MATHS

BOOKS - NCERT MATHS (ENGLISH)

THREE DIMENSIONAL GEOMETRY

Short Answer Type Questions

1. Find the position vector of a point A in space such that $\overrightarrow{OA}$ is inclined at $60^0 \to OX$ and at $45^0 \to OY and \left|\overrightarrow{OA}\right| = 10 units.$

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2. Find the vector equation of the line which is parallel to the vector $3\hat{i} - 2\hat{j} + 6\hat{k}$ and which passes through the point $(1, -2, 3)$.

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3. Show that the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} and \frac{x-4}{5} = \frac{y-1}{2}$ intersect. Find their point of intersection.

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4. Find the angle between the lines

$\vec{r} = 3\hat{i} - 2\hat{j} + 6\hat{k} + \lambda\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$ and

$\vec{r} = \left(2\hat{j} - 5\hat{k}\right) + \mu\left(6\hat{i} + 3\hat{j} + 2\hat{k}\right).$

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5. Prove that the lines through $A(0, -1, -1) and B(4, 5, 1)$ intersects the line through $C(3, 9, 4) and D(-4, 4, 4)$. Also, find their point of intersection.

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6. Find the condition that the lines $x = py + q, z = ry + s$ and $x = p'y + q', z = r'y + s'$ may be perpendicular to each other.

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7. Find the equation of the plane which bisects the line segment joining the points $A(2, 3, 4) and B(4, 5, 8)$ at right angles.

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8. Find the equation of a plane which is at a distance of $3\sqrt{3}$ units from origin and the normal to which is equally inclined to the coordinate axes.

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9. If the line drawn from the point $(-2, -1, -3)$ meets a plane at right angle at the point $(1, -3, 3)$, find the equation of the plane.

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10. Find the equation of the plane through points (2,1,0),(3,-2,-2), and (3,1,7).

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11. Find the equations of the two lines through the origin which intersect the line $\frac{x-3}{2}=\frac{y-3}{1}=\frac{z}{1}$ at angle of $\frac{\pi}{3}$ each.

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12. The angle between the line whose d.c.'s are connected by the relations $l^2+m^2-n^2=0$ and

l+m+n=0 is

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13. about to only mathematics

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14. If O is the origin and the coordinates of A are (a, b, c) . Find the direction cosines of OA and the equation of the plane through A at right angles to OA.

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15. Two systems of rectangular axes have the same origin. If a plane cuts them at distances a, b, c and a', b', c' respectively, prove that $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}$

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16. Find the position vector of a point A in space such that $\overrightarrow{OA}$ is inclined at $60^0 \to OX$ and at $45^0 \to OY and \left|\overrightarrow{OA}\right| = 10 units.$

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17. Find the vector equation of the line which is parallel to the vector $3\hat{i} - 2\hat{j} + 6\hat{k}$ and which passes through the point $(1, -2, 3)$.

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18. Show that the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} and \frac{x-4}{5} = \frac{y-1}{2}$ intersect. Find their point of intersection.

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19. Find the angle between the lines

$\vec{r} = 3\hat{i} - 2\hat{j} + 6\hat{k} + \lambda\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$ and

$\vec{r} = \left(2\hat{j} - 5\hat{k}\right) + \mu\left(6\hat{i} + 3\hat{j} + 2\hat{k}\right).$

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20. Prove that the line through $A(0, -1, -1)$ and $B(4, 5, 1)$ intersects the line through $C(3, 9, 4)$ and $D(-4, 4, 4)$.

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21. Prove that the lines $x = py + q; z = ry + s$ and $x = p'y + q'; z = r'y + s'$ are perpendicular If $pp' + qq' + 1 = 0$

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22. Find the equation of the plane which bisects the line segment joining the points $A(2, 3, 4) and B(4, 5, 8)$ at right angles.

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23. Write the equation of a plane which is at a distance of $5\sqrt{3}$ units from origin and the normal to which is equally inclined to coordinate axes.

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24. If he line drawn from the point $(-2, -1, -3)$ meets a plane at right angle at the point $(1, -3, 3)$, find the equation of the plane.

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25. Find the equation of the plane through points (2,1,0),(3,-2,-2), and (3,1,7).

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26. Find the equations of the two lines through the origin which intersect the line $\frac{x-3}{2}=\frac{y-3}{1}=\frac{z}{1}$ at angle of $\frac{\pi}{3}$ each.

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27. Find the acute angle between the two straight lines whose direction cosines are given by $l+m+n=0$

and $l^2 + m^2 - n^2 = 0$

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28. If the direction cosines of a variable line in two adjacent points be l, M, n and $l + \delta l, m + \delta m + n + \delta n$ the small angle $\delta\theta$as between the two positions is given by

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29. If O is the origin and the coordinates of A are (a, b, c) . Find the direction cosines of OA and the equation of the plane through A at right angles to OA.

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30. Two systems of rectangular axes have the same origin. If a plane cuts them at distances $a, b, canda', b', c'$ respectively, prove that $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}$

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Long Answer Type Questions

1. Find the foot of the perpendicular from the point (2,3,-8) to the line $\frac{4-x}{2}=\frac{y}{6}=\frac{1-z}{3}$. Find the

perpendicular distance from the given point to the line.

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2. Find the equation of the perpendicular drawn from (2,4,-1) to the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$.

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3. Find the length and the foot of perpendicular from the point $(1, 3/2, 2)$ to the plane $2x - 2y + 4z + 5 = 0$.

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4. Find the equations of the line passing through the point $(3, 0, 1)$ parallel to the planes $x + 2y = 0$ and $3y - z = 0$.

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5. Find the shortest distance between the lines gives by

$\vec{r} = (8 + 3\lambda)\hat{i} - (9 + 16\lambda)\hat{j} + (10 + 7\lambda)\hat{k}$

and $\vec{r} = 15\hat{i} + 29\hat{j} + 5\hat{k} + \mu\left(3\hat{i} + 8\hat{j} - 5\hat{k}\right)$.

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6. Find the equation of the plane which is perpendicular to the plane $5x + 3y + 6z + 8 = 0$ and which contains the line of intersection of the planes $x + 2y + 3z - 4 = 0 \, and \, 2x + y - z + 5 = 0$

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7. The plane ax + by = 0 is rotated about its line of intersection with the plane z = 0 through an angle α. Prove that the equation of the plane in its new position is $ax + by \pm \left(\sqrt{a^2 + b^2}\tan\alpha\right)z = 0$

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8. Find the equation of the plane through the points (2, 1, 1) and (1, 3, 4) and perpendicular to the plane $x + 2y + 4z = 10$.

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9. Find the foot of perpendicular from the point $(2, 3, -8)$ to the line.

$\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$. Also find the perpendicular distance from the given point to the line.

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10. Find the distance of a point $(2, 4, -1)$ from the line

$$\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}.$$

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11. Find the length and the foot of perpendicular from the point $(1, 3/2, 2)$ to the plane $2x - 2y + 4z + 5 = 0.$

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12. Find the equations of the line passing through the point $(3, 0, 1)$ parallel to the planes $x + 2y = 0$ and $3y - z = 0$.

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13. Find the shortest distance between the lines gives by

$\vec{r} = (8 + 3\lambda)\hat{i} - (9 + 16\lambda)\hat{j} + (10 + 7\lambda)\hat{k}$

and $\vec{r} = 15\hat{i} + 29\hat{j} + 5\hat{k} + \mu\left(3\hat{i} + 8\hat{j} - 5\hat{k}\right)$.

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14. Find the equation of the plane which is perpendicular to the plane $5x + 3y + 6z + 8 = 0$ and which contains the line of intersection of the planes $x + 2y + 3z - 4 = 0$ *and* $2x + y - z + 5 = 0$

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15. The plane ax + by = 0 is rotated about its line of intersection with the plane z = 0 through an angle α. Prove that the equation of the plane in its new position is $ax + by \pm \left(\sqrt{a^2 + b^2}\tan\alpha\right)z = 0$

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16. Find the equation of the plane through the points (2, 1, 1) and (1, 3, 4) and perpendicular to the plane $x + 2y + 4z = 10$.

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