12}}$

c) $\cos^{-1}\frac{5}{7}$ d) $\frac{3}{\sqrt{14}}$

10. If $\vec{a} = (\hat{i} - \hat{j} + 2\hat{k})$ and $\vec{b} = (2\hat{i} + 3\hat{j} - 4\hat{k})$ then $|\vec{a} \times b| = ?$ **[1]**

a) $\sqrt{174}$ b) $\sqrt{87}$

c) $\sqrt{73}$ d) $\sqrt{93}$

11. The position vectors of three consecutive vertices of a parallelogram ABCD are $A(4\hat{i} + 2\hat{j} - 6\hat{k})$, B $(5\hat{i} - 3\hat{j} + \hat{k})$ and $C(12\hat{i} + 4\hat{j} + 5\hat{k})$. The position vector of D is given by **[1]**

a) $21\hat{i} + 3\hat{j}$ b) $-3\hat{i} - 5\hat{j} - 10\hat{k}$

c) $11\hat{i} + 9\hat{j} - 2\hat{k}$ d) $-11\hat{i} - 9\hat{j} + 2\hat{k}$

12. The position vectors of the points $\vec{A}$ and $\vec{B}$ are respectively, $3\hat{i} - 5\hat{j} + 2\hat{k}$ and $\hat{i} + \hat{j} - \hat{k}$ What is the length of $\overrightarrow{AB}$? **[1]**

a) 9 b) 11

c) 7 d) 6

13. The position vector of the point which divides the join of points $2\vec{a} - 3\vec{b}$ and $\vec{a} + \vec{b}$ in the ratio 3: 1 is **[1]**

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

c) $\frac{5\vec{a}}{4}$ d) $\frac{7\vec{a}-8\vec{b}}{4}$

14. Consider the following **[1]**

I. $4\hat{i} \times 3\hat{i} = 0$

II. $\frac{4\hat{i}}{3\hat{i}} = \frac{4}{3}$

Which of the above statement(s) is/are correct?

a) Both I and II b) Neither I nor II

c) Only I d) Only II

15. If ABCDEF is a regular hexagon, then $\overrightarrow{AD} + \overrightarrow{EB} + \overrightarrow{FC}$ equals. **[1]**

a) $2\overrightarrow{AB}$ b) $\overrightarrow{4AB}$

c) $3\overrightarrow{AB}$ d) $\overrightarrow{0}$

16. If a unit vector $\vec{a}$ makes angles $\frac{\pi}{3}$ *with* $\hat{i}$, $\frac{\pi}{4}$ *with* $\hat{j}$ *and an acute angle* θ *with* $\hat{k}$, then the components of $\vec{a}$ are **[1]**

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

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

17. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then which one of the following is correct? **[1]**

a) $\vec{a}$ is parallel to $\vec{b}$ b) $\vec{a}$ is a unit vector

c) $\vec{a}$ is perpendicular to $\vec{b}$ d) $\vec{a} = \lambda\vec{b}$ for some scalar λ

18. The direction cosines of the vector $\vec{a} = (-2\hat{i} + \hat{j} - 5\hat{k})$ are **[1]**

a) -2 , 1, -5

b) $\frac{1}{3}, \frac{-1}{6}, \frac{-5}{6}$

c) $\frac{-2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{-5}{\sqrt{30}}$

d) $\frac{2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{5}{\sqrt{30}}$

19. Let $|\vec{a}|$ = 7, $|\vec{b}|$ = 11 and $|\vec{a}+\vec{b}| = 10\sqrt{3}$. **[1]**

What is $|\vec{a}$ - $\vec{b}|$ equal to?

a) $2\sqrt{2}$

b) $2\sqrt{10}$

c) 5

d) 10

20. If $\vec{a}$ and $\vec{b}$ are mutually perpendicular unit vectors then $(3\vec{a}+2\vec{b})\cdot(5\vec{a}-6\vec{b}) =$? **[1]**

a) 6

b) 12

c) 5

d) 3

21. What is the area of the rectangle having vertices A, B, C and D with position vectors $-\hat{\mathbf{i}}+\frac{1}{2}\hat{\mathbf{j}}+4\hat{\mathbf{k}}$, **[1]**
$\hat{\mathbf{i}}+\frac{1}{2}\hat{\mathbf{j}}+4\hat{\mathbf{k}}$, $\hat{\mathbf{i}}-\frac{1}{2}\hat{\mathbf{j}}+4\hat{\mathbf{k}}$ and $-\hat{\mathbf{i}}-\frac{1}{2}\hat{\mathbf{j}}+4\hat{\mathbf{k}}$?

a) $\frac{1}{2}$ sq units

b) 1 sq units

c) 2 sq units

d) 4 sq units

22. If $|\vec{a}| = 3$ and $-1 \leq k \leq 2$, then $|k\vec{a}|$ lies in the interval. **[1]**

a) [- 3, 6]

b) [3, 6]

c) [0, 6]

d) [1, 2]

23. If $\vec{a}$ and $\vec{b}$ are unit vectors inclined at an angle θ, then the value of $|\vec{a}-\vec{b}|$ is **[1]**

a) $2\cos\frac{\theta}{2}$

b) $2\sin\frac{\theta}{2}$

c) $2\cos$

d) $2\sin\theta$

24. If $|\overrightarrow{\mathrm{a}} \times \overrightarrow{\mathrm{b}}|$ = $\sqrt{3}$ and $\vec{a}\cdot\vec{b}$ = -3, then angle between $\vec{a}$ and $\vec{b}$ is **[1]**

a) $\frac{\pi}{3}$

b) $\frac{\pi}{6}$

c) $\frac{2\pi}{3}$

d) $\frac{5\pi}{6}$

25. The magnitude of the vector $6\hat{\mathrm{i}}-2\hat{\mathrm{j}}+3\hat{\mathrm{k}}$ is **[1]**

a) 5

b) 12

c) 7

d) 1

26. If $\vec{a} = a_1\hat{i}+a_2\hat{j}+a_3\hat{k}$ and $\vec{b} = b_1\hat{i}+b_2\hat{j}+b_3\hat{k}$ then the dot product $\vec{a}.\vec{b} =$ **[1]**

a) $a_1b_1-a_2b_2+a_3b_3$

b) $a_1b_1+a_2b_2+a_3b_3$

c) $a_1b_1-a_2b_2-a_3b_3$

d) $a_1b_1+a_2b_2-a_3b_3$

27. If two vectors $\vec{a}$ and $\vec{b}$are such that $|\vec{a}| = 2, |\vec{b}| = 3$ and $\vec{a}\cdot\vec{b} = 4$, then $|\vec{a}-2\vec{b}|$ is equal to **[1]**

a) $2\sqrt{6}$

b) 24

c) $2\sqrt{2}$

d) $\sqrt{2}$

28. If $|\vec{a}|$ = 10, $\vec{b}$ = 2 and $\vec{a}\cdot\vec{b}$ = 12, then what is the value of $|\vec{a}\times\vec{b}|$? **[1]**

a) 20

b) 24

c) 16

d) 12

29. If $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c}$ and $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}, \vec{a} = 0$, then **[1]**

a) $\vec{b} + \vec{c} = \overrightarrow{0}$ b) $\vec{b} + \vec{a} = \overrightarrow{0}$

c) $\vec{b} = \vec{c}$ d) $\vec{b} = \overrightarrow{0}$

30. If $\hat{i}$, $\hat{j}$, $\hat{k}$ are unit vectors along with three mutually perpendicular directions, then: **[1]**

a) $\hat{i} \cdot \hat{k} = 0$ b) $\hat{\mathrm{i}} \times \hat{\mathrm{k}} = 0$

c) $\hat{\mathbf{i}} \cdot \hat{\mathbf{j}} = 1$ d) $\hat{\mathrm{i}} \times \hat{\mathrm{j}} = 1$

31. Let $\vec{a}$ and $\vec{b}$ be two unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit vector if **[1]**

a) $\theta = \frac{\pi}{3}$ b) $\theta = \frac{2\pi}{3}$

c) $\theta = \frac{\pi}{2}$ d) $\theta = \frac{\pi}{4}$

32. If $\vec{a} = (\hat{i} + 2\hat{j} - 3\hat{k})$ and $\vec{b} = (3\hat{i} - \hat{j} + 2\hat{k})$ then the angle between $(2\vec{a} + \vec{b})$ and $(\vec{a} + 2\vec{b})$ is **[1]**

a) $\cos^{-1}\left(\frac{31}{50}\right)$ b) $\cos^{-1}\left(\frac{21}{30}\right)$

c) $\cos^{-1}\left(\frac{21}{40}\right)$ d) $\cos^{-1}\left(\frac{11}{30}\right)$

33. If $\overrightarrow{\mathrm{a}}$ lies in the plane of vectors $\overrightarrow{\mathrm{b}}$ and $\vec{C}$, then which of the following is correct? **[1]**

a) $[\vec{a}\vec{b}\vec{c}] = 0$ b) $[\vec{a}\vec{b}\vec{c}]$ =3

c) $[\overrightarrow{\mathrm{b}}\overrightarrow{\mathrm{c}}\overrightarrow{\mathrm{a}}]$ = 1 d) $[\vec{a}\vec{b}\vec{c}]$ =2

34. If the position vectors of P and Q are $\hat{i} + 3\hat{j} - 7\hat{k}$ and $5\hat{i} - 2\hat{j} + 4\hat{k}$ respectively , then the cosine of the angle between $\overrightarrow{PQ}$ and y-axis is **[1]**

a) $\frac{4}{\sqrt{162}}$ b) $\frac{11}{\sqrt{162}}$

c) $\frac{5}{\sqrt{162}}$ d) $-\frac{5}{\sqrt{162}}$

35. The vector with initial point P (2, -3, 5) and terminal point Q(3, -4, 7) is **[1]**

a) -$\hat{i}$ + $\hat{j}$ - 2$\hat{k}$ b) $\hat{i}$-$\hat{j}$+2$\hat{k}$

c) 5$\hat{i}$- 7$\hat{j}$+12$\hat{k}$ d) 5$\hat{i}$- 7$\hat{j}$-12$\hat{k}$

36. If $\vec{\mathrm{a}} + \vec{\mathrm{b}} = \hat{\mathrm{i}}$ and $\vec{\mathrm{a}}$ = $2\hat{\mathrm{i}} - 2\hat{\mathrm{j}} + 2\hat{\mathrm{k}}$, then $|\vec{\mathrm{b}}|$ equals: **[1]**

a) $\sqrt{14}$ b) $\sqrt{17}$

c) $\sqrt{12}$ d) 3

37. Let ABCD is a parallelogram. If $\overrightarrow{AB} = \vec{a}$ and $\overrightarrow{BC} = \vec{b}$, then what is $\overrightarrow{BD}$ equal to? **[1]**

a) -$\vec{a}$ - $\vec{b}$ b) $\vec{a}$ + $\vec{b}$

c) -$\vec{a}$ + $\vec{b}$ d) $\vec{a}$ - $\vec{b}$

38. $(\vec{a} + 2\vec{b} - \vec{c}) \cdot \{(\vec{a} - \vec{b}) \times (\vec{a} - \vec{b} - \vec{c})\}$ is equal to **[1]**

a) 0 b) $2[\vec{a}\ \vec{b}\ \vec{c}]$

c) $3[\vec{a}\ \vec{b}\ \vec{c}]$ d) $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$

39. Find the vector components of the vector with initial point (2, 1) and terminal point (– 5, 7). **[1]**

a) $7\hat{i}\ and\ 6\hat{j}$ b) $-7\hat{i}\ and - 6\hat{j}$

c) $7\hat{i}\ and - 6\hat{j}$

d) $-7\hat{i}\ and\ 6\hat{j}$

40. If $\vec{a} \cdot \hat{i} = \vec{a} \cdot (\hat{i} + \hat{j}) = \vec{a} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1,$ then $\vec{a}$= **[1]**

a) $\hat{i}$

b) $\overrightarrow{0}$

c) $\hat{j}$

d) $\hat{i} + \hat{j} + \hat{k}$

41. The unit vector perpendicular to the plane passing through point $P(\hat{i} - \hat{j} + 2\hat{k}), Q(2\hat{i} - \hat{k})$ and $R(2\hat{j} + \hat{k})$ is **[1]**

a) $\frac{1}{6}(2\hat{i} + \hat{j} + \hat{k})$

b) $2\hat{i} + \hat{j} + \hat{k}$

c) $\frac{1}{\sqrt{6}}(2\hat{i} + \hat{j} + \hat{k})$

d) $\sqrt{6}(2\hat{i} + \hat{j} + \hat{k})$

42. Find the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$ **[1]**

a) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

b) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, -\frac{3}{\sqrt{14}}$

c) $\frac{1}{\sqrt{14}}, -\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

d) $-\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

43. The value of $(\vec{a} \times \vec{b})^2$ is **[1]**

a) $|\vec{a}|^2|\vec{b}|^2 - (\vec{a} \cdot \vec{b})^2$

b) $|\vec{a}|^2 + |\vec{b}|^2 - 2(\vec{a} \cdot \vec{b})$

c) $|\vec{a}|^2 + |\vec{b}|^2 - (\vec{a} \cdot \vec{b})^2$

d) $|\vec{a}|^2 + |\vec{b}|^2 - \vec{a} \cdot \vec{b}$

44. If $\vec{a} = (\hat{i} + 2\hat{j} - 3\hat{k})$ and $\vec{b} = (3\hat{i} - \hat{j} + 2\hat{k})$ then the angle between $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ is **[1]**

a) $\frac{\pi}{2}$

b) $\frac{2\pi}{3}$

c) $\frac{\pi}{4}$

d) $\frac{\pi}{3}$

45. The vector $(\cos\alpha\cos\beta)\hat{i} + (\cos\alpha\sin\beta)\hat{j} + (\sin\alpha)\hat{k}$ is a **[1]**

a) Coplanar Vector

b) constant vector

c) null vector

d) unit vector

46. Which of the following is meaningless? **[1]**

a) $\vec{a} \cdot (\vec{b} \times \vec{c})$

b) $\vec{a} \cdot (\vec{b} \cdot \vec{c})$

c) $\vec{a} \times (\vec{b} \cdot \vec{c})$

d) $\vec{a} \times (\vec{b} \times \vec{c})$

47. In a hexagon ABCDEF $\vec{AB} = a, \vec{BC} = \vec{b}$ and $\overrightarrow{CD} = \vec{c}$. Then $\overrightarrow{AE} =$ **[1]**

a) $\vec{a} + 2\vec{b} + 2\vec{c}$

b) $2\vec{a} + \vec{b} + \vec{c}$

c) $\vec{a} + \vec{b} + \vec{c}$

d) $\vec{b} + \vec{c}$

48. For any three vectors $\vec{a}, \vec{b}, \vec{c}$ the expression $(\vec{a} - \vec{b}) \cdot ((\vec{b} - \vec{c}) \times (\vec{c} - \vec{a}))$ equals. **[1]**

a) $[\vec{a}\vec{b}\vec{c}]$

b) $2[\vec{a}\vec{b}\vec{c}]$

c) None of these

d) $[\vec{a}\vec{b}\vec{c}]^2$

49. If $\hat{i}, \hat{j}, \hat{k}$ are unit vectors, then **[1]**

a) $\hat{i} \times (\hat{j} \times \hat{k}) = 1$

b) $\hat{i} \cdot \hat{j} = 1$

c) $\hat{i}.\hat{i} = 1$

d) $\hat{i} \times \hat{j} = 1$

50. $\vec{a} + \vec{b} + \vec{c} = 0$ such that $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$. **[1]**

What is the angle between $\vec{a}$ and $\vec{b}$?

a) $\frac{\pi}{3}$ b) $\frac{\pi}{2}$

c) $\frac{\pi}{4}$ d) $\frac{\pi}{6}$

51. If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit vector such that $\vec{a}+\vec{b}+\vec{c}=\overrightarrow{0}$ Then $(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a})=$ **[1]**

a) $\frac{1}{2}$ b) $\frac{3}{2}$

c) $\frac{-3}{2}$ d) $\frac{-1}{2}$

52. Let a vector $\vec{r}$ make angles 60°, 30° with X and Y-axes, respectively. What are the direction cosines of $\vec{r}$? **[1]**

a) $< \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0 >$ b) $< \frac{1}{2}, \frac{\sqrt{3}}{2}, 0 >$

c) $< -\frac{1}{2}, \frac{\sqrt{3}}{2}, 0 >$ d) $< \frac{1}{2}, -\frac{\sqrt{3}}{2}, 0 >$

53. If $|\vec{a}| = 2$ and $|\vec{b}|$ = 3, then $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2$ is **[1]**

a) 64 b) 72

c) 36 d) 48

54. Let the vectors $\vec{a}$ and $\vec{b}$ be such that $|\vec{a}| = 3$ and $|b| = \frac{\sqrt{2}}{3}$, then $\vec{a} \times \vec{b}$ is a unit vector if the angle between $\vec{a}$ and $\vec{b}$ is **[1]**

a) $\frac{\pi}{4}$ b) $\frac{\pi}{3}$

c) $\frac{\pi}{6}$ d) $\frac{\pi}{2}$

55. If $|\vec{a}| = 4$ and $-3 \leq \lambda \leq 2$, then the range of $|\lambda\vec{a}|$ is **[1]**

a) [0, 12] b) [0, 8]

c) [8, 12] d) [-12, 8]

56. The angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 4, respectively, and $\vec{a} \cdot \vec{b} = 2\sqrt{3}$ is **[1]**

a) $\frac{\pi}{2}$ b) $\frac{5\pi}{2}$

c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$

57. If in a $\triangle$ABC, $A = (0, 0), B = (3, 3\sqrt{3}), C = (-3\sqrt{3}, 3)$, then the vector of magnitude $2\sqrt{2}$ units directed along AO, where O is the circumcentre of $\triangle$ABC, then $\overrightarrow{AO}$ is **[1]**

a) $(1-\sqrt{3})\hat{i} - (\sqrt{3}-1)\hat{j}$ b) $(1-\sqrt{3})\hat{i} + (1+\sqrt{3})\hat{j}$

c) $(1+\sqrt{3})\hat{i} + (1-\sqrt{3})\hat{j}$ d) $(1+\sqrt{3})\hat{i} + (\sqrt{3}-1)\hat{j}$

58. What is the value of m, if the vectors $2\hat{\mathbf{i}} - \hat{\mathbf{j}} + \hat{\mathbf{k}}$, $\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}}$ and $3\hat{\mathbf{i}} + m\hat{\mathbf{j}} + 5\hat{\mathbf{k}}$ are coplanar? **[1]**

a) -2 b) 4

c) 2 d) -4

59. The projection of vector $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ along $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ is **[1]**

a) 2 b) $\frac{1}{3}$

c) $\sqrt{6}$ d) $\frac{2}{3}$

60. If $\vec{a}$ is a non zero vector of magnitude 'a' and λ a non zero scalar, then $\lambda\vec{a}$ is a unit vector if **[1]**

a) a = $|\lambda|$ b) a = $\frac{1}{|\lambda|}$

c) $\lambda = 1$ d) $\lambda = -1$

61. Two vectors $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ are collinear if **[1]**

a) $a_1 = b_1, a_2 = b_2, a_3 = b_3$

b) $\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$

c) $a_1b_1 + a_2b_2 + a_3b_3 = 0$

d) $a_1 + a_2 + a_3 = b_1 + b_2 + b_3$

62. Consider the vectors $\vec{a} = \hat{i} - 2\hat{j} + \hat{k}$ and $b = 4\hat{i} - 4\hat{j} + 7\hat{k}$. **[1]**

What is the vector perpendicular to both the vectors?

a) $-10\hat{i} + 3\hat{j} + 4\hat{k}$

b) $10\hat{i} - 3\hat{j} + 4\hat{k}$

c) $-10\hat{i} - 3\hat{j} + 4\hat{k}$

d) $10\hat{i} - 3\hat{j} - 4\hat{k}$

63. The value of λ for which the two vectors $2\hat{i} - \hat{j} + 2\hat{k}$ and $3\hat{i} + \lambda\hat{j} + \hat{k}$ are perpendicular is **[1]**

a) 6

b) 8

c) 4

d) 2

64. If a = (2, 1, -1), b = (1, -1, 0), c = (5 , -1, 1), then what is the unit vector parallel to a + b - c in the opposite direction? **[1]**

a) $\frac{\hat{i}-2\hat{j}+2\hat{k}}{3}$

b) $\frac{\hat{i}+\hat{j}-2\hat{k}}{3}$

c) $\frac{2\hat{i}-\hat{j}-2\hat{k}}{3}$

d) $\frac{2\hat{i}-\hat{j}+2\hat{k}}{3}$

65. If the volume of a parallelepiped having $\vec{a} = (5\hat{i} - 4\hat{j} + \hat{k})$, $\vec{b} = (4\hat{i} + 3\hat{j} + \lambda\hat{k})$ and $\vec{c} = (\hat{i} - 2\hat{j} + 7\hat{k})$ as coterminous edges, is $\frac{648}{3}$ cubic units then value of λ is **[1]**

a) $\frac{2}{3}$

b) $\frac{4}{3}$

c) 5

d) $\frac{1}{3}$

66. The number of vectors of unit length perpendicular to the vectors $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{j} + \hat{k}$ **[1]**

a) three

b) infinite

c) two

d) one

67. If the vectors $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} - 3\hat{k}$ are perpendicular to each other then $\lambda =$? **[1]**

a) -6

b) -3

c) -1

d) -9

68. The vectors $2\hat{i} + 3\hat{j} - 4\hat{k}$ and $a\hat{i} + b\hat{j} + c\hat{k}$ are perpendicular, if **[1]**

a) a = - 4, b = 4,c = -5

b) a = 2, b = 3, c = - 4

c) a = 4, b = 4, c = 5

d) a = 4, b=4, c = -5

69. A unit vector $\hat{a}$ makes equal but acute angles on the co-ordinate axes. The projection of the vector $\hat{a}$ on the vector $\vec{b} = 5\hat{i} + 7\hat{j} - \hat{k}$ is **[1]**

a) $\frac{3}{5\sqrt{3}}$

b) $\frac{11}{15}$

c) $\frac{4}{5}$

d) $\frac{11}{5\sqrt{3}}$

70. $[\hat{i} \quad \hat{j} \quad \hat{k}] =$? **[1]**

a) 3

b) 1

c) 2

d) 0

71. If$\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ *and* $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then the value of λ is **[1]**

a) 9 b) 8

c) 11 d) 7

72. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\left(2\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - 3\vec{b}\right)$ externally in the ratio 1 : 2. Also, show that P is the mid point of the line segment RQ. **[1]**

a) $5\vec{a} + 5\vec{b}$ b) $5\vec{a} + 3\vec{b}$

c) $3\vec{a} + 3\vec{b}$ d) $3\vec{a} + 5\vec{b}$

73. If $\vec{a} \cdot \vec{b}$ = 0 and $\vec{a} \times \vec{b}$ = 0, then which one of the following is correct? **[1]**

a) $\vec{a}$ is parallel to $\vec{b}$ b) $\vec{a}$ = 0 or $\vec{b}$ = 0

c) $\vec{a}$ is perpendicular to $\vec{b}$ d) $\vec{a}$ and $\vec{b} \neq 0$

74. The area of a triangle with vertices A, B, C is given by **[1]**

a) $|\overrightarrow{AB} \times \overrightarrow{AC}|$ b) $\frac{1}{8}|\overrightarrow{AC} \times \overrightarrow{AB}|$

c) $\frac{1}{4}|\overrightarrow{AC} \times \overrightarrow{AB}|$ d) $\frac{1}{2}|\overrightarrow{AB} \times \overrightarrow{AC}|$

75. Projection vector of $\vec{a}$ on $\vec{b}$ is **[1]**

a) $\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|}$ b) $\left(\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|^2}\right)\vec{b}$

c) $\left(\frac{\vec{a} \cdot \vec{b}}{|\vec{a}|^2}\right)\hat{b}$ d) $\frac{\vec{a} \cdot \vec{b}}{|\vec{a}|}$