MATHS

BOOKS - MARVEL MATHS (HINGLISH)

THREE DIMENSIONAL GEOMETRY

Solved Examples

1. find the equationfo the plane passing thrugh points (2,1,0),(5,0,1) and (4,1,1).`

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2. If P is the point $(2, 1, 6)$ then find the point Q such that PQ is perpendicular to the plane x + y − 2 z = 3 and the midpoint of PQ lies on it

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3. Find the equation of a plane passing through (1, 1, 1) and parallel to the lines L_1 and L_2 direction ratios (1, 0,-1) and (1,-1, 0) respectively. Find the volume of the tetrahedron formed by origin and the points where this plane intersects the coordinate axes.

A. $\frac{9}{5}$ sq units

B. 9 sq units

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

D. $\frac{9}{2}$ sq units

Answer: D

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Multiple Choice Questions

1. If α, β, γ are the angles which a line makes with OX,OY and OZ , then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$

A. 1

B. 2

C. 3

D. 4

Answer: B

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2. If α, β, γ are direction angles of a line , then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$

A. -1

B. 0

C. 1

D. 2

Answer: A

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3. Direction cosines of a line , for which $\alpha = \beta$ and $\gamma = 45^\circ$

A. $\frac{1}{\sqrt{2}}, \pm\frac{1}{2}, \pm\frac{1}{2}$

B. $\pm\frac{1}{2}, \pm\frac{1}{\sqrt{2}}, \pm\frac{1}{2}$

C. $\pm\frac{1}{2}, \pm\frac{1}{2}, \frac{1}{\sqrt{2}}$

D. $\frac{1}{2}, \frac{1}{2}, \pm\frac{1}{\sqrt{2}}$

Answer: c

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4. If a line is inclined at 60° and 30° with the X- and Y-axes respectively, then the angle which makes with the Z-axes is

A. 0

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

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

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

Answer: D

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5. The direction consines of a line which lies in XZ-plane and making an angle of 30° with positive Z-axis are

A. $0, \frac{1}{2}, \pm\frac{\sqrt{3}}{2}$

B. $\frac{\sqrt{3}}{2}, 0, \pm\frac{1}{2}$

C. 1,0,0

D. $\pm\frac{1}{2}, 0, \frac{\sqrt{3}}{2}$

Answer: d

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6. Show that no line in space can make angles $\frac{\pi}{6}$ and $\frac{\pi}{4}$ with x -axis and y -axis.

A. 0

B. 1

C. 2

D. infinite

Answer: a

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7. If a line is equally inclines to co - ordinate to co - ordinate axes , then its each direction angle is of measure

A. $\sin^{-1}\sqrt{3}$

B. $\cos^{-1}\sqrt{3}$

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

D. $\sec^{-1}\sqrt{3}$

Answer: d

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8. Direction cosines of a line , whose direction ratios are $-2, 1, 2$ are

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

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

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

D. $\frac{2}{3}, \frac{1}{3}, \frac{4}{3}$

Answer: A

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9. If P is $(-1, 1, 2)$, then direction cosines of line OP are

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

B. $\frac{-1}{\sqrt{6}}, \frac{1}{\sqrt{6}}, \frac{2}{\sqrt{6}}$

C. $\frac{1}{\sqrt{6}}, \frac{-1}{\sqrt{6}}, \frac{2}{\sqrt{3}}$

D. $-1, 1, 2$

Answer: B

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10. Direction cosines of the line passing through $A(2, 3, -1)$ and $B(-3, -4, 2)$ are

A. $\frac{-5}{\sqrt{83}}, \frac{-7}{\sqrt{83}}, \frac{3}{\sqrt{83}}$

B. $\frac{5}{\sqrt{83}}, \frac{7}{\sqrt{83}}, \frac{3}{\sqrt{83}}$

C. $\frac{-7}{\sqrt{83}}, \frac{3}{\sqrt{83}}, \frac{-5}{\sqrt{83}}$

D. $-5, -7, 3$

Answer: A

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11. Find the value of $p$for which the line through the points $A(4, 1, 2)$ and $B(5, p, 0)$ is perpendicular to the line through the points $C(2, 1, 1)$and $D(3, 3, -1)$.

A. 1

B. 2

C. 3

D. 4

Answer: C

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12. Given $P = (3, -6, 10)$ and $PQ = \sqrt{17}$. If direction cosines of line PQ are $\frac{-2}{\sqrt{17}}, \frac{3}{\sqrt{17}}, \frac{-2}{\sqrt{17}}$, then point Q can be

A. $(5, 12, -19)$

B. $(1, -3, 8)$

C. $(-9, 5, 12)$

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

Answer: B

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13. If l,m,n are direction cosines of a line , then vector $li + mj + nk$ is a

A. null vector

B. unit vector

C. non-unit vector

D. bound vector

Answer: B

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14. If $|\bar{u}| = \sqrt{3}$ and $\bar{u}$ is equally inclined to co - ordinate axes, then vector $\bar{u}$ =

A. $i - j - k$

B. $i - j + k$

C. $i + j - k$

D. $i + j + k$

Answer: d

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15. If $|\bar{u}| = 2$ and $\bar{u}$ makes angles of 60° and 120° with OX and OY respectively , then vector $\bar{u} =$

A. $i + j - \sqrt{jk}$

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

C. $i + j + \sqrt{2}k$

D. $i + \sqrt{2}j - k$

Answer: b

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16. If a line makes angles $\theta_1, \theta_2, \theta_3$ with the coordinates planes, then $\sin^2\theta_1 + \sin^2\theta_2 + \sin^2\theta_3 = ...$

A. 1

B. 2

C. -1

D. 3

Answer: a

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17. Find the angle between the lines whose direction ratios are:

$2, -3, 4$ and $1, 2, 1$.

A. 0°

B. 30°

C. 60°

D. 90°

Answer: d

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18. If $\bar{a}, \bar{b}, \bar{c}$ are pair wise mutually perpendicular vectors of equal magnitude , then the angle wisv $\bar{a}+\bar{b}+\bar{c}$ is

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

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

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

D. $\cos^{-1}(\sqrt{3})$

Answer: a

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19. If direction ratios of two lines are $2, -6, -3$ and $4, 3, -1$ then direction ratios of a line perpendicular to them are

A. $2, 3, 3$

B. $3, -2, 6$

C. $1, 2, 3$

D. $2, -3, 6$

Answer: B

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20. A line makes 45° with OX and equal angles with OY and OZ .Then the sum of these three angles is

A. 180°

B. 165°

C. 150°

D. 135°

Answer: b

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21. What is the angle between the two lines whose direction numbers are $(\sqrt{3}-1, -\sqrt{3}-1, 4)$ and $(-\sqrt{3}-1, \sqrt{3}-1, 4)$?

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

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

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

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

Answer: D

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22. If the line of the vector $\bar{r} = \lambda I + 2j - k$ makes angles α, β, γ with co - ordinate axes ,then :

A. 2

B. 1

C. $1 + \lambda^2$

D. $1 - \lambda^2$

Answer: a

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23. The number of lines which are equally inclined to the axes is :

A. 2

B. 4

C. 6

D. 8

Answer: b

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24. The projection of the line segment joining the points $A(-1, 0, 3)$ and $B(2, 5, 1)$ on the line whose direction ratios are proportional to 6,2,3 is

A. $\frac{22}{7}$

B. $\frac{15}{7}$

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

D. π

Answer: A

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25. Direction Cosines of a normal to the XOY - plane are

A. $1, 0, 0$

B. $0, 1, 0$

C. $1, 1, 0$

D. $0, 0, 1$

Answer: d

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26. If the direction cosines of a line are $\frac{1}{c}, \frac{1}{c}, \frac{1}{c}$ rthen (A) $c.0$ (B) $0 < c < 1$ (C) $c = \pm\sqrt{3}$ (D) $c > 2$

A. $0 < c < 1$

B. $c > 2$

C. $c > 2$

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

Answer: d

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27. A mirror and a source of light are situated at the origin O and at a point on OX, respectively. A ray of light from the source strikes the mirror and is reflected. If the direction ratios of the normal to the plane are $1, -1, 1,$ then find the DCs of the reflected ray.

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

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

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

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

Answer: D

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28. The direction Cosines of two lines at right angles are l_1, m_1, n_1 and l_2, m_2, n_2 Then the direction cosines of a line which is perpendicular to both these lines are

A. $l_2 - l_2, m_1 - m_2, n_1 - n_2$

B. $l_1 + l_2, m_1 + m_2, n_1 + n_2$

C. $m_1n_2 - m_2n_1, n_1l_2 - n_2l_1, l_1m_2 - l_2m_1$

D. $l_1 + kl_2, m_1 + km_2, n_1 + kn_2$

Answer: c

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29. The graph of the equation $x^2 + y^2 = 0$ in the three dimensional space is (A) x-axis (B) y-axis (C) z-axis (D) xy-plane

A. X-axis

B. Y-axis

C. Z-axis

D. XY-axis

Answer: c

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30. If the line OP of length r makes an angle α with the X - axis , and lies in the ZX - plane , then the co - ordinates of P are

A. $(r.\cos\alpha, 0, r.\sin\alpha)$

B. $(r.\cos\alpha, 0, r.\sin\alpha)$

C. $(0, 0, r.\cos\alpha)$

D. $(0, r.\cos\alpha, 0)$

Answer: a

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31. l = m = n = 1 are the direction Cosines of

A. X-axis

B. Y-axis

C. Z-axis

D. no line

Answer: d

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32. STATEMENT-1 : The direction ratios of a line joining the points (0, 0, 0) and (x, y, z) must be x, y, z.

and

STATEMENT-2 : If P(x, y, z) is a point is space and $OP = r$ then direction cosines of OP are $\frac{x}{r}, \frac{y}{r}, \frac{z}{r}$,.

A. $\frac{r}{x}, r, y, r, z$

B. rx, ry, rz

C. $\frac{x}{r}, \frac{y}{r}, \frac{z}{r}$

D. $r\cos\alpha, r\cos\beta, r\cos\gamma$

Answer: c

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33. Co - ordinates of the foot of the perpendicular from the point (a,b,c) on the Z - axis are

A. $(a, b, 0)$

B. $(0, 0, c)$

C. $(a, 0, 0)$

D. $(0, b, 0)$

Answer: b

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34. In three dimensional space , the equation xy = 0 represents

A. a pair of lines

B. a plane

C. a pair of perpendicular planes

D. a parie of parallel planes

Answer: c

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35. In space , the equation $3x - 4y = 0$ represents

A. the Z - axis

B. a plane containing the Z - axis

C. the Xy - plane

D. the YZ - plane

Answer: b

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36. A line lies in ZX plane and makes 60° with x - axis ,then direction cosines of the line are :

A. $\frac{1}{2}, 0, \frac{\sqrt{3}}{2}$

B. $\frac{\sqrt{3}}{2}, 0, \frac{1}{2}$

C. $0, \frac{1}{2}, \frac{\sqrt{3}}{2}$

D. $\frac{1}{2}, \sqrt{3}, 0$

Answer: a

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37. The ratio in which XOZ plane divides $A(2, -3, 1)$ and $B(-1, 4, 5)$ is :

A. $-4:3$

B. $4:3$

C. $-3:4$

D. $3:4$

Answer: d

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38. If the line $\overrightarrow{OR}$ makes angles $\theta_1, \theta_2, \theta_3$ with the planes XOY, YOZ, ZOX respectively , then $\cos^2\theta_1 + \cos^2\theta_2 + \cos^2\theta_3$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: d

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39. The direction ratios of a line which is perpendicular to the two vectors $-2\bar{i}+3\bar{j}-\bar{k}$ and $4\bar{i}+\bar{j}+3\bar{k}$ is

A. $1, 2, -7$

B. $5, 1, -7$

C. $5, 2, -3$

D. $6, 1, -2$

Answer: b

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