1. Let $P(-2,-1,1)$ and $Q\left(\frac{56}{17}, \frac{43}{17}, \frac{111}{17}\right)$ be the vertices of the rhombus $PRQS$. If the direction ratios of the diagonal RS are $\alpha,-1,\beta$, where both α and β are integers of minimum absolute values, then $\alpha^2+\beta^2$ is equal to

2. Let α be the angle between the lines whose direction cosines satisfy the equations $l+m-n=0$ and $l^2+m^2-n^2=0$. Then the value of $\sin^4\alpha+\cos^4\alpha$ is :
(1) $\frac{5}{8}$
(2) $\frac{1}{2}$
(3) $\frac{3}{8}$
(4) $\frac{3}{4}$

3. If two straight lines whose direction cosines are given by the relations $l+m-n=0, 3l^2+m^2+cnl=0$ are parallel, then the positive value of c is
(1) 6
(2) 4
(3) 3
(4) 2

4. The angle between the straight lines, whose direction cosines l, m, n are given by the equations $2l+2m-n=0$ and $mn+nl+\mathrm{lm}=0$, is:
(1) $\frac{\pi}{3}$
(2) $\frac{\pi}{2}$
(3) $\cos^{-1}\left(\frac{8}{9}\right)$
(4) $\pi-\cos^{-1}\left(\frac{4}{9}\right)$

5. The shortest distance between the lines $\frac{x+2}{1}=\frac{y}{-2}=\frac{z-5}{2}$ and $\frac{x-4}{1}=\frac{y-1}{2}=\frac{z+3}{0}$ is
(1) 8
(2) 6
(3) 7
(4) 9

6. If the lines $\frac{x-1}{2}=\frac{2-y}{-3}=\frac{z-3}{\alpha}$ and $\frac{x-4}{5}=\frac{y-1}{2}=\frac{z}{\beta}$ intersect, then the magnitude of the minimum value of $8\alpha\beta$ is _____.

7. The shortest distance between the lines $\frac{x-5}{1}=\frac{y-2}{2}=\frac{z-4}{-3}$ and $\frac{x+3}{1}=\frac{y+5}{4}=\frac{z-1}{-5}$ is
(1) $7\sqrt{3}$
(2) $5\sqrt{3}$
(3) $6\sqrt{3}$
(4) $4\sqrt{3}$

8. The distance of the point $P(4,6,-2)$ from the line passing through the point $(-3,2,3)$ and parallel to a line with direction ratios $3,3,-1$ is equal to:
(1) 3
(2) $\sqrt{6}$
(3) $2\sqrt{3}$
(4) $\sqrt{14}$

9. Let N be the foot of perpendicular from the point $P(1,-2,3)$ on the line passing through the points $(4,5,8)$ and $(1,-7,5)$. Then the distance of N from the plane $2x-2y+z+5=0$ is
(1) 8
(2) 6
(3) 9
(4) 7

10. The shortest distance between the lines $x+1=2y=-12z$ and $x=y+2=6z-6$ is
(1) 2
(2) 3
(3) $\frac{5}{2}$
(4) $\frac{3}{2}$

11. If the shortest distance between the lines $\vec{r}=(-\hat{i}+3\hat{k})+\lambda(\hat{i}-a\hat{j})$ and $\vec{r}=(-\hat{j}+2\hat{k})+\mu(\hat{i}-\hat{j}+\hat{k})$ is $\sqrt{\frac{2}{3}}$, then the integral value of a is equal to _____

12. If the two lines $l_1: \frac{x-2}{3}=\frac{y+1}{-2}, z=2$ and $l_2: \frac{x-1}{1}=\frac{2y+3}{\alpha}=\frac{z+5}{2}$ are perpendicular, then an angle between the lines l_2 and $l_3: \frac{1-x}{3}=\frac{2y-1}{-4}=\frac{z}{4}$ is
(1) $\cos^{-1}\left(\frac{29}{4}\right)$
(2) $\sec^{-1}\left(\frac{29}{4}\right)$
(3) $\cos^{-1}\left(\frac{2}{29}\right)$
(4) $\cos^{-1}\left(\frac{2}{\sqrt{29}}\right)$

13. For real numbers α and $\beta \neq 0$, if the point of intersection of the straight lines $\frac{x-\alpha}{1}=\frac{y-1}{2}=\frac{z-1}{3}$ and $\frac{x-4}{\beta}=\frac{y-6}{3}=\frac{z-7}{3}$ lies on the plane $x+2y-z=8$, then $\alpha-\beta$ is equal to :
(1) 5
(2) 9
(3) 3
(4) 7

14. The distance of the point $P(3,4,4)$ from the point of intersection of the line joining the points $Q(3,-4,-5)$ and $R(2,-3,1)$ and the plane $2x+y+z=7$, is equal to _____.

15. The equation of the line through the point $(0,1,2)$ and perpendicular to the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{-2}$ is :
(1) $\frac{x}{3}=\frac{y-1}{-4}=\frac{z-2}{3}$
(2) $\frac{x}{3}=\frac{y-1}{4}=\frac{z-2}{3}$
(3) $\frac{x}{-3}=\frac{y-1}{4}=\frac{z-2}{3}$
(4) $\frac{x}{3}=\frac{y-1}{4}=\frac{z-2}{-3}$

16. If (a, b, c) is the image of the point $(1,2,-3)$ in the line, $\frac{x+1}{2}=\frac{y-3}{-2}=\frac{z}{-1}$, then $a+b+c$ is equal to:
(1) 2
(2) -1
(3) 3
(4) 1

17. Two lines $\frac{x-3}{1}=\frac{y+1}{3}=\frac{z-6}{-1}$ and $\frac{x+5}{7}=\frac{y-2}{-6}=\frac{z-3}{4}$ intersect at the point R. The reflection of R in the xy - plane has coordinates :
(1) $(2,-4,-7)$
(2) $(2,4,7)$
(3) $(2,-4,7)$
(4) $(-2,4,7)$

18. Let S be the set of all values of λ, for which the shortest distance between the lines $\frac{x-\lambda}{0}=\frac{y-3}{4}=\frac{z+6}{1}$ and $\frac{x+\lambda}{3}=\frac{y}{-4}=\frac{z-6}{0}$ is 13. Then $8\left|\sum_{\lambda\in S}\lambda\right|$ is equal to

(1) 306
(2) 304
(3) 308
(4) 302

19. Let a line L pass through the origin and be perpendicular to the lines $L_1: \vec{r}=\left(\hat{i}-11\hat{j}-7\hat{k}\right)+\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right)$, $\lambda\in\mathbb{R}$ and $L_2: \vec{r}=\left(-\hat{i}+\hat{k}\right)+\mu\left(2\hat{i}+2\hat{j}+\hat{k}\right)$, $\mu\in\mathbb{R}$. If P is the point of intersection of L and L_1, and ,$Q(\alpha,\beta,\gamma)$ is the foot of perpendicular from P on L_2, then $9(\alpha+\beta+\gamma)$ is equal to ________.

20. Let the image of the point $P(1,2,3)$ in the line $L: \frac{x-6}{3}=\frac{y-1}{2}=\frac{z-2}{3}$ be Q. let $R(\alpha,\beta,\gamma)$ be a point that divides internally the line segment PQ in the ratio $1:3$. Then the value of $22(\alpha+\beta+\gamma)$ is equal to

21. The vertices B and C of a ΔABC lie on the line, $\frac{x+2}{3}=\frac{y-1}{0}=\frac{z}{4}$ such that $BC=5$ units. Then the area (in sq. units) of this triangle, given the point $A(1,\ -1,2)$, is

(1) 6
(2) $2\sqrt{34}$
(3) $\sqrt{34}$
(4) $5\sqrt{17}$

22. Let D be the centroid of the triangle with vertices $(3,\ -1)$, $(1,3)$ and $(2,4)$. Let P be the point of intersection of the lines $x+3y-1=10$ and $3x-y+1=0$. Then, the line passing through the points D and P also passes through the point:

(1) $(-9,-6)$
(2) $(9,7)$
(3) $(7,6)$
(4) $(-9,-7)$

23. A line l passing through origin is perpendicular to the lines

$l_1: \vec{r}=(3+t)\hat{\mathrm{i}}+(-1+2t)\hat{\mathrm{j}}+(4+2t)\hat{\mathrm{k}}$

$l_2: \vec{r}=(3+2s)\hat{\mathrm{i}}+(3+2s)\hat{\mathrm{j}}+(2+s)\hat{\mathrm{k}}$

If the co-ordinates of the point in the first octant on l_2 at a distance of $\sqrt{17}$ from the point of intersection of l and l_1 are $(a,\ b,\ c)$, then $18(a+b+c)$ is equal to ___ .

24. If the foot of the perpendicular from point $(4,3,8)$ on the line $L_1: \frac{x-a}{l}=\frac{y-2}{3}=\frac{z-b}{4}$, $l\neq 0$ is $(3,5,7)$, then the shortest distance between the line L_1 and line $L_2: \frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$ is equal to

(1) $\frac{1}{2}$
(2) $\frac{1}{\sqrt{6}}$
(3) $\sqrt{\frac{2}{3}}$
(4) $\frac{1}{\sqrt{3}}$

25. The foot of perpendicular of the point $(2,0,5)$ on the line $\frac{x+1}{2}=\frac{y-1}{5}=\frac{z+1}{-1}$ is (α,β,γ). Then. Which of the following is NOT correct?

(1) $\frac{\alpha\beta}{\gamma}=\frac{4}{15}$
(2) $\frac{\alpha}{\beta}=-8$
(3) $\frac{\beta}{\gamma}=-5$
(4) $\frac{\gamma}{\alpha}=\frac{5}{8}$

26. Let the co-ordinates of one vertex of ΔABC be $A(0,2,\alpha)$ and the other two vertices lie on the line $\frac{x+\alpha}{5}=\frac{y-1}{2}=\frac{z+4}{3}$. For $\alpha\in\mathbb{Z}$, if the area of ΔABC is 21 sq. units and the line segment BC has length $2\sqrt{21}$ units, then α^2 is equal to _______.

27. Let the line $L: \frac{x-1}{2}=\frac{y+1}{-1}=\frac{z-3}{1}$ intersect the plane $2x+y+3z=16$ at the point P. Let the point Q be the foot of perpendicular from the point $R(1,-1,-3)$ on the line L. If α is the area of triangle PQR. then α^2 is equal to _____ .

28. The line l_1 passes through the point $(2,6,2)$ and is perpendicular to the plane $2x+y-2z=10$. Then the shortest distance between the line l_1 and the line $\frac{x+1}{2}=\frac{y+4}{-3}=\frac{z}{2}$ is:

(1) 7
(2) $\frac{19}{3}$
(3) $\frac{19}{2}$
(4) 9

29. Let l_1 be the line in xy-plane with x and y intercepts $\frac{1}{8}$ and $\frac{1}{4\sqrt{2}}$ respectively, and l_2 be the line in zx-plane with x and z intercepts $-\frac{1}{8}$ and $-\frac{1}{6\sqrt{3}}$ respectively. If d is the shortest distance between the line l_1 and l_2, then d^{-2} is equal to _____.

30. Let the position vectors of two points P and Q be $3\hat{\mathrm{i}}-\hat{\mathrm{j}}+2\hat{\mathrm{k}}$ and $\hat{\mathrm{i}}+2\hat{\mathrm{j}}-4\hat{\mathrm{k}}$, respectively. Let R and S be two points such that the direction ratios of lines PR and QS are $(4,-1,2)$ and $(-2,1,-2)$, respectively. Let lines PR and QS intersect at T. If the vector $\overrightarrow{TA}$ is perpendicular to both $\overrightarrow{PR}$ and $\overrightarrow{QS}$ and the length of vector $\overrightarrow{TA}$ is $\sqrt{5}$ units, then the modulus of a position vector of A is :

(1) $\sqrt{482}$
(2) $\sqrt{171}$
(3) $\sqrt{5}$
(4) $\sqrt{227}$