MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

THREE DIMENSIONAL COORDINATES DIRECTION COSINES AND DIRECTION RATIOS AND PLANE

Problems

1. If the extremities of a diagonal of a square are (1,2,3) and (2,-3,5), then its side is of length

A. $\sqrt{6}$

B. 15

C. $\sqrt{15}$

D. 3

Answer: C

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2. $A(4, 3, 5), B(0, -2, 2)$ and $C(3, 2, 1)$ are three points .The coordinates of the point in which the bisector of $\triangle BAC$ meets the side $\overline{BC}$ is

A. $\left(\frac{15}{8}, \frac{4}{8}, \frac{11}{8}\right)$

B. $\left(\frac{12}{7}, \frac{2}{7}, \frac{10}{7}\right)$

C. $\left(\frac{9}{5}, \frac{2}{5}, \frac{7}{5}\right)$

D. $\left(\frac{3}{2}, 0, \frac{3}{2}\right)$

Answer: A

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3. Plane meets the coordinate axes in P,Q,R respectively .If the centroid of $\triangle PQR$ is $\left(1, \frac{1}{2}, \frac{1}{3}\right)$, then the equation of plane is .

A. $2x + 4y + 3z = 5$

B. $x + 2y + 3z = 3$

C. $x + 4y + 6z = -5$

D. $2x - 2y + 6z = 3$

Answer: B

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4. Match the following

I.	The centroid of the triangle formed by (2, 3, –1), (5, 6, 3), (2, –3, 1) is	(a) (2, 2, 2)
II.	The circumcenter of the triangle formed by (1, 2, 3), (2, 3, 1), (3, 1, 2) is	(b) (3, 1, 4)
III.	The orthocenter of the triangle formed by (2, 1, 5), (3, 2, 3), (4, 0, 4) is	(c) (1, 1, 0)
IV.	The incentre of the triangle formed by (0, 0, 0), (3, 0, 0), (0, 4, 0) is	(d) (3, 2, 1)
		(e) (0, 0, 0)

A. $\begin{matrix} I & II & III & IV \\ d & a & b & c \end{matrix}$

B. $\begin{matrix} I & II & III & IV \\ a & b & c & d \end{matrix}$

C. $\begin{matrix} I & II & III & IV \\ d & e & b & c \end{matrix}$

D. $\begin{matrix} I & II & III & IV \\ d & a & e & c \end{matrix}$

Answer: A

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5. If $(2, -1, 2)$ and $(K, 3, 5)$ are the traids of direction ratios of two lines and the angle between them is 45°, then is a value of k is

A. 2

B. 3

C. 4

D. 6

Answer: C

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6. The length of perpendicular from the origin to the plane which makes intercepts $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ respectively on the coordinate axes is

A. $\frac{1}{5\sqrt{2}}$

B. $\frac{1}{10}$

C. $5\sqrt{2}$

D. 5

Answer: A

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7. If the joining $A(1, 3, 4)$ and B is divided by the point $(-2, 3, 5)$ in the ratio $1:3$ then, B is

A. $(-11, 3, 8)$

B. $(-11, 3, -8)$

C. $(-8, 12, 20)$

D. $(13, 6, -13)$

Answer: A

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8. If the direction cosines of two lines are givenby $l + m + n = 0$ and $l^2 - 5m^2 = 0$, then the angle between them is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{3}$

Answer: D

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9. If $A(3, 4, 5), B(4, 6, 3), C(-1, 2, 4)$ and $D(-1, 2, 4)$ are such that the angle between the lines DC and AB is θ, then $\cos\theta$ is equal is

A. $\frac{7}{9}$

B. $\frac{2}{9}$

C. $\frac{4}{9}$

D. $\frac{5}{9}$

Answer: C

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10. If $D(2,1,0), E(2,0,0)$ and $F(0,1,0)$ are mid - points of the sides BC,CA and AB of $\triangle ABC$, respectively , Then , the centroid of ΔABC is

A. $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$

B. $\left(\frac{4}{3}, \frac{2}{3}, 0\right)$

C. $\left(-\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$

D. $\left(\frac{2}{3}, \frac{1}{3}, \frac{1}{3}\right)$

Answer: B

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11. The direction ratios of the two lines AB and AC are $(, -1, -1, -1)$ and $(2, -1, 1)$. The direction ratios of the normal to the plane ABC are

A. $2, 3, -1$

B. $2, 2, 1$

C. $3, 2, -1$

D. $-1, 2, 3$

Answer: A

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12. A plane passing through $(-1, 2, 3)$ and whose normal makes equal angles with the coordinate axes is

A. $x + y + z + 4 = 0$

B. $x - y + z + 4 = 0$

C. $x + y + z - 4 = 0$

D. $x + y + z = 0$

Answer: C

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13. A variable plane passes through a fixed point $(1, 2, 3)$ Then , the foot of the perpendicular from the origin to the plane lies on

A. a circle

B. a sphere

C. an elipse

D. a parabola

Answer: B

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14. If x - coordinate of a point P on the line joining the [points $Q(2, 2, 1)$ and $R(5, 1, -2)$ is 4 , then the z - cossrdinate of P is

A. -2

B. -1

C. 1

D. 2

Answer: B

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15. A straight line is equally inclined to all the three coordinate axes. Then , an angle made by the line with the y - axis is ,

A. $\cos^{-1}\left(\frac{1}{3}\right)$

B. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

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

D. $\frac{\pi}{4}$

Answer: B

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16. If the foot of the perpendicular from $(0, 0, 0)$ to a plane is $(1, 2, 3)$ then the equation of the plane is ,

A. $2x + y + 3z = 14$

B. $x + 2y + 3z = 14$

C. $x + 2y + 3z + 14 = 0$

D. $x + 2y - 3z = 14$

Answer: B

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17. The equation of the sphere through the points $(1, 0, 0), (0, 1, 0)$ and $(1, 1, 1,)$ and having the smallest radius

A. $3\left(x^2 + y^2 + z^2\right) - 4x - 4y - 2z + 1 = 0$

B. $2\left(x^2 + y^2 + z^2\right) - 3x - 3y - z + 1 = 0$

C. $x^2 + y^2 + z^2 - x - y + z + 1 = 0$

D. $x^2 + y^2 + z^2 - 2x - 2y + 4z + 1 = 0$

Answer: A

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18. If the angle made by a straight line with the coordinate axes are $\alpha, \frac{\pi}{2} - \alpha, \beta$ then β is equal to

A. 0

B. $\frac{\pi}{6}$

C. $\frac{\pi}{2}$

D. π

Answer: C

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19. The ratio in which the line joining $(2, -4, 3)$ and $(-4, 5, -6)$ is divided by the plane $3x + 2y + z - 4 = 0$ is

A. $2:1$

B. $4:3$

C. $-1:4$

D. $2:3$

Answer: C

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20. A plane passes through $(2, 3, -1)$ and is perpendicular to the line having direction ratios $3, -4, 7$. The perpendicular distance from the origin to this plane is

A. $\frac{3}{\sqrt{74}}$

B. $\frac{5}{\sqrt{74}}$

C. $\frac{6}{\sqrt{74}}$

D. $\frac{13}{\sqrt{74}}$

Answer: D

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21. The radius of the circle given by

$$x^2 + y^2 + z^2 + 2x - 2y - 4z - 19 = x + 2y + 2z + 7,$$

is

A. 4

B. 3

C. 2

D. 1

Answer: B

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22. The point dividing the join of $(3, -2, 1)$ and $(-2, 3, 11)$ in the ratio $2:3$ is

A. $(1, 1, 4)$

B. $(1, 0, 5)$

C. $(2, 3, 5)$

D. $(0, 6, -1)$

Answer: B

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23. A plane meets the coordinate axes A,B,C so that the centroid of the triangle ABC is $(1, 2, 4)$. Then , the equation of the plane is

A. $x + 2y + 4z = 12$

B. $4x + 2y + z = 12$

C. $x + 2y + 4z = 3$

D. $4x + 2y + z = 3$

Answer: B

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24. If $(2, 3, -3)$ is one end of a diameter of the sphere $x^2 + y^2 + z^2 - 6x - 12y - 2z + 20 = 0$ then the other end of the diameter is

A. $(4, 9, -1)$

B. $(4, 9, 5)$

C. $(-8, -15, 1)$

D. $(8, 15, 5)$

Answer: B

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25. 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. $3\sqrt{2}$

Answer: D

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26. The angle between the lines whose direction cosines satisfy the equations $l + m + n = 0, l^2 + m^2 - n^2 = 0$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: C

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27. If a line in the space makes angle α, β and γ with the coordinate axes , then

$\cos 2\alpha + \cos 2\beta + \cos 2\gamma + \sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ equals

A. -1

B. 0

C. 1

D. 2

Answer: C

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28. The image of the point $(3, 2, 1)$ in the plane $2x - y + 3z = 7$ is

A. $(1, 2, 3)$

B. $(2, 3, 1)$

C. $(3, 2, 1)$

D. $(2, 1, 3)$

Answer: C

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29. The radius of the sphere $x^2 + y^2 + z^2 = 12x + 4y + 3z$ is

A. $\frac{13}{2}$

B. 13

C. 26

D. 52

Answer: A

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30. In $\triangle ABC$ the mid points of the sides AB,BC and CA are respectively (l,0,0),(0,m,0) and (0,0,n) . Then $\frac{AB^2 + BC^2 + CA^2}{l^2 + m^2 + n^2}$ is equal to

A. 2

B. 4

C. 8

D. 6

Answer: C

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31. The angle between the lines whose direction cosines are $\left(\frac{\sqrt{3}}{4}, \frac{1}{4}, \frac{\sqrt{3}}{2}\right)$ and $\left(\frac{\sqrt{3}}{4}, \frac{1}{4}, \frac{-\sqrt{3}}{2}\right)$ is ,

A. π

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{4}$

Answer: C

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32. The ratio in which yz - plane divides the line segment joining $(-3, 4, -2)$ and $(2, 1, 3)$ is

A. $-4:1$

B. $3:2$

C. $-2:3$

D. $1:4$

Answer: B

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33. The cosine of the anglee A of the triangle with vertices $A(-1, -1, 2), B(6, 11, 2), C(1, 2, 6)$ is

A. $63/65$

B. $36/65$

C. $16/65$

D. $13/64$

Answer: B

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34. If OA is equally inclined to OX,OY and OZ and if A is $\sqrt{3}$ unit from the origin , then A is

A. $(3, 3, 3)$

B. $(-1, 1, -1)$

C. $(-1, 1, 1)$

D. $(1, 1, 1)$

Answer: D

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35. If the direction cosines of two lines are such that $l+m-n=0, l^2+m^2-n^2=0$ then the angle between them is

A. π

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{6}$

Answer: B

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36. The direction cosines of the line passing through $P(2, 3, -1)$ and the origin are

A. $\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}, \frac{1}{\sqrt{14}}$

B. $\frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}, \frac{1}{\sqrt{14}}$

C. $\frac{-2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}, \frac{1}{\sqrt{14}}$

D. $\frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}, \frac{-1}{\sqrt{14}}$

Answer: C

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37. If the direction ratios of two lines are given by $l + m + n = 0, mn - 2\ln + lm = 0$ then the angle between the lines is

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. 0

Answer: C

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38. If $(2, -1, 3)$ is the foot of the perpendicular drawn from the origin to the plane , then the equation of the plane is

A. $2x + y - 3z + 6 = 0$

B. $2x - y + 3z - 14 = 0$

C. $2x - y + 3z - 13 = 0$

D. $2x + y + 3z - 10 = 0$

Answer: B

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39. If the plane $3x - 2y - z - 18 = 0$ meets the coordinates axes in A,B,C then the centroid of $\triangle ABC$ is

A. $(2, 3, -6)$

B. $(2, -3, 6)$

C. $(-2, -3, 6)$

D. $(2, -3, -6)$

Answer: D

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40. XOZ plane divides the join of $(2, 3, 1)$ and $(6, 7, 1)$ in the ratio

A. $3:7$

B. $2:7$

C. $-3:7$

D. $-2:7$

Answer: C

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41. If the direction ratios of two lines are given by $3lm - 4\ln + mn = 0$ and $l + 2m + 3n = 0,$ then the angle between the lines , is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{2}$

Answer: D

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42. A plane π makes intercepts 3 and 4 respectively on z - axis and x- axis . If π is parallel to y - axis , then its equation is

A. $3x + 4z = 12$

B. $3z + 4x = 12$

C. $3y + 4z = 12$

D. $3z + 4y = 12$

Answer: A

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43. The equation of the plane passing through $(1, 1, 1)$ and $(1, -1, -1)$ and perpendicular to $2x - y + z + 5 = 0$, is

A. $2x + 5y + z = 8 = 0$

B. $x + y - z - 1 = 0$

C. $2x + 5y + z + 4 = 0$

D. $x - y + z - 1 = 0$

Answer: B

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44. The direction ratios of normal to the plane passing through $(0, 0, 1), (0, 1, 2)$ and $(1, 0, 3)$ are

A. $(2, 1, -1)$

B. $(1, 0, 1)$

C. $(0, 0, -1)$

D. $(1, 0, 0)$

Answer: A

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45. If $P = (0, 1, 0), Q = (0, 2, 1)$, then the projection of PQ on the plane $x + y + z = 3$ is

A. 2

B. $\sqrt{2}$

C. 3

D. $\sqrt{3}$

Answer: B

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46. In the space the equation $by + cz + d = 0$ represents a plane perpendicular to the

A. YOZ - plane

B. ZOX - plane

C. XOY - plane

D. None of these

Answer: A

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47. A plane x passes through the point $(1, 1, 1)$ .If b,c,a are the direction ratios of a normal to the normal to the palne , where a, b ,c $(a < b < c)$ are the factors of 2001 , then the equation of the palne is

A. $29x + 31y + 3z = 63$

B. $23x + 29y - 29z = 23$

C. $23x + 29y + 3z = 55$

D. $31x + 37y + 3z = 71$

Answer: C

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48. If the plane $7x + 11y + 13z = 3003$, meets the coordinate axes in A,B,C the the centroid of the $\triangle ABC$ is

A. $(143, 91, 77)$

B. $(143, 77, 91)$

C. $(91, 143, 77)$

D. $(143, 66, 91)$

Answer: A

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49. The foot of the perpendicular from $(0, 2, 3)$ to the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$ is

A. $(-2, 3, 4)$

B. $(2, -1, 3)$

C. $(2, 3, -1)$

D. $(3, 2, -1)$

Answer: C

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50. If a line makes angles $\frac{\pi}{3}$ and $\frac{\pi}{4}$ with the x - axis and y - axis respectively , then the angle made by the line with the z - axis is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{4}$

C. $\frac{5\pi}{12}$

D. $\frac{\pi}{3}$

Answer: D

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51. If the foot of the perpendicular from $(0, 0, 0)$ to the plane is $(1, 2, 2)$ then the equation of the plane is

A. $-x + 2y + 8z - 9 = 0$

B. $x + 2y + 2z - 9 = 0$

C. $x + y + z - 5 = 0$

D. $x + 2y - 3z + 1 = 0$

Answer: B

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52. If $P = (0, 1, 2), Q = (4, -2, 1), O = (0, 0, 0)$ then $\angle POQ$ is equal to

A. $\frac{\pi}{2}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{3}$

Answer: A

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53. A variable plane is at a constant distance h from the origin and meets the coordinate axes in A,B,C . Locus of centroid of $\triangle ABC$ is

A. $x^2 + y^2 + z^2 = h^{-2}$

B. $x^2 + y^2 + z^2 = 4h^{-2}$

C. $x^2 + y^2 + z^2 = 16h^2$

D. $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{9}{h^2}$

Answer: D

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54. If the extremities of diagonal of a square are $(1, -2, 3), (2, -3, 5)$ then the length of its side is

A. $\sqrt{6}$

B. $\sqrt{3}$

C. $\sqrt{5}$

D. $\sqrt{7}$

Answer: B

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