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

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

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

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

Answer: A

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

I	II	III	IV
d	a	b	c

B.

I	II	III	IV
a	b	c	d

C.

I	II	III	IV
d	e	b	c

D.

I	II	III	IV
d	a	e	c

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. $\dfrac{1}{5\sqrt{2}}$

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

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. $\dfrac{\pi}{2}$

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

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

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

Answer: D

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. $\dfrac{7}{9}$

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

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

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

Answer: C

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 $\triangle ABC$ is

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

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

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

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

Answer: B

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

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

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

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

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

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

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

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 α, $\dfrac{\pi}{2} - \alpha$, β then β is equal to

A. 0

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

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

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. $\dfrac{3}{\sqrt{74}}$

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

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

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

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. $\dfrac{\pi}{6}$

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

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

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

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. $\dfrac{13}{2}$

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 $\dfrac{AB^2 + BC^2 + CA^2}{l^2 + m^2 + n^2}$ 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 $\left(\dfrac{\sqrt{3}}{4}, \dfrac{1}{4}, \dfrac{\sqrt{3}}{2}\right)$ and $\left(\dfrac{\sqrt{3}}{4}, \dfrac{1}{4}, \dfrac{-\sqrt{3}}{2}\right)$ is ,

A. π

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

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

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

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

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. $\dfrac{\pi}{3}$

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

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

Answer: B

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36. The direction cosines of the line passing through

$P(2, 3, -1)$ and the origin are

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

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

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

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

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. $\dfrac{\pi}{4}$

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

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

D. 0

Answer: C

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. $\dfrac{\pi}{6}$

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

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

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

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

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

49. The foot of the perpendicular from $(0, 2, 3)$ to the line $\dfrac{x+3}{5} = \dfrac{y-1}{2} = \dfrac{z+4}{3}$ 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 $\dfrac{\pi}{3}$ and $\dfrac{\pi}{4}$ with the x - axis and y - axis respectively , then the angle made by the line with the z - axis is

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

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

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

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

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. $\dfrac{\pi}{2}$

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

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

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

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

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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