



MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

THREE DIMENSIONAL GEOMETRY

Exercise 1 Topical Problems

1. If the distance between the origin O and point P is 5 units and the direction ratios of line segment are $(1, -2, 3)$ then the coordinates of P are

A. $\left(\frac{5}{\sqrt{14}}, \frac{-10}{\sqrt{14}}, \frac{15}{\sqrt{14}} \right)$

B. $\left(\frac{5}{\sqrt{14}}, \frac{10}{\sqrt{14}}, \frac{15}{\sqrt{14}} \right)$

C. $\left(\frac{-5}{\sqrt{14}}, \frac{-10}{\sqrt{14}}, \frac{-15}{\sqrt{14}} \right)$

D. None of these

Answer: A



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2. The angle between the lines whose direction ratios are proportional to $(1, 1, 2)$ and $(\sqrt{3} - 1, -\sqrt{3} - 1, 4)$ is

A. 45°

B. 30°

C. 60°

D. 90°

Answer: A



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3. Find the direction cosines of the sides of the triangle

whose vertices are

$(3, 5, -4)$, $(-1, 1, 1)$ and $(-5, -5, -2)$.

A. $\frac{-4}{\sqrt{17}}, \frac{-4}{\sqrt{17}}, \frac{6}{\sqrt{17}}$

B. $\frac{-2}{\sqrt{17}}, \frac{-2}{\sqrt{17}}, \frac{3}{\sqrt{17}}$

C. $\frac{-2}{\sqrt{17}}, \frac{2}{\sqrt{17}}, \frac{-3}{\sqrt{17}}$

D. None of these

Answer: A::B



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4. If a line makes an angle of $\frac{\pi}{4}$ with each of Y and Z-axes, then the angle which it makes with X-axis is

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

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

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

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

Answer: A



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5. A line passes through the points $(6, -7, -1)$ and $(2, -3, 1)$. Find the direction cosines of the line if the line makes an acute angle with the positive direction of the x-axis.

A. $\frac{2}{3}, -\frac{2}{3}, -\frac{1}{3}$

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

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

D. $\frac{2}{3}, \frac{2}{3}, \frac{1}{3}$

Answer: A



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6. If a line makes angle α , β and γ with the coordinate axes respectively, then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$

A. -2

B. -1

C. 1

D. 2

Answer: B



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7. Lines OA , OB are drawn from O with direction cosines proportional to $(1, -2, -1)$; $(3 - 2, 3)$. Find the direction cosines of the normal to the plane AOB .

A. $(4, 3, 2)$

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

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

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

Answer: D



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8. If a line makes angles α, β, γ with the coordinate axes, prove that $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma =$

A. 0

B. 1

C. 2

D. -1

Answer: C



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9. एक रेखा, एक घन के विकर्णों के साथ $\alpha, \beta, \gamma, \delta$, कोण बनती है तो सिद्ध कीजिए कि

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = \frac{4}{3}$$

A. 1

B. $\frac{4}{3}$

C. $\frac{3}{4}$

D. $\frac{4}{5}$

Answer: B



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10. If the projection of a line segment on X,Y and Z-axes are 3, 1 and $\sqrt{15}$ respectively, then length of line segment is

A. 5

B. $4 + \sqrt{15}$

C. $5 + \sqrt{2}$

D. 6

Answer: A



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11. A line AB in three-dimensional space makes angles 45° and 120° with the positive x-axis and the positive y-axis respectively. If AB makes an acute angle q with the positive z-axis, then q equals

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C



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12. If the direction cosines of a line are $\frac{1}{c}, \frac{1}{c}, \frac{1}{c}$ then (A)

$c < 0$ (B) $0 < c < 1$ (C) $c = \pm \sqrt{3}$ (D) $c > 2$

A. $0 < c < 1$

B. $c > 2$

C. $c = \pm \sqrt{3}$

$$D. c = iv\sqrt{3}$$

Answer: D



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13. 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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14. A straight line which makes an angle of 60° with each of Y and Z-axis, the angle this lines makes with X-axis is

A. 30°

B. 60°

C. 75°

D. 45°

Answer: D



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15. A line makes an obtuse angle with the positive X-axis and angle $\frac{\pi}{4}$ and $\frac{\pi}{3}$ with positive Y and Z-axes respectively. Its directions cosines are

A. $\left(\frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{2} \right)$

B. $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{2} \right)$

C. $\left(-\frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{1}{2} \right)$

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

Answer: C



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16. Suppose $A(2,3,7)$, $B(-1,3,2)$ and $C(p,s,r)$ are the vertices of ΔABC . If the median through A is equally inclined to the coordinate axes then the coordinate of the vertex C is

A. $(7,5,12)$

B. $(7,5,16)$

C. $(7,5,14)$

D. None of these

Answer: C



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17. The angle between the two lines having direction cosines $\left(\frac{2}{\sqrt{6}}, -\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}\right)$ and $\left(\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}, \frac{2}{\sqrt{6}}\right)$ is

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

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

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

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

Answer: D



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18. The angles made by line having direction ratios (3,5,4) with Y-axis

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

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

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

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

Answer: A



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19. If the direction ratios of two lines are (1,2,4) and (-1,-2,-3) then the acute angle between them is

A. $\cos^{-1}\left(\frac{-17}{7\sqrt{6}}\right)$

B. $\cos^{-1}\left(\frac{17}{7\sqrt{6}}\right)$

C. $\cos^{-1}\left(\frac{17}{7}\right)$

D. None of these

Answer: B



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20. If the angle between the lines with direction ratios $(3,4,x)$ and $(2,-1,4)$ is $\frac{\pi}{2}$ then the value of x is

A. -2

B. 2

C. $-\frac{1}{2}$

D. $\frac{1}{2}$

Answer: C



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21. The angle between the vectors a and b having direction ratios $(-p, 1, -2)$ and $(2, -p, -1)$ is $\frac{\pi}{3}$ then the value of p is

A. $-3 \pm 2\sqrt{2}$

B. $-3 \pm 2\sqrt{3}$

C. $-3 \pm 4\sqrt{3}$

D. None of these

Answer: A



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22. The acute angle between the two lines with direction ratios $(1, -2, -2)$ and $(2, -2, 1)$ is

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

B. $\cos^{-1}\left(\frac{4}{9}\right)$

C. $\cos^{-1}\left(\frac{2}{9}\right)$

D. $\cos^{-1}\left(\frac{5}{9}\right)$

Answer: B



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23. If the coordinates of the points A, B, C, D be $(1, 2, 3), (4, 5, 7), (-4, 3, -6)$ and $(2, 9, 2)$ respectively then find the angle between AB and CD .

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

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

C. π

D. None of these

Answer: C



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24. Find the angle between any two diagonals of a cube.

A. $\sin^{-1} \frac{2}{3}$

B. $\cos^{-1} \frac{1}{2}$

C. $\cos^{-1} \frac{1}{\sqrt{3}}$

D. $\cos^{-1} \frac{1}{3}$

Answer: D



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Exercise 2 Miscellaneous Problems

1. Find the angles of $\triangle ABC$ whose vertices are $A((-1, 3, 2))$, $B(2, 3, 5)$ and $C(3, 5, -2)$.

A. 45°

B. 60°

C. 90°

D. 30°

Answer: C



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2. If projection of a line on X,Y and Z-axes are 6,2 and 3 respectively then direction cosines of the line is

A. $\left(\frac{6}{7}, \frac{2}{7}, \frac{3}{7}\right)$

B. $\left(\frac{7}{6}, \frac{7}{2}, \frac{7}{3}\right)$

C. $\left(\frac{6}{11}, \frac{2}{11}, \frac{3}{11}\right)$

D. None of these

Answer: A



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

A. (3,3,3)

B. (-1,1,-1)

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

D. $(1,1,1)$

Answer: D



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4. If $P(0, 1, 2)$, $Q(4, -2, 1)$ and $O(0, 0, 0)$ are three points, then $\angle POQ =$

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

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

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

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

Answer: D



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5. A line makes the same angle θ with each of the x and z -axes. If the angle β , which it makes with y -axis, is such that $\sin^2 \beta = 3 \sin^2 \theta$ then $\cos^2 \theta =$

A. $2/3$

B. $1/5$

C. $3/5$

D. $2/5$

Answer: C



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6. If the directions cosines of a vector of magnitude 3 are

$\left(\frac{2}{3}, \frac{-a}{3}, \frac{2}{3}\right)$ and $a > 0$ then the vector is

A. $2\hat{i} + \hat{j} + 2\hat{k}$

B. $2\hat{i} - \hat{j} + 2\hat{k}$

C. $\hat{i} - 2\hat{j} + 2\hat{k}$

D. $\hat{i} + 2\hat{j} + 2\hat{k}$

Answer: B



7. If $\frac{1}{2}$, $\frac{1}{3}$, n are direction cosines of a line, then the value of n is

A. $\frac{\sqrt{23}}{6}$

B. $\frac{23}{6}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: A



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8. A line makes an angle θ both with x-axis and y-axis. A possible range of θ is

A. $\left[0, \frac{\pi}{4}\right]$

B. $\left[0, \frac{\pi}{2}\right]$

C. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

D. $\left[\frac{\pi}{3}, \frac{\pi}{6}\right]$

Answer: C



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9. The direction cosines to two lines at right angles are $(1,2,3)$ and $\left(-2, \frac{1}{2}, \frac{1}{3}\right)$ then the direction cosine perpendicular to both the given lines are

A. $\sqrt{\frac{25}{2198}}, \sqrt{\frac{38}{1099}}, \sqrt{\frac{729}{2198}}$

B. $\sqrt{\frac{24}{2198}}, \sqrt{\frac{38}{2198}}, \sqrt{\frac{730}{2198}}$

C. $\frac{1}{3}, -2, \frac{-7}{2}$

D. None of these

Answer: A



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10. A line makes acute angles of α, β and γ with the coordinate axes such that

$$\cos \alpha, \cos \beta = \cos \beta, \cos \gamma = \frac{2}{9} \text{ and } \cos \gamma \cos \alpha = \frac{4}{9}$$

then $\cos \alpha + \cos \beta + \cos \gamma$ is equal to

A. $\frac{25}{9}$

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

C. $\frac{5}{3}$

D. $\frac{2}{3}$

Answer: C



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11. The direction ratios of the diagonals of a cube which joins the origin to the opposite corner are (when the three concurrent edges of the cube are coordinate axes)

A. $\left(\frac{2}{\sqrt{2}}, \frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}} \right)$

B. (1,1,1)

C. (2,-2,1)

D. (1,2,3)

Answer: B



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12. The projection of the line segment joining (2,5,6) and (3,2,7) on the line with direction ratios 2,1,-2 is

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

B. $\frac{1}{3}$

C. 2

D. 1

Answer: D



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

A. 2

B. 4

C. 8

D. 16

Answer: C



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14. The direction cosines of two lines are proportional to $(2, 3, -6)$ and $(3, -4, 5)$, then the acute angle between them is (A) $\cos^{-1}\left\{\frac{49}{36}\right\}$ (B) $\cos^{-1}\left\{\frac{18\sqrt{2}}{35}\right\}$ (C) 96° (D) $\cos^{-1}\left(\frac{18}{35}\right)$

A. $\cos^{-1}\left(\frac{49}{36}\right)$

B. $\cos^{-1}\left(\frac{6}{35\sqrt{2}}\right)$

C. 96°

D. $\cos^{-1}\left(\frac{18}{35}\right)$

Answer: B



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15. 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. $\pi/4$

Answer: C



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16. Let O be the origin and P be the point at a distance 3 units from origin. If direction ratios of OP are (1,-2,-2),

then coordinates of P is given by

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

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

C. $(\frac{1}{3}, -\frac{2}{3}, -\frac{2}{3})$

D. $(\frac{1}{9}, -\frac{2}{9}, -\frac{2}{9})$

Answer: A



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17. If the points $A(2,3,-4)$, $B(1,-2,3)$ and $C(3, \lambda, -1)$ are collinear, then value of λ is

A. 4

B. 8

C. -10

D. 2

Answer: B



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18. If the directions cosines of a straight line are

$\langle k, k, k \rangle$ then

A. $k > 0$

B. $0 < k < 1$

C. $k = 1$

$$D. k = \frac{1}{\sqrt{3}} \text{ or } -\frac{1}{\sqrt{3}}$$

Answer: D



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19. Find the angle between the following pair of lines: A line with direction ratios 2,2,1 and a line joining (3,1,4) to (7,2,12)

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

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

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

D. $\sin^{-1} \left(\frac{2}{3} \right)$

Answer: A



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20. If $P(p)$, $Q(q)$, $R(r)$ and $S(s)$ be four points such that $3p+8q=6r+5s$ then the lines PQ and RS are

A. skew

B. intesectiong

C. parallel

D. None of these

Answer: B



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21. The direction cosines of line joining $(1, -1, 1)$ and $(-1, 1, 1)$ are (A) $2, -2, 0$ (B) $1, -1, 0$ (C) $\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0$ (D) none of these

A. $\langle 2, -2, 0 \rangle$

B. $\langle 1, -1, 0 \rangle$

C. $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0 \right)$

D. None of these

Answer: C



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22. A vector r is inclined at equal angles to OX, OY and OZ . If the magnitude of r is 9 units then r is equal to

A. $\sqrt{\hat{i} + \hat{j} + \hat{k}}$

B. $-\sqrt{3}(\hat{i} + \hat{j} + \hat{k})$

C. $3\sqrt{3}(\hat{i} + \hat{j} + \hat{k})$

D. None of these

Answer: C



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1. Direction ratios of the line which is perpendicular to the lines with direction ratios $(-1,2,2)$ and $(0,2,1)$ are

A. 1,1,2

B. 2,-1,2

C. $-2, 1, 2$

D. 2,1,-2

Answer: B



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2. A vector v is equally inclined to the X-axis, Y-axis and Z-axis respectively the direction cosines are

A. $\left\langle \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \right\rangle$

B. $\left\langle -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}} \right\rangle$

C.

$\left\langle \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \right\rangle$ or $\left\langle -\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}} \right\rangle$

D. None of these

Answer: C



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3. What are the DR's of a vector parallel to (2,-1,1) and (3,4,-1)

A. (1,5,-2)

B. $(-2,-5,2)$

C. $(-1,5,-2)$

D. $(-1,-5,-2)$

Answer: A



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