

MISSION NDA MATHEMATICS

COMPLETE TOPICWISE QUESTIONS

THREE DIMENSIONAL GEOMETRY

- The shortest distance between lines
 $\vec{r} = 6\hat{i} + 2\hat{j} + 2\hat{k} + \lambda(\hat{i} - 2\hat{j} + 2\hat{k})$ and
 $\vec{r} = -4\hat{i} - \hat{k} + \mu(3\hat{i} - 2\hat{j} - 2\hat{k})$ is
 (a) 0 unit (b) +2 units
 (c) +30 units (d) 9 units
- The sine of the angle between the straight line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ and the plane $2x - 2y + z = 5$ is
 (a) $\frac{10}{6\sqrt{5}}$ (b) $\frac{4}{5\sqrt{2}}$
 (c) $\frac{\sqrt{2}}{10}$ (d) $\frac{2\sqrt{3}}{5}$
- Under what condition is a straight line $\frac{x-x_0}{l} = \frac{y-y_0}{m} = \frac{z-z_0}{n}$ parallel to the xy -plane?
 (a) $l = 0$ (b) $m = 0$
 (c) $n = 0$ (d) $l = 0, m = 0$
- If α, β and γ are the angles which a half ray makes with the positive directions of the axes, then $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ is equal to
 (a) 1 (b) 2
 (c) 0 (d) -1
- The equations $|x| = p, |y| = p, |z| = p$ in the xyz space represent
 (a) a cube (b) a rhombus
 (c) a sphere (d) a point (p, p, p)
- The ratio in which the line joining $(2, 4, 5)$ and $(3, 5, -4)$ is divided by the yz -plane is
 (a) 2:3 (b) 3:2
 (c) -2:3 (d) 4:-3
- The distance of the point $(-1, -5, -10)$ from the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane $x - y + z = 5$ is
 (a) 14/5 (b) 11
 (c) 13 (d) 15
- The lines $\frac{x-1}{k} = \frac{y-4}{1} = \frac{z-5}{1}$ and $\frac{x-2}{1} = \frac{y-3}{1} = \frac{4-z}{k}$ are coplanar if
 (a) $k = 0$ or 4 (b) $k = 1$ or -1
 (c) $k = 0$ or -1 (d) $k = -1$ or -2



9. The angle between the lines $\vec{r} = (4\hat{i} - \hat{j}) + s(2\hat{i} + \hat{j} - 3\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + t(\hat{i} - 3\hat{j} + 2\hat{k})$ is
 (a) $3\pi/2$ (b) $\pi/3$
 (c) $2\pi/3$ (d) $\pi/6$
10. A plane which is perpendicular to two planes $x - y + 2z - 4 = 0$ and $2x - 2y + z = 0$ passes through $(1, -2, 1)$. The distance of the plane from the point $(1, 2, 2)$ is
 (a) $2\sqrt{2}$ (b) 0
 (c) 2 (d) $\sqrt{2}$
11. If lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ are mutually perpendicular, then k is equal to
 (a) $-10/7$ (b) $-7/10$
 (c) -10 (d) -7
12. The equation of the plane bisecting the obtuse angle between the planes $2x - y + 2z + 3 = 0$ and $3x - 2y + 6z + 8 = 0$ is
 (a) $23x - 13y + 32z + 45 = 0$ (b) $6x - 5y + 17z + 19 = 0$
 (c) $3x + 5y - 11z - 20 = 0$ (d) none of these
13. The equation of the plane through the points $(1, 2, 3)$, $(-1, 4, 2)$ and $(3, 1, 1)$ is
 (a) $5x + y + 12z - 23 = 0$ (b) $5x + 6y + 2z - 23 = 0$
 (c) $x + 6y + 2z - 23 = 0$ (d) $x + y + z - 13 = 0$
14. If $\sin^{-1} \frac{1}{3}$ is the angle between the line $L_1 = \frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$ and the plane $P_1 = 2x - y + \sqrt{k}z + 4 = 0$, then the value of k is
 (a) $-7/3$ (b) $-3/7$
 (c) $5/3$ (d) $-5/3$
15. The position vector of the point where the line $\vec{r} = \hat{i} - \hat{j} + \hat{k} + t(\hat{i} + \hat{j} - \hat{k})$ meets the plane $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 5$ is
 (a) $5\hat{i} + \hat{j} - \hat{k}$ (b) $5\hat{i} + 3\hat{j} - 3\hat{k}$
 (c) $2\hat{i} + \hat{j} + 2\hat{k}$ (d) $5\hat{i} + \hat{j} + \hat{k}$
16. If the line makes angles α, β and γ with the x -axis, y -axis and z -axis, then the value of $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$ is
 (a) -1 (b) 1
 (c) -2 (d) 2
17. The equation of the plane which contains the lines $\vec{r} = \hat{i} + 2\hat{j} - \hat{k} + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = \hat{i} + 2\hat{j} - \hat{k} + \mu(\hat{i} + \hat{j} + 3\hat{k})$ must be
 (a) $\vec{r} \cdot (7\hat{i} - 4\hat{j} - \hat{k}) = 0$ (b) $\vec{r} \cdot (4\hat{i} - 7\hat{j} + \hat{k}) = 5$
 (c) $\vec{r} \cdot (\hat{i} + 2\hat{j} - \hat{k}) = 0$ (d) $\vec{r} \cdot (-\hat{i} - 2\hat{j} + 3\hat{k}) = 3$
18. The angle between the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$ and the plane $3x + 2y - 3z = 4$ is
 (a) 45° (b) 0°
 (c) $\cos^{-1} \left(\frac{24}{\sqrt{29}\sqrt{22}} \right)$ (d) 90°
19. The ratio in which the plane $\vec{r} \cdot (\hat{i} - 2\hat{j} + 3\hat{k}) = 17$ divides the line joining the points $-2\hat{i} + 4\hat{j} + 7\hat{k}$ and $3\hat{i} - 5\hat{j} + 8\hat{k}$ is
 (a) 1:10 (b) 3:10
 (c) 3:5 (d) 1:5



20. The planes $ax + 4y + z = 0$, $2y + 3z - 1 = 0$ and $3x - 6z + 2 = 0$
 (a) will meet on a line if $ab = 15$ and $a = 30$
 (b) will have a common point if $ab = 15$ and $a = 30$
 (c) will have no common point if $ab = 15$, $a \neq 30$
 (d) will have no common point if $ab \neq 15$, $a \neq 30$
21. The equation of the plane in which the lines $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$ lie is
 (a) $17x - 47y - 24z + 172 = 0$ (b) $17x + 47y - 24z + 172 = 0$
 (c) $17x + 47y + 24z + 172 = 0$ (d) $17x - 47y + 24z + 172 = 0$
22. The foot of the perpendicular from the origin to the plane $3x + 4y - 6z + 1 = 0$ is
 (a) $-\frac{3}{61}, \frac{4}{61}, \frac{6}{61}$ (b) $\frac{-3}{61}, \frac{-4}{61}, \frac{6}{61}$
 (c) $\frac{4}{61}, \frac{-3}{61}, \frac{5}{61}$ (d) none of these
23. A line makes angles of 45° and 60° with axes of x and y respectively. The angle made by the same line with the positive axis of z is
 (a) 30° or 60° (b) 60° or 90°
 (c) 90° or 120° (d) 60° or 120°
24. The radius of the sphere circumscribing the tetrahedron whose faces are $\frac{y}{b} + \frac{z}{c} = 0$, $\frac{z}{c} + \frac{x}{a} = 0$, $\frac{x}{a} + \frac{y}{b} = 0$ and $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ is
 (a) $\frac{a^2+b^2+c^2}{2}$ (b) $\frac{2}{a^2+b^2+c^2} \left(\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} \right)$
 (c) $\frac{a^2+b^2+c^2}{2} \sqrt{\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}}$ (d) $\frac{1}{2} (a^2 + b^2 + c^2)^{3/2}$
25. The image of the point $P(1,3,4)$ in the plane $2x - y + z + 3 = 0$ is
 (a) $(3,5,-2)$ (b) $(-3,5,2)$
 (c) $(3,-5,2)$ (d) $(-1,4,2)$
26. The distance of the point $(1,-2,3)$ from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is
 (a) 5 (b) 3
 (c) 1 (d) none of these
27. The direction ratios of the line segment joining from the origin to the point $(2,-3,6)$ is
 (a) $(1,0,0)$ (b) $(2,3,6)$
 (c) $(2,-3,6)$ (d) $(0,-1,6)$
28. The centre of the sphere which passes through four points $(0,0,0)$, $(0,2,0)$, $(1,0,0)$ and $(0,0,4)$ is
 (a) $\left(\frac{1}{2}, 1, 2\right)$ (b) $\left(-\frac{1}{2}, 1, 2\right)$
 (c) $\left(\frac{1}{2}, 1, -2\right)$ (d) $\left(1, \frac{1}{2}, 2\right)$
29. The line $\frac{x-3}{2} = \frac{y-4}{5} = \frac{z-6}{7}$
 (a) lies in $3x + 2y + 4z - 6 = 0$ (b) is parallel to $2x - 5y + 3z = 9$
 (c) is perpendicular to $2x - 5y + 3z = 0$ (d) passes through $(1,2,3)$
30. The direction ratios of the line segment joining the points $(3,-2,4)$ and $(4,1,3)$ are
 (a) $(-1,1,2)$ (b) $(3,2,-3)$
 (c) $(1,3,-1)$ (d) $(4,2,7)$



31. The radius of the circle formed due to the intersection of the sphere $x^2 + y^2 + z^2 - 2y - 4z - 11 = 0$ and the plane $x + 2y + 2z - 15 = 0$ is
 (a) $\sqrt{3}$ (b) $\sqrt{5}$
 (c) $\sqrt{7}$ (d) 3
32. The point in which the line $\frac{x-1}{1} = \frac{y-1}{-1} = \frac{z+3}{1}$ cuts the surface $x^2 + y^2 + z^2 - 20 = 0$ is
 (a) (0,2,4) (b) (0,2,-4)
 (c) (4,2,0) (d) (0,-2,-4)
33. The direction ratios of the segment joining the points $P(-1, \cos \frac{\pi}{2}, 2)$ and $Q(\sin \frac{\pi}{2}, 0, \tan \frac{\pi}{4})$ are
 (a) (-1, -1, -1) (b) (1, -3, 4)
 (c) (2, 0, -1) (d) (1, 3, 4)
34. The angle between the line $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \mu(\hat{i} - \hat{j} + \hat{k})$ and the normal to the plane $\vec{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 4$ is
 (a) $\sin^{-1} \left(\frac{2\sqrt{2}}{3} \right)$ (b) $\cos^{-1} \left(\frac{2\sqrt{2}}{3} \right)$
 (c) $\tan^{-1} \left(\frac{2\sqrt{2}}{3} \right)$ (d) $\cot^{-1} \left(\frac{2\sqrt{2}}{3} \right)$
35. Using direction ratios, the points $A(1,2,3)$, $B(4,0,4)$ and $C(-2,4,2)$
 (a) form an equilateral triangle (b) are concyclic
 (c) are non-collinear (d) are collinear
36. The equation $3x^2 - 2y^2 - 4z^2 + xy + xz + 6yz = 0$ represents
 (a) a pair of straight lines (b) a pair of planes
 (c) a sphere (d) a pair of planes passing through the origin
37. The direction cosines of the line segment joining points $(-3, 1, 2)$ and $(1, 4, -10)$ are
 (a) $\left(\frac{4}{13}, \frac{3}{13}, -\frac{12}{13} \right)$ (b) $\left(\frac{1}{13}, \frac{2}{13}, \frac{5}{13} \right)$
 (c) $\left(-\frac{1}{2}, \frac{1}{3}, -\frac{1}{7} \right)$ (d) $\left(-\frac{5}{13}, \frac{4}{13}, \frac{2}{13} \right)$
38. If the projections of a directed line segment on the coordinate axes are 12, 4, 3, the direction cosines of the line are
 (a) $\frac{-12}{13}, \frac{-4}{13}, \frac{-3}{13}$ (b) $\frac{12}{13}, \frac{4}{13}, \frac{3}{13}$
 (c) $\frac{12}{13}, \frac{-4}{13}, \frac{3}{13}$ (d) $\frac{12}{13}, \frac{4}{13}, \frac{-3}{13}$
39. The projection of the line segment joining the points $(-5, 1, 3)$ and $(2, 3, 5)$ on a line with direction cosines $\frac{1}{3}, \frac{1}{3}, \frac{2}{3}$ is
 (a) $1/3$ (b) $7/3$
 (c) $11/3$ (d) $13/3$
40. The value of α for which the lines $\frac{x-1}{2} = \frac{2y-1}{3} = \frac{1-3z}{\alpha}$ and $\frac{x+1}{+2} = \frac{3y-5}{2} = \frac{z-4}{3}$ are perpendicular to each other is
 (a) 3 (b) 2
 (c) -3 (d) 5



41. The angle between any two diagonals of a cube is
 (a) 45° (b) 60°
 (c) 90° (d) $\tan^{-1}(2\sqrt{2})$
42. The equation of the plane through the line of intersection of $\vec{r} \cdot (\hat{i} - 2\hat{j} + 2\hat{k}) = 1$ and $\vec{r} \cdot (2\hat{i} - \hat{j}) + 2 = 0$ and perpendicular to $\vec{r} \cdot (\hat{i} + \hat{j} + 2\hat{k}) + 9 = 0$ is
 (a) $\vec{r} \cdot (-5\hat{i} + \hat{j} + 2\hat{k}) = 7$ (b) $\vec{r} \cdot (5\hat{i} + \hat{j} + 2\hat{k}) = 7$
 (c) $\vec{r} \cdot (5\hat{i} - \hat{j} - 2\hat{k}) = 7$ (d) none of these
43. If points $P(6,3,2)$, $Q(5,1,4)$ and $R(3,3,5)$ are the vertices of a triangle PQR , then the value of $\angle PQR$ is
 (a) 0 (b) $\pi/6$
 (c) $\pi/3$ (d) $\pi/2$
44. The lines whose direction cosines are given by the relations $a^2l + b^2m + c^2n = 0$ and $mn + nl + lm = 0$ are parallel if
 (a) $(a^2 - b^2 + c^2)^2 = 4a^2c^2$ (b) $(a^2 + b^2 + c^2)^2 = 4a^2c^2$
 (c) $(a^2 - b^2 + c^2) = a^2c^2$ (d) none of these
45. The equation of the plane which bisects the line joining $(2,3,4)$ and $(6,7,8)$ is
 (a) $x + y + z - 15 = 0$ (b) $x - y + z - 15 = 0$
 (c) $x - y - z - 15 = 0$ (d) $x + y + z + 15 = 0$
46. The vectors of magnitudes $a, 2a, 3a$ meet at a point and their directions are along the diagonals of three adjacent faces of a cube. Then the magnitude of their resultant is
 (a) $5a$ (b) $6a$
 (c) $10a$ (d) $9a$
47. The distance of the point $(-1,2,5)$ from the line which passes through $(3,4,5)$ and whose direction cosines are proportional to $(2, -3, 6)$ is
 (a) $\frac{4\sqrt{61}}{7}$ (b) $\frac{2\sqrt{74}}{5}$
 (c) $\frac{2\sqrt{37}}{5}$ (d) none of these
48. The equations of the line through the point $(2,3, -5)$ and equally inclined to the axis are
 (a) $x - 2 = y - 3 = z + 5$ (b) $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z+1}{-5}$
 (c) $\frac{x}{2} = \frac{y}{3} = \frac{z}{-5}$ (d) none of these
49. If the direction cosines of a line are $(\frac{1}{c}, \frac{1}{c}, \frac{1}{c})$, then
 (a) $0 < c < 1$ (b) $c > 2$
 (c) $c = \pm\sqrt{2}$ (d) $c = \pm\sqrt{3}$
50. The points $(5,0,2)$, $(2, -6,0)$, $(4, -9,6)$ and $(7, -3,8)$ are vertices of a
 (a) square (b) rhombus
 (c) rectangle (d) parallelogram
51. The perimeter of the triangle with vertices at $(1,0,0)$, $(0,1,0)$ and $(0,0,1)$ is
 (a) 3 (b) 2
 (c) $2\sqrt{2}$ (d) $3\sqrt{2}$



52. The line $\frac{x-2}{1} = \frac{y-3}{2} = \frac{z-4}{0}$
 (a) is parallel to the x -axis
 (b) is parallel to the y -axis
 (c) is parallel to the z -axis
 (d) lies in a plane parallel to the xy -plane
53. The xy -plane divides the line joining the points $(-1, 3, 4)$ and $(2, -5, 6)$
 (a) internally in the ratio 2:3
 (b) externally in the ratio 2:3
 (c) internally in the ratio 3:2
 (d) externally in the ratio 3:2
54. The equation of the plane passing through the point $(-2, -2, 2)$ and containing the line joining the points $(1, 1, 1)$ and $(1, -1, 2)$ is
 (a) $x - 3y - 6z + 8 = 0$
 (b) $x - 3y - 6z - 8 = 0$
 (c) $2x + 3y + 6z + 8 = 0$
 (d) none of these

ANSWER KEY

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|--------------|---------|--------------|---------|---------|---------|---------|
| 1. (d) | 2. (c) | 3. (c) | 4. (b) | 5. (a) | 6. (c) | 7. (c) |
| 8. (b) | 9. (b) | 10. (a) | 11. (a) | 12. (a) | 13. (b) | 14. (c) |
| 15. (b) | 16. (a) | 17. (a) | 18. (b) | 19. (b) | 20. (a) | 21. (a) |
| 22. (b) | 23. (d) | 24. (c) | 25. (b) | 26. (c) | 27. (c) | 28. (a) |
| 29. (b) | 30. (c) | 31. (c) | 32. (b) | 33. (c) | 34. (b) | 35. (d) |
| 36. (b), (d) | 37. (a) | 38. (a), (b) | 39. (d) | 40. (d) | 41. (d) | 42. (a) |
| 43. (d) | 44. (a) | 45. (a) | 46. (a) | 47. (a) | 48. (a) | 49. (d) |
| 50. (a) | 51. (d) | 52. (d) | 53. (b) | 54. (a) | | |

