MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

PLANE AND STRAIGHT LINE IN SPACE

Illustration

1. Find the equation of the plane through the points $A(2, 2, -1), B(3, 4, 2) and C(7, 0, 6.)$

A. $5x+2y+3z=17$

B. $5x+2y-3z=17$

C. $5x-2y+3z=17$

D. none of these

Answer: B

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2. Write the equation of the plane whose intercepts on the coordinate axes are $-4, 2and3$ respectively.

A. $3x+6y+4z=12$

B. $-3x+6y+4z=12$

C. $-3x-6y-4z=12$

D. none of these

Answer: B

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3. The intercepts of the plane $5x-3y+6z-60=0$ on the coordinate axes are

A. $10, 20, \ -10$

B. $10, \ -20, 12$

C. $12, \ -20, 10$

D. $12, 20, \ -10$

Answer: C

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4. If the plane $7x + 11y + 13z = 3003$ meets the axes in A,B and C then the centorid of ΔABC is

A. $(143, 91, 77)$

B. $(143, 77, 91)$

C. $(91, 143, 77)$

D. $(143, 66, 91)$

Answer: A

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5. A plane meets the coordinate axes in A,B,C such that the centroid of triangle ABC is the point (p, q, r). If the equation of the plane is $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = k$ then $k =$

A. 1

B. 2

C. 3

D. none of these

Answer: C

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6. The vector equation of a plane passing through a point having position vector $2\hat{i} + 3\hat{j} - 4\hat{k}$ and perpendicular to the vector $2\hat{i} - \hat{j} + 2\hat{k}$, is

A. $\overrightarrow{r}.\left(2\hat{i} - \hat{j} + 2\hat{k}\right) = 7$

B. $\vec{r}.\left(2\hat{i}-\hat{j}+2\hat{k}\right)=-7$

C. $\vec{r}.\left(2\hat{i}-\hat{j}+2\hat{k}=4\right.$

D. none of these

Answer: B

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7. Find the vector equation of a plane which is at a distance of 8 units from the origin and which is normal to the vector $2\hat{i}+\hat{j}+2\hat{k}$.

A. $\vec{r}.\left(2\hat{i}+\hat{j}+2\hat{k}\right)=8$

B. $\vec{r}.\left(2\hat{i}+\hat{j}+2\hat{k}\right)=24$

C. $\vec{r}.\left(2\hat{i}+\hat{j}+2\hat{k}\right)=4$

D. none of these

Answer: B

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8. The angle between the planes

$\overrightarrow{r}.\left(2\hat{i}-\hat{j}+\hat{k}\right)=6$ and $\overrightarrow{r}.\left(\hat{i}+\hat{j}+2\hat{k}\right)=5$ is

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

B. $\frac{2\pi}{3}$

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

D. $\frac{5\pi}{6}$

Answer: A

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9. Find the angle between the planes

$x+y+2z=9adn2x-y+z=15.$

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

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

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

D. none of these

Answer: B

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10. If the planes $\vec{r}.\left(2\hat{i}-\hat{j}+2\hat{k}\right)=4$ and $\vec{r}.\left(3\hat{i}+2\hat{j}+\lambda\hat{k}\right)=3$ are perpendicular then $\lambda=$

A. 2

B. -2

C. 3

D. -3

Answer: B

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11. If the planes $2x - y + \lambda z - 5 = 0$ an $x + 4y + 2z - 7 = 0$ are perpendicular then $\lambda =$

A. 1

B. -1

C. 2

D. -2

Answer: A

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12. The acute angle between the planes $2x - y + z = 6$ and $x + y + 2z = 3$ is

A. 45°

B. 60°

C. 30°

D. 75°

Answer: B

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

A. YOZ

B. ZOX

C. XOY

D. $Z = k$

Answer: A

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14. The equation of the plane passing through the point $(1, 1, 1)$ and perpendicular to the planes $2x + y - 2z = 5$ and $3x - 6y - 2z = 7$ is

A. $14x + 2y - 15z = 1$

B. $14x - 2y + 15z = 27$

C. $14x + 2y + 15z = 31$

D. $-14x + 2y + 15z = 3$

Answer: C

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15. Vector equation of the plane $r = i - j + \lambda(i + j + k) + \mu(i - 2j + 3k)$ in the scalar dot product form is

A. $\overrightarrow{r}.\left(5\hat{i} - 2\hat{j} - 3\hat{k}\right) = 7$

B. $\overrightarrow{r}.\left(5\hat{i} + 2\hat{j} + 3\hat{k}\right) = 7$

C. $\overrightarrow{r}.\left(5\hat{i}-2\hat{j}-3\hat{k}\right)=-7$

D. none of these

Answer: A

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16. The vector equation of the plane passing through the points $\hat{i}+\hat{j}-2\hat{k}, 2\hat{i}-\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+\hat{k}$, is

A. $\overrightarrow{r}.\left(9\hat{i}+3\hat{j}-\hat{k}\right)=-14$

B. $\overrightarrow{r}.\left(9\hat{i}+3\hat{j}-\hat{k}\right)=14$

C. $\overrightarrow{r}.\left(3\hat{i}+9\hat{j}-\hat{k}\right)=14$

D. none of these

Answer: B

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17. The equation of plane passing through the point $\hat{i}+\hat{j}+\hat{k}$ and paralel to the plane $\overrightarrow{r}.\left(2\hat{i}-\hat{j}+2\hat{k}\right)=5$ is

A. $\overrightarrow{r}.\left(2\hat{i}-\hat{j}+2\hat{k}\right)=5$

B. $\overrightarrow{r}.\left(2\hat{i}-\hat{j}+2\hat{k}\right)=-3$

C. $\overrightarrow{r}.\left(2\hat{i}-\hat{j}+2\hat{k}\right)=3$

D. none of these

Answer: C

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18. Find the equation of the plane through the point (1,4,-2) and parallel to the plane $-2x+y-3z=7$.

A. $2x-y+3z=8$

B. $2x-y+3z+8=0$

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

D. none of these

Answer: B

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19. The direction cosines of the line $6x-2=3y+1=2z-2$ are

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

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

C. $\frac{3}{\sqrt{4}}, \frac{2}{\sqrt{14}}, \frac{1}{\sqrt{14}}$

D. none of these

Answer: B

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20. The equation of a line passing through (1,-1,0) and parallel to $\frac{x-2}{3}=\frac{2y+1}{2}=\frac{5-z}{-1}$ is

A. $\frac{x-1}{3}=\frac{y+1}{3}=\frac{z-0}{-1}$

B. $\frac{x-1}{3}=\frac{y+1}{1}=\frac{z-0}{-1}$

C. $\frac{x-1}{3}=\frac{y+1}{1}=\frac{z-0}{1}$

D. $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-0}{1}$

Answer: C

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21. The line $\frac{x-3}{1}=\frac{y-4}{2}=\frac{z-5}{2}$ cuts the plane $x+y+z=17$ at

A. (3,4,5)

B. (4,6,7)

C. (4,5,8)

D. (8,4,5)

Answer: B

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22. The distance between the point (3,4,5) and the point where the line $\frac{x-3}{1}=\frac{y-4}{2}=\frac{z-5}{2}$ meets the plane $x+y+z=17$ is

A. 1

B. 2

C. 3

D. none of these

Answer: C

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23. The disatance of the point $(1, 0, 2)$ from the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane $x - y + z = 16$, is

A. $3\sqrt{21}$

B. 13

C. $2\sqrt{14}$

D. 8

Answer: B

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24. Find the distance of the point $(2, 3, 4)$ from the line $\frac{x+3}{3} = \frac{y-2}{6} = \frac{z}{2}$ measured parallel to the plane $3x + 2y + 2z - 5 = 0$.

A. 2

B. 4

C. 6

D. 7

Answer: D

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25. The distance of the point $(1, -5, 9)$ from the plane $x - y + z = 5$ measured along the line $x = y = z$ is

A. $3\sqrt{10}$

B. $10\sqrt{3}$

C. $\frac{10}{\sqrt{3}}$

D. $\frac{20}{3}$

Answer: B

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26. The vector parallel to the line of intersection of the planes $\overrightarrow{r}.\left(3\hat{i}-\hat{j}+\hat{k}\right)=1$ and $\overrightarrow{r}.\left(\hat{i}+4\hat{j}-2\hat{k}\right)=2$ is :

A. $-2\hat{i}+7\hat{j}+13\hat{k}$

B. $2\hat{i}+7\hat{j}-13\hat{k}$

C. $-2\hat{i}-7\hat{j}+13\hat{k}$

D. $2\hat{i}+7\hat{j}+13\hat{k}$

Answer: A

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27. The direction cosines of the line $x-y+2z=5, 3x+y+z=6$ are

A. $\frac{-3}{5\sqrt{2}}, \frac{5}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$

B. $\frac{3}{5\sqrt{2}}, \frac{-5}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$

C. $\frac{3}{5\sqrt{2}}, \frac{5}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$

D. none of these

Answer: A

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28. A symmetrical form of the line of intersection of the planes $x = ay + b$ and $z = cy + d$ is

A. $\frac{x-b}{a} = \frac{y-1}{0} = \frac{z-d}{c}$

B. $\frac{x-b}{a} = \frac{y-0}{1} = \frac{z-d}{c}$

C. $\frac{x-a}{b} = \frac{y-0}{1} = \frac{z-c}{d}$

D. none of these

Answer: B

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29. The angle between the lines

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

and $\vec{r} = (\hat{i} + \hat{j} + \hat{k}) + \mu\{(-\sqrt{3} - 1)\hat{i} + (\sqrt{3} - 1)\hat{j} + 4\hat{k}\}$ is

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

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

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

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

Answer: C

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30. Find the angle between the lines $\frac{x-2}{3} = \frac{y+1}{-2} = z = 2 and \frac{x-1}{1} = \frac{2y+3}{3} = \frac{z+5}{2}.$

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

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

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

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

Answer: C

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31. Prove that the line $x = ay + b, z = cy + d$ and $x = a'y + b', z = dy + d'$ are perpendicular if $aa' + ' + 1 = 0$

A. $aa' + ' = 1$

B. $aa' + \mathrm{cc}' = -1$

C. $ab + cd = a'b' + c'd'$

D. $aa' + \mathrm{bb}' = \mathrm{cc}' + dd'$

Answer: B

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32. If the lines $6x - 2 = 3y + 1 = 2z - 2$ and $\frac{x-2}{\lambda} = \frac{2y-5}{-3}, z = -2$ are perpendicular then $\lambda =$

A. 3

B. 2

C. -3

D. 1

Answer: A

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33. The lines $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and $\frac{x-1}{-2} = \frac{y-2}{-4} = \frac{z-3}{-6}$ are

A. coincident

B. skew

C. intersecting

D. parallel

Answer: D

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34. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is

A. 0°

B. 30°

C. 45°

D. 90°

Answer: D

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35. The directionratios of the line which is perpendicular to the lines $\frac{x-7}{2}=\frac{y+17}{-3}=z-6$ and $x+5=\frac{y+3}{2}=\frac{z-4}{-2}$ are (A) (4,5,7) (B) (4,-5,7) (C) (4,-5,-7) (D) (-4,5,7)

A. 4,5,7

B. 4,-5,7

C. 4,-5,7

D. $-4, 5, 7$

Answer: A

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36. The lines $\vec{r}=2\hat{i}-3\hat{j}+7k+\lambda\left(2\hat{i}+p\hat{j}+5\hat{k}\right)$ and $\vec{r}=\left(\hat{i}+2\hat{j}+3\hat{k}\right)+\mu\left(3\hat{i}+p\hat{j}+p\hat{k}\right)$` are perpendicular

then p is equal to

A. $-6, -1$

B. $-1, 6$

C. $2, 3$

D. none of these

Answer: B

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37. The plane $2x - (1 + \lambda)y + 3\lambda z = 0$ passes through the intersection of the plane

A. $2x - y = 0$ and $y - 3z = 0$

B. $2x + 3z = 0$ and $y = 0$

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

D. none of these

Answer: A

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38. Find the equation of a plane passing through the intersection of the planes $\vec{r}.\left(\hat{i}+3\hat{j}-\hat{k}\right)=5$ and $\vec{r}.\left(2\hat{i}-\hat{j}+\hat{k}\right)=3$ and passes through the point $(2, 1, -2)$.

A. $\vec{r}.\left(3\hat{i}+2\hat{j}\right)=8$

B. $\vec{r}.\left(2\hat{i}+3\hat{j}\right)=8$

C. $\vec{r}.\left(3\hat{i}+2\hat{j}\right)+8=0$

D. none of these

Answer: A

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39. Find the equation of a plane containing the line of intersection of the planes $x+y+z-6=0 and 2x+3y+4z+5=0$ passing through $(1, 1, 1)$.

A. $20x + 23y + 26z - 69 = 0$

B. $20x + 26y + 23z - 69 = 0$

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

D. $2x + 3y + 4z - 9 = 0$

Answer: A

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40. 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 $2x + y - z + 5 = 0$

A. $15x + 15y - 20z + 4 = 0$

B. $51x + 15y - 50z + 173 = 0$

C. $3x - 5y + 7 = 0$

D. $3x + 5y - 5z + 9 = 0$

Answer: B

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41. Find the equation of the plane through the line of intersection of $\overrightarrow{r} \cdot \left(2\hat{i} - 3\hat{j} - 4\hat{k}\right) = 6$ and $\overrightarrow{r} \cdot \left(\hat{i} - \hat{j}\right) + 4 = 0$ and perpendicular to vecr cdot(2hati -hatj+ hatk)+8= 0`

A. 47

B. -47

C. 37

D. -37

Answer: A

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42. The equation of the plane containing the line $2x - 5y + z = 3; x + y + 4z = 5$, and parallel to the plane, $x + 3y + 6z = 1$, is : (1) $2x + 6y + 12z = 13$ (2) $x + 3y + 6z = -7$ (3) $x + 3y + 6z = 7$ (4) $2x + 6y + 12z = -13$

A. $x + 3y + 6z = 7$

B. $2x + 6y + 12z = -13$

C. $2x + 6y + 12z = 13$

D. $x + 3y + 6z = 7$

Answer: A

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43. Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is (1) $\frac{5}{2}$ (2) $\frac{7}{2}$ (3) $\frac{9}{2}$ (4) $\frac{3}{2}$

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

B. $\frac{5}{2}$

C. $\frac{7}{2}$

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

Answer: C

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44. The equation of a plane passing through the line of intersection of the planes x+2y+3z = 2 and x - y + z = 3 and at a distance $\frac{2}{\sqrt{3}}$ from the point (3, 1, -1) is

A. $5x - 11y + z = 17$

B. $\sqrt{2}x + y = 3\sqrt{2} - 1$

C. $x + y + z = \sqrt{3}$

D. $x - \sqrt{2}y = 1 - \sqrt{2}$

Answer: A

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45. In R^3, consider the planes $P_1 : y = 0$ and $P_2, x + z = 1$. Let P_3 be a plane, different from P_1 and P_2 which passes through the intersection of P_1 and P_2, If the distance of the point (0,1,0) from P_3 is 1 and the distance of a point (α, β, γ) from P_3 is 2, then which of the following relation(s) is/are true? (a) $2\alpha + \beta + 2\gamma + 2 = 0$ (b) $2\alpha - \beta + 2\gamma + 4 = 0$ (c) $2\alpha + \beta - 2\gamma - 10 = 0$ (d) $2\alpha - \beta + 2\gamma - 8 = 0$

A. $2\alpha + \beta + 2\gamma + 2 = 0$

B. $2\alpha - \beta + 2\gamma + 4 = 0$

C. $2\alpha + \beta - 2\gamma - 10 = 0$

D. $2\alpha - \beta + 2\gamma - 8 = 8$

Answer: B::D

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46. Find the distance of the point $(21, 0)$ from the plane $2x + y + 2z + 5 = 0.$

A. $\frac{10}{3}$

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

C. $\frac{10}{9}$

D. none of these

Answer: A

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47. Find the Cartesian as well as vector equations of the planes through the intersection of the planes $\rightarrow r 2\hat{i} \dot{+} 6\hat{j} + 12 = 0 \; and \; \rightarrow r 3\hat{i} - \dot{\hat{j}} + 4\hat{k} = 0$ which are at a unit distance from the origin.

A. $\overrightarrow{r} . \left(2\hat{i} + \hat{j} + 2\hat{k}\right) + 3 = 0$

B. $\vec{r}.\left(\hat{i}-2\hat{j}+2\hat{k}\right)+3=0$

C. $\vec{r}.\left(\hat{i}-2\hat{j}-2\hat{k}\right)+3=0$

D. $\vec{r}.\left(2\hat{i}+\hat{j}+2\hat{k}\right)-3=0$

Answer: A

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48. A variable plane is at a distance p from the origin O and meets the set of rectangular axes $OX_i(i=1,2,3)$ at points $A_i(i=1,2,3)$ respectively. If planes are drawn through A_1, A_2, A_3 which are parallel to the coordinate planes, then the locus of theri point of intersection is

A. $x^2+y^2+z^2=p^2$

B. $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{1}{p}$

C. $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{1}{p^2}$

D. $\frac{1}{x^3}+\frac{1}{y^3}+\frac{1}{z^3}=\frac{1}{p^3}$

Answer: C

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49. The distance of the point $(1, 3, -7)$ from the plane passing through the point $(1, -1, -1)$ having normal perpendicular to both the lines $\frac{x-1}{1} = \frac{y+2}{-2} = \frac{z-4}{3}$ and $\frac{x-2}{2} = \frac{y+1}{-1} = \frac{z+7}{-1}$ is

A. $\frac{20}{\sqrt{74}}$

B. $\frac{10}{\sqrt{83}}$

C. $\frac{10}{\sqrt{74}}$

D. $\frac{5}{\sqrt{83}}$

Answer: B

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50. Find the distance between the parallel planes

$2x - y + 2z + 3 = 0 and 4x - 2y + 4z + 5 = 0.$

A. $1/3$

B. $2/6$

C. $2/3$

D. none of these

Answer: B

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51. Find the distance between the parallel planes

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

$\overrightarrow{r}.\left(6\hat{i} - 9\hat{j} + 18\hat{k}\right) + 20 = 0.$

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

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

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

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

Answer: B

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52. If d_1, d_2, d_3 denote the distances of the plane $2x - 3y + 4z = 0$ from the planes $2x - 3y + 4z + 6 = 0$ $4x - 6y + 8z + 3 = 0$ and $2x - 3y + 4z - 6 = 0$ respectively, then

A. $d_1 + 8d_2 + d_3 = 0$

B. $d_1 + 16d_2 = 0$

C. $8d_2 = d_1$

D. $d_1 - 2d_2 + 3d_3 = \sqrt{29}$

Answer: C

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53. The distance of the point $(1, -2, 4)$ from the plane passing through the point $(1, 2, 2)$ and perpendicular to the planes $x - y + 2z = 3$ and $2x - 2y + z + 12 = 0$, is :

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

B. 2

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: D

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54. Find the length of the perpendicular from the point $(1, 2, 3)$ to the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$.

A. 5 units

B. 7 units

C. 4 units

D. none of these

Answer: B

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55. The position vector of the foot of the perpendicular draw from the point $2\hat{i}-\hat{j}+5\hat{k}$ to the line $\vec{r}=\left(11\hat{i}-2\hat{j}-8\hat{k}\right)+\lambda\left(10\hat{i}-4\hat{j}-11\hat{k}\right)$ is

A. $\hat{i}+3\hat{j}+2\hat{k}$

B. $-\hat{i}+3\hat{j}-2\hat{k}$

C. $\hat{i}-3\hat{j}-2\hat{k}$

D. $\hat{i}+2\hat{j}+3\hat{k}$

Answer: D

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56. Find the image of the point $(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

A. $(3, 5, 2)$

B. $(-3, 5, 2)$

C. $(3, 5, -2)$

D. $(3, -5, 2)$

Answer: B

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57. For all $d, 0 < d < 1$, which one of the following points is the reflection of the point $(d, 2d, 3d)$ in the plane pasing through the points $(1, 0, 0)$, $(0, 1, 0$ and $(0, 0, 1)$?

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

B. $\left(-\frac{1}{3}+3d, 2d, \frac{1}{3}+e\right)$

C. $(3d, 2d, d)$

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

Answer: A

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58. Find the image of the point $(1, 6, 3)$ in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$

A. (1,1,7)

B. (0,1,7)

C. (1,0,7)

D. none of these

Answer: C

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59. If the image of the point $P(1, -2, 3)$ in the plane, $2x + 3y - 4z + 22 = 0$ measured parallel to the line, $\frac{x}{1} = \frac{y}{4} = \frac{z}{5}$ is Q, then PQ is equal to : $\sqrt{42}$ (2) $6\sqrt{5}$ (3) $3\sqrt{5}$ (4) $3\sqrt{42}$

A. $\sqrt{42}$

B. $6\sqrt{5}$

C. $3\sqrt{5}$

D. $2\sqrt{42}$

Answer: D

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60. The foot of the perpendicular from the point (1,2,3) on the line $\vec{r} = \left(6\hat{i} + 7\hat{j} + 7\hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} - 2\hat{k}\right)$ has the coordinates

A. (5,8,15)

B. (8,5,15)

C. (3,5,9)

D. (3,5,-9)

Answer: C

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61. about to only mathematics

A. 6

B. $\frac{6}{\sqrt{5}}$

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

D. $\frac{2}{\sqrt{5}}$

Answer: B

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62. The shortest distance between the lines $\frac{x}{2} = \frac{y}{2} = \frac{z}{1}$ and $\frac{x+2}{-2} = \frac{y-4}{8} = \frac{z-5}{4}$ lies in the interval

A. $(2, 3]$

B. $[0, 1)$

C. $(3, 4]$

D. $[1, 2)$

Answer: A

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63. Find the angle between the line $\vec{r} = \hat{i} + 2\hat{j} - \hat{k} + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and the plane $\vec{r} \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right) = 4.$

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

B. $\frac{2\sqrt{2}}{3}$

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

D. none of these

Answer: C

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64. Find the value of λ such that the line $\frac{x-1}{2}=\frac{y-1}{3}=\frac{z-1}{\lambda}$ is $\perp$ to normal to the plane $\overrightarrow{r}.\left(2\overrightarrow{i}+3\overrightarrow{j}+4\overrightarrow{k}\right)=0.$

A. $-\frac{13}{4}$

B. $-\frac{17}{4}$

C. 4

D. none of these

Answer: A

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65. The distance of the plane through (1,1,1) and perpendicular to the line $\frac{x-1}{3}=\frac{y-1}{0}=\frac{z-1}{4}$ from the origin is

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

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

C. $\frac{7}{5}$

D. 1

Answer: C

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66. The equation of the plane through the line $x+y+z+3=0=2x-y+3z+1$ and parallel to the line $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ is

A. $x-5y+3z=7$

B. $x-5y+3z=-7$

C. $x+5y+z=7$

D. $x+5y+3z=-7$

Answer: A

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67. Find the vector equation of the plane in which the lines $\overrightarrow{r}=\hat{i}+\hat{j}+\lambda\left(\hat{i}+2\hat{j}-\hat{k}\right)$ and $\overrightarrow{r}=\left(\hat{i}+\hat{j}\right)+\mu\left(-\hat{i}+\hat{j}-2\hat{k}\right)$ lie.

A. $\overrightarrow{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)=0$

B. $\overrightarrow{r}.\left(-\hat{i}+\hat{j}+\hat{k}\right)=0$

C. $\overrightarrow{r}.\left(-\hat{i}+\hat{j}+\hat{k}\right)=1$

D. $\overrightarrow{r}.\left(\hat{i}+\hat{k}-\hat{k}\right)=0$

Answer: B

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68. If the line, $\frac{x-3}{2}=\frac{y+2}{-1}=\frac{z+4}{3}$ lies in the plane, $lx+my-n=9$, then l^2+m^2 is equal to

A. 26

B. 18

C. 5

D. 2

Answer: D

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69. Find ten equation of the plane passing through the point $(0, 7, -7)$ and containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$.

A. $x+y+z=0$

B. $x-y-z=0$

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

D. $x - y - z + 14 = 0$

Answer: A

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70. The vector equation of the plane containing he line $\vec{r} = \left(-2\hat{i} - 3\hat{j} + 4\hat{k}\right) + \lambda\left(3\hat{i} - 2\hat{j} - \hat{k}\right)$ and the point $\hat{i} + 2\hat{j} + 3\hat{k}$ is

A. $\vec{r}.\left(\hat{i} + 3\hat{k}\right) = 10$

B. $\vec{r}.\left(\hat{i} - 3\hat{k}\right) = 10$

C. $\vec{r}.\left(3\hat{i} + \hat{k}\right) = 10$

D. none of these

Answer: A

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71. The equation $3y + 4z = 0$ represents a

A. plane containing z-axis

B. plane containing x-axis

C. plane containing y-axis

D. line with direction numbers 0,3,4

Answer: B

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72. Let P be the image of the point (3,1,7) with respect to the plane x-y+z=3. then the equation o the plane passing through P and containing the straight line $\frac{x}{1} = \frac{y}{2} = \frac{z}{1}$

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

B. $3x + z = 0$

C. $x - 4y + 7z = 0$

D. $2x - y = 0$

Answer: C

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73. The equation of the plane containing the lines $\overrightarrow{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(3\hat{i} - \hat{j}\right)$ and $\overrightarrow{r} = \left(4\hat{i} - \hat{k}\right) + \mu\left(2\hat{i} + 3\hat{k}\right)$, is

A. $\overrightarrow{r}.\left(3\hat{i} + 9\hat{j} - 2\hat{k}\right) + 14 = 0$

B. $\overrightarrow{r}.\left(3\hat{i} + 9\hat{j} + 2\hat{k}\right) = 14$

C. $\overrightarrow{r}.\left(3\hat{i} + 9\hat{j} - 2\hat{k}\right) = 14$

D. none of these

Answer: C

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74. Prove that the lines $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7} and \frac{x-2}{1}=\frac{y-4}{4}=\frac{z-6}{7}$ are coplanar . Aslo, find the plane containing these two lines.

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

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

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

D. none of these

Answer: A

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75. The equation of the plane containing the two lines $\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z}{3}$ and $\frac{x}{-1}=\frac{y-2}{3}=\frac{z+1}{-1}$ is

A. $8x+y-5x-7=0$

B. $8x+y+5z-7=0$

C. $8x - y - 5z - 7 = 0$

D. none of these

Answer: D

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76. If the lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar, then k can have

A. any value

B. exactly one value

C. exactly two values

D. exactly three values

Answer: C

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77. If the lines $\frac{x-4}{1}=\frac{y-2}{1}=\frac{z-\lambda}{3}$ and $\frac{x}{1}=\frac{y+2}{2}=\frac{z}{4}$ intersect each other, then λ lies in the interval

A. (9,11)

B. (-5,-3)

C. (13,15)

D. (11,13)

Answer: D

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78. Two lines $L_1 : x = 5, \frac{y}{3-\alpha}=\frac{z}{-2}$ and $L_2 : x = \alpha, \frac{y}{-1}=\frac{z}{2-\alpha}$ are coplanar. Then α can take value (s) a. 1 b. 2 c. 3 d. 4

A. 1,4,5

B. 1,2,5

C. 3,4,5

D. 2,4,5

Answer: A

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79. The number of distinct real values of λ for which the lines $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z+3}{\lambda^2}$ and $\frac{x-3}{1}=\frac{z-1}{2}$ are coplanar is :

A. 3

B. 2

C. 1

D. 4

Answer: A

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Section I - Solved Mcqs

1. The locus of a point $P(x, y, z)$ which moves in such a way that $z = c$ (constant), is a

A. a. line parallel to z-axis

B. b. plane parallel to xy-plane

C. c.line parallel to y-axis

D. d.line parallel to x-axis

Answer: B

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2. The locus of a point $P(x, y, z)$ which moves in such away that $x = a$ and $y = b$ is a

A. plane parallel to xy-plane

B. line parallel to x-axis

C. line parallel to y-axis

D. line parallel to z-axis

Answer: D

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3. In a three-dimensional xyz space, the equation $x^2 - 5x + 6 = 0$ represents

A. two points

B. two parallel planes

C. two parallel lines

D. a pair of non -parallel lines

Answer: B

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4. If the equation of a plane is $lx + my + nz = p$ which is in the normal form, then which one of the following is not true?

A. l,m and n are the direction cosines of the normal to the plane

B. p is the length of the perpendicular from the origin to the plane

C. the plane passes through theorigin for all values of

D. $l^2 + m^2 + n^2 = 1$

Answer: C

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5. The equation $ax + by + c = 0$ represents a plane perpendicular to the

A. xy-plane

B. yz-plane

C. zx-plane

D. none of these

Answer: A

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6. The plane $2x-(1+\lambda)y+3\lambda z=0$ passes through the intersection of the plane

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

B. $2x-y=0$ and $y-3z=0$

C. $2x+3yz=0$ and $y=0$

D. none of these

Answer: B

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7. If a plane meets the coordinates axes at A, Band C, in such a way that the centroid of ΔABC is at the point $(1, 2, 3)$, the equation of the plane is

A. $\frac{x}{1} + \frac{y}{2} + \frac{z}{3} = 1$

B. $\frac{x}{3} + \frac{y}{6} + \frac{z}{9} = 1$

C. $\frac{x}{1} + \frac{y}{2} + \frac{z}{3} = \frac{1}{3}$

D. none of these

Answer: B

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8. The equation $12x^2 - 2y^2 - 6z^2 - 2xy - 8xy + 6xz = 0$ represents

A. a pair of straight lines

B. a pair of planes

C. a shere

D. a pair of planes not passing through the origin.

Answer: B

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9. Find the image of the point $(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

A. $(3, 5, -2)$

B. $(-3, 5, 2)$

C. $(3, -5, 2)$

D. $(3, 5, 2)$

Answer: B

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10. The line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$ intersects the curve $xy = c^2, z = 0$ if c is equal to a. ± 1 b. $\pm \frac{1}{3}$ c. $\pm \sqrt{5}$ d. none of these

A. ± 1

B. $\pm 1/3$

C. $\pm \sqrt{5}$

D. none of these

Answer: C

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11. A non-zero vectors a is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i} + \hat{j}$ and the plane determined by the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{k}$. Find the angle between a and $\hat{i} - 2\hat{j} + 2\hat{k}$.

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. none of these

Answer: B

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12. The perpendicular distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda\left(\hat{i} - \hat{j} + 4\hat{k}\right)$ and the plane $\vec{r}.\left(\hat{i} + 5\hat{j} + \hat{k}\right) = 5$ is :

A. $\frac{10}{9}$

B. $\frac{10}{3\sqrt{3}}$

C. $\frac{10}{3}$

D. none of these

Answer: B

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13. Equations of the line passing through $(1, 1, 1)$ and perpendicular to the plane $2x + 3y + z + 5 = 0$ are

A. $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-1}{1}$

B. $\frac{x-1}{-1} = \frac{y-1}{1} = \frac{z-1}{-1}$

C. $\frac{x-1}{3} = \frac{y-1}{2} = \frac{z-1}{1}$

D. $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{1}$

Answer: B

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14. Find the line of intersection of the planes $\vec{r}.\left(3\hat{i} - \hat{j} + \hat{k}\right) = 1 \text{ and } \vec{r}.\left(\hat{i} + 4\hat{j} - 2\hat{k}\right) = 2$

A. $2\hat{i} + 7\hat{j} + 13\hat{k}$

B. $-2\hat{i} - 7\hat{j} + 13\hat{k}$

C. $2\hat{i} + 7\hat{j} + 13\hat{k}$

D. $-2\hat{i} + 7\hat{j} + 13\hat{k}$

Answer: D

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15. Given the line $L: \dfrac{x-1}{3} = \dfrac{y+1}{2} = \dfrac{z+3}{1}$ and the plane $\pi: x - 2y + z = 0$, of the following assertions, the only one that is always true is ,

A. L is $\perp$ to II

B. L lies in II

C. L is parallel to II

D. none of these

Answer: B

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16. The equation of the plane containing the line $\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$ and origin is :

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

B. $\vec{r}.\left(\hat{i} + 2\hat{j} - \hat{k}\right) = 0$

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

D. none of these

Answer: C

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17. The ratio in which the plane $\vec{r}.\left(\vec{i} - 2\vec{j} + 3\vec{k}\right) = 17$ divides the line joining the points $-2\vec{i} + 4\vec{j} + 7\vec{k}$ and $\vec{3}i - 5\vec{j} + 8\vec{k}$ is

A. $3:5$

B. $1:10$

C. $3:10$

D. $1:5$

Answer: C

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18. The sine of the angle between the line $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ and the plane $2x-2y+z=5$ is

A. $\frac{10}{6\sqrt{5}}$

B. $\frac{4}{5\sqrt{2}}$

C. $\frac{\sqrt{2}}{10}$

D. $\frac{2\sqrt{3}}{5}$

Answer: C

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19. If the plane $\frac{x}{2}+\frac{y}{3}+\frac{z}{6}=1$ cuts the axes of coordinates at points, $A, B,$ and C, then find the area of the triangle ABC. a. 18 sq unit b. 36 sq unit c. $3\sqrt{14}$ sq unit d. $2\sqrt{14}$ sq unit

A. $\sqrt{29}$ sq. units

B. $\sqrt{41}$ sq. units

C. $\sqrt{61}$ sq. units

D. none of these

Answer: C

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20. Let the pairs $\vec{a}, \vec{b}$ and $\vec{c}\,\vec{d}$ each determine a plane. Then the planes are parallel if

A. $\left(\vec{a}\times\vec{c}\right)\times\left(\vec{b}\times\vec{d}\right)=\vec{0}$

B. $\left(\vec{a}\times\vec{c}\right).\left(\vec{b}\times\vec{d}\right)=\vec{0}$

C. $\left(\vec{a} \times \vec{b}\right) \times \left(\vec{c} \times \vec{d}\right) = \vec{0}$

D. $\left(\vec{a} \times \vec{b}\right). \left(\vec{c} \times \vec{d}\right) = 0$

Answer: C

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21. The equation of the plane containing the lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}$ and $= \vec{a}_2 + \mu\hat{b}$ is :

A. $\left[\vec{r} \ \vec{a} \ \vec{b}\right] = 0$

B. $\left[\vec{r} \ \vec{a} \ \vec{b}\right] = \vec{a}. \vec{b}$

C. $\left[\vec{a} \ \vec{b} \ \vec{a}\right] = \vec{a}. \vec{b}$

D. none of these

Answer: A

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22. The points $A(2-x, 2, 2), B(2, 2-y, 2), C(2, 2, 2-z)$ and $D(1, 1, 1)$ are coplanar, then locus of $P(x, y, z)$ is

A. $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1$

B. $x+y+z=1$

C. $\frac{1}{1-x}+\frac{1}{1-y}+\frac{1}{1-z}=1$

D. none of these

Answer: A

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23. Find the vector equation of the plane in which the lines $\overrightarrow{r}=\hat{i}+\hat{j}+\lambda\left(\hat{i}+2\hat{j}-\hat{k}\right)$ and $\overrightarrow{r}=\left(\hat{i}+\hat{j}\right)+\mu\left(-\hat{i}+\hat{j}-2\hat{k}\right)$ lie.

A. $\overrightarrow{r}.\left(2\hat{i}+\hat{j}-3\hat{k}\right)=-4$

B. $\overrightarrow{r}\times\left(-\hat{i}+\hat{j}+\hat{k}\right)=\overrightarrow{0}$

C. $\vec{r}.\left(-\hat{i}+\hat{j}+\hat{k}\right)=0$

D. none of these

Answer: C

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24. The equation of the plane which contains the origin and the line of intersectio of the plane $\vec{r}.\vec{a}=d_1$ and $\vec{r}.\vec{b}=d_2$ is

A. $\vec{r}.\left(d_1\vec{a}-d_2\vec{b}\right)=0$

B. $\vec{r}.\left(d_1\vec{a}+d_2\vec{b}\right)=0$

C. $\vec{r}.\left(d_2\vec{a}+d_1\vec{b}\right)=0$

D. $\vec{r}.\left(d_2\vec{a}-d_2\vec{b}\right)=0$

Answer: D

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25. The length of the perpendicular from the origin to the plane passing through the point $\vec{a}$ and containing the line $\vec{r} = \vec{b} + \lambda \vec{c}$

A. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|}$

B. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c}\right|}$

C. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|}$

D. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{c} \times \vec{a}\right|}$

Answer: C

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26. Find the distance of the point $(1, -2, 3)$ from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$.

A. 1

B. 2

C. 4

D. none of these

Answer: A

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27. The equation of the plane which bisects the line joining $(2, 3, 4)$ and $(6, 7, 8)$

A. $x + y + z + 15 = 0$

B. $x - y - z - 15 = 0$

C. $x - y + z - 15 = 0$

D. $x + y + z - 15 = 0$

Answer: D

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28. Distance of the point $P\left(\vec{p}\right)$ from the line $\vec{r} = \vec{a} + \lambda\vec{b}$ is

(a) $\left|\left(\vec{a} - \vec{p}\right) + \frac{\left(\left(\vec{p} - \vec{a}\right).\vec{b}\right)\vec{b}}{\left|\vec{b}\right|^2}\right|$ (b) $\left|\left(\vec{b} - \vec{p}\right) + \frac{\left(\left(\vec{p} - \vec{a}\right).\vec{b}\right)\vec{b}}{\left|\vec{b}\right|^2}\right|$

(c) $\left|\left(\vec{a} - \vec{p}\right) + \frac{\left(\left(\vec{p} - \vec{b}\right).\vec{b}\right)\vec{b}}{\left|\vec{b}\right|^2}\right|$ (d)none of these

A. $\frac{\left|\left(\vec{c} - \vec{a}\right) \times \vec{b}\right|}{\left|\vec{b}\right|}$

B. $\frac{\left|\left(\vec{c} - \vec{a}\right).\vec{b}\right|}{\left|\vec{b}\right|}$

C. $\frac{\left|\left(\vec{c} - \vec{a}\right) \times \vec{b}\right|}{\left|\vec{b}\right|^2}$

D. none of these

Answer: A

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29. Distance of the point $P(x_2, y_2, z_2)$ from the line $\frac{x - x_1}{l} = \frac{y - y_1}{m} = \frac{z - z_1}{n}$, where l, m, n are the direction cosines of the line, is

A. $\sqrt{l^2(x_2 - x_1)^2 + m^2(y_2 - y_1)^2 + n^2(z_2 - z_1^2)}$

B. $|l(x_2 - x_1) + m(y_2 - y_1) + n(z_2 - z_1)|$

C.

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2 - \{l(x_2 - x_1) + m(y_2 - y_1}$$

D. none of these

Answer: C

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30. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three non-coplanar vectors then the length of projection of vector $\vec{a}$ in the plane of the vectors $\vec{b}$ and $\vec{c}$ may be given by

A. $\frac{\left|\vec{a}.\left(\vec{b}\times\vec{c}\right)\right|}{\left|\vec{b}\times\vec{c}\right|}$

B. $\left|\frac{\vec{a}\times\left(\vec{b}\times\vec{c}\right)}{\left|\vec{b}\times\vec{c}\right|}\right|$

C. $\frac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\vec{b}.\vec{c}}$

D. none of these

Answer: B

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31. If $P(0, 1, 0)$ and $Q(0, 01)$ are two points, then the projection of PQ on the plane $x + y + z = 3$ is

A. 2

B. 3

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: C

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

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

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

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

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

Answer: C

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33. If the foot of the perpendicular from $O(0, 0, 0)$ to a plane is $P(1, 2, 2)$. 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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34. The equation of the plane through the point (1,2,3) and parallel to the plane $x + 2y + 5z = 0$ is

A. $(x-1)+2(y-2)+5(z-3)=0$

B. $x+2y+5z=14$

C. $x+2y+5z=6$

D. none of these

Answer: A

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35. The straight line $\frac{x-3}{3}=\frac{y-2}{1}=\frac{z-1}{0}$ is Parallel to x-axis Parallel to the y-axis Parallel to the z-axis Perpendicular to the z-axis

A. parallel to x-axis

B. parallel to y-axis

C. parallel to z-axis

D. perpendicular to z-axis

Answer: A

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36. The direction ratios o f a normal to the plane through (1,0,0) and (0,1,0), which makes an angle of $\frac{\pi}{4}$ with the plane x+y=3, are

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

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

C. $1, 1, 2$

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

Answer: B

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37. Find the equation of a plane which passes through the point (3, 2, 0) and contains the line $\frac{x-3}{1}=\frac{y-6}{5}=\frac{z-4}{4}$

A. $x-y+z=1$

B. $x + y + z = 5$

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

D. $2x - y + z = 5$

Answer: A

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38. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4} and \frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then find the value of k.

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

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

C. $-\frac{2}{9}$

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

Answer: B

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39. The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-3}{k}=\frac{y-4}{1}=\frac{z-5}{1}$ are coplanar if the values of k are

A. $k=3$ or -3

B. $k=0$ or -1

C. $k=1$ or -1

D. $k=0$ or -3

Answer: D

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

A. $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}-\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$

B. $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}+\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}=0$

C. $\frac{1}{a^2}+\frac{1}{b^2}-\frac{1}{c^2}+\frac{1}{a'^2}+\frac{1}{b'^2}-\frac{1}{c'^2}=0$

D. $\frac{1}{a^2}-\frac{1}{b^2}-\frac{1}{c^2}+\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$

Answer: A

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41. A tetrahedron has vertices O (0,0,0), A(1,2,1,), B(2,1,3) and C(-1,1,2), the angle between faces OAB and ABC will be

A. 90°

B. $\cos^{-1}\left(\frac{19}{35}\right)$

C. $\cos^{-1}\left(\frac{17}{31}\right)$

D. 30°

Answer: B

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42. The value of k such that $\frac{x-4}{1}=\frac{y-2}{1}=\frac{z-k}{2}$ lies in the plane $2x-4y+z=7$ is a. 7 b. -7 c. no real value d. 4

A. 7

B. -7

C. no real value

D. 4

Answer: A

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43. Find the distance of the point $(-1, -5, -10)$ from the point of intersection of the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ and plane $x-y+z=5$.

A. 10

B. 8

C. 21

D. 13

Answer: D

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44. The length of the perpendicular drawn from (1,2,3) to the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$ is

A. 4

B. 5

C. 6

D. 7

Answer: D

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45. Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is (1) $\frac{5}{2}$ (2) $\frac{7}{2}$ (3) $\frac{9}{2}$ (4) $\frac{3}{2}$

A. $9/2$

B. $5/2$

C. $7/2$

D. $3/2$

Answer: C

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46. A line with direction cosines proportional to 2,1,2 meet each of the lines $x = y + a = zndx + a = 2y = 2z$. The coordinastes of each of the points of intersection are given by

A. $(2a, 3a, a), (2a, a, a)$

B. $(3a, 2a, 3a), (a, a, a)$

C. $(3a, 2a, 3a), (a, a, 2a)$

D. $(3a, 3a, 3a), (a, a, a)$

Answer: B

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47. If the straight lines $x = -1 + s, y = 3 - \lambda s, z = 1 + \lambda s and x = \frac{t}{2}, y = 1 + t, z = 2 - t,$ with paramerters $s and t,$ respectivley, are coplanar, then find λ.

A. 0

B. -1

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

D. -2

Answer: D

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48. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three non-coplanar vectors, then the vector equation $\vec{r} - (1-p-q)\vec{a} + p\vec{b} + q\vec{c}$ represents a

A. straight line

B. plane

C. plane pasing through the origin

D. sphere

Answer: B

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49. A plane II makes intercept 3 and 4 respectively on x and z axes. If II is parallel to y-axis, then its equation is

A. $3x + 4y = 12$

B. $4x + 3z = 12$

C. $3y + 4z = 12$

D. $4y + 3y = 12$

Answer: B

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50. The equation of the plane through the intersection of the planes $x + y + z = 1$ and $2x + 3y - z + 4 = 0$ and parallel to x-axis is

A. $y - z + 6 = 0$

B. $3y - z + 6 = 0$

C. $y + 3z + 6 = 0$

D. $3y - 2z + 6 = 0$

Answer: A

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51. Find the distance of the point $P(3, 8, 2)$ from the line $\frac{1}{2}(x-1) = \frac{1}{4}(y-3) = \frac{1}{3}(z-2)$ measured parallel to the plane $3x + 2y - 2z + 15 = 0$.

A. 2

B. 3

C. 6

D. 7

Answer: D

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52. If from a point $P(a, b, c)$ prpendiculars $PAandPB$ are drawn to $yzandzx - planes,$ find the eqution of th plane OAB.

A. $bcx + cay + abz = 0$

B. $bcx + cay - abz = 0$

C. $bcx - cay + abz = 0$

D. $-bcx + cay + abz = 0$

Answer: B

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53. A non-zero vectors a is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i} + \hat{j}$ and the plane determined by the vectors $\hat{i} - \hat{j}$ and $\hat{i} + \hat{k}$. Find the angle between a and $\hat{i} - 2\hat{j} + 2\hat{k}$.

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

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

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

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

Answer: D

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54. If M denotes the md point of the line segment joining $A\left(4\hat{i}+6\hat{j}-10\hat{k}\right)$ and $B\left(-\hat{i}+2\hat{j}+\hat{k}\right)$, then the equation, of the plane through M and perpendicular to AB is

A. $\overrightarrow{r}.\left(-5\hat{i}-3\hat{j}+11\hat{k}\right)+\frac{135}{2}=0$

B. $\overrightarrow{r}.\left(\frac{3}{2}\hat{i}+\frac{7}{2}\hat{j}-\frac{9}{2}\hat{k}\right)+\frac{135}{2}=0$

C. $\overrightarrow{r}.\left(4\hat{i}+5\hat{j}-10\hat{k}\right)+4=0$

D. $\overrightarrow{r}.\left(-\hat{i}+2\hat{j}+\hat{k}\right)+4=0$

Answer: A

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55. The perpendicular distance between the line $\overrightarrow{r}=2\hat{i}-2\hat{j}+3\hat{k}+\lambda\left(\hat{i}-\hat{j}+4\hat{k}\right)$ and the plane $\overrightarrow{r}.\left(\hat{i}+5\hat{j}+\hat{k}\right)=5$ is :

A. $\frac{10}{3}$

B. $\frac{3}{10}$

C. $\frac{10}{3\sqrt{3}}$

D. $\frac{10}{9}$

Answer: C

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56. If angle θ bertween the line $\frac{x+1}{1}=\frac{y-1}{2}=\frac{z-2}{2}$ and the plane $2x-y+\sqrt{\lambda}z+4=0$ is such that $\sin\theta=1/3$, the value of λ is

a. $-\frac{3}{5}$

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

c. $-\frac{4}{3}$

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

A. $-4/3$

B. $3/4$

C. $-3/5$

D. $5/3$

Answer: D

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57. the image of the point $(-1, 3, 4)$ in the plane $x-2y=0$ a. $\left(-\frac{17}{3}, \frac{19}{3}, 4\right)$ b.(15,11,4) c. $\left(-\frac{17}{3}, \frac{19}{3}, 1\right)$ d. $\left(\frac{9}{5}, -\frac{13}{5}, 4\right)$

A. $\left(-\frac{17}{3}, -\frac{19}{3}, 4\right)$

B. $(15, 11, 4)$

C. $\left(-\frac{17}{3}, -\frac{19}{3}, 1\right)$

D. none of these

Answer: D

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58. Let L be the line of intersection of the planes $2x + 3y + z = 1$ and $x + 3y + 2z = 2$. If L makes an angles $\alpha$with the positive x-axis, then cos α equals $\frac{1}{\sqrt{3}}\ \frac{1}{2}$ 1 $\frac{1}{\sqrt{2}}$

A. 1

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

C. $\frac{1}{\sqrt{3}}$

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

Answer: C

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59. The line passing through the points $(5, 1, a)$ and $(3, b, 1)$ crosses the YZ-plane at the point $\left(0, \frac{17}{2}, -\frac{13}{2}\right)$. Then,

A. $a = 6, b = 4$

B. $a = 8, b = 2$

C. $a = 2, b = 8$

D. $a = 4, b = 6$

Answer: A

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60. If the straight lines $\frac{x-1}{k} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x-2}{3} = \frac{y-3}{k} = \frac{z-1}{2}$ intersect at a point, then the integer k is equal to

A. 2

B. -2

C. -5

D. 5

Answer: C

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61. Let the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lies in the plane $x+3y-\alpha z+\beta=0$. Then, (α, β) equals

A. $(6, \; -17)$

B. $(-6, 7)$

C. $(5, \; -15)$

D. $(-5, 5)$

Answer: B

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62. Read the following passage and answer the questions. Consider the lines

$$L_1 : \frac{x+1}{3}=\frac{y+2}{1}=\frac{z+1}{2}$$
$$L_2 : \frac{x-2}{1}=\frac{y+2}{2}=\frac{z-3}{3}$$

Q. The shortest distance between L_1 and L_2 is

A. $\frac{1}{\sqrt{99}}\left(-\hat{i}+7\hat{j}+7\hat{k}\right)$

B. $\frac{1}{5\sqrt{5}}\left(-\hat{i}-7\hat{j}+5\hat{k}\right)$

C. $\frac{1}{5\sqrt{3}}\left(-\hat{i}+7\hat{j}+5\hat{k}\right)$

D. $\frac{1}{\sqrt{99}}\left(7\hat{i}-7\hat{j}-\hat{k}\right)$

Answer: B

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63. Let $P(3, 2, 6)$ be a point in space and Q be a point on line $\vec{r}=\left(\hat{i}-\hat{j}+2\hat{k}\right)+\mu\left(-3\hat{i}+\hat{j}+5\hat{k}\right)$. Then the value of μ for which the vector $\vec{P}Q$ is parallel to the plane $x-4y+3z=1$ is a. 1/4 b. -1/4 c. 1/8 d. -1/8

A. $\frac{1}{4}$

B. $-\frac{1}{4}$

C. $\frac{1}{8}$

D. $-\frac{1}{8}$

Answer: A

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64. A plane which is perpendicular to two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$ passes through $(1, -2, 1)$. The distance of the plane from the point (1, 2, 2) is

A. 0

B. 1

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: D

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65. Let $\overrightarrow{A}$ be a vector parallel to the line of intersection of planes P_1 and P_2 . Plane P_1 is parallel to vectors $2\hat{j}+3\hat{k}$ and $4\hat{j}-3\hat{k} nad P_2$ is parallel to $\hat{j}-\hat{k}$ and $3\hat{i}+3\hat{j}$. Then the angle between vector $\overrightarrow{A}$ and a given vector $2\hat{i}+\hat{j}-2\hat{k}$ is

A. $\frac{\pi}{4}$ or $\frac{3\pi}{4}$

B. $\frac{\pi}{2}$ or $\frac{3\pi}{2}$

C. $\frac{\pi}{6}$ or $\frac{\pi}{3}$

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

Answer: A

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66. If $\alpha+\beta+\gamma=2$ and $\overrightarrow{a}=\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}, \hat{k}\times\left(\hat{k}\times\overrightarrow{a}\right)=\overrightarrow{0}$ then gamma= (A) 1 (B) -1 (C) 2 (D) none of these

A. 0

B. 1

C. 2

D. 3

Answer: C

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67. A variable plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ at a unit distance from origin cuts the coordinate axes at A, B and C. Centroid (x, y, z) satisfies the equation $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=K$. The value of K is (A) 9 (B) 3 (C) $\frac{1}{9}$ (D) $\frac{1}{3}$

A. 9

B. 3

C. $1/9$

D. $1/3$

Answer: A

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68. If the distance of the point $P(1, -2, 1)$ from the plane $x + 2y - 2z = \alpha, where\alpha > 0, is5,$ then the foot of the perpendicular from P to the plane is a. $\left(\frac{8}{3}, \frac{4}{3}, -\frac{7}{3}\right)$ b. $\left(\frac{4}{3}, -\frac{4}{3}, \frac{1}{3}\right)$ c. $\left(\frac{1}{3}, \frac{2}{3}, \frac{10}{3}\right)$ d. $\left(\frac{2}{3}, -\frac{1}{3}, -\frac{5}{3}\right)$

A. $\left(\frac{8}{3}, \frac{4}{3}, \frac{-7}{3}\right)$

B. $\left(\frac{4}{3}, \frac{-4}{3}, \frac{1}{3}\right)$

C. $\left(\frac{1}{3}, \frac{2}{3}, \frac{10}{3}\right)$

D. $\left(\frac{2}{3}, -\frac{1}{3}, \frac{5}{2}\right)$

Answer: A

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69. Equation of the plane containing the straight line $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$ and perpendicular to the plane containing the straight lines

$\frac{x}{3} = \frac{y}{4} = \frac{z}{2}$ and $\frac{x}{4} = \frac{y}{2} = \frac{z}{3}$ is

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

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

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

D. $5x + 2y - 4z = 0$

Answer: C

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70. If the distance between the plane Ax 2y + z = d and the plane containing the lines 2 1x = 3 2y = 4 3z and 3 2x = 4 3y = 5 4z is 6 , then |d| is

A. 3

B. 4

C. 6

D. 1

Answer: C

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71. A line from the origin meets the lines $\frac{x-2}{1}=\frac{y-1}{-2}=\frac{z+1}{1}$ and $\frac{x-\frac{8}{3}}{2}=\frac{y+3}{-1}=\frac{z-1}{1}$ at P and Q respectively. If length $PQ=d$, then d^2 is

A. 3

B. 4

C. 5

D. 6

Answer: D

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72. The number of 3×3 matrices A whose entries are either 0 or 1 and for which the system $A\begin{vmatrix} x \\ y \\ z \end{vmatrix} = \begin{vmatrix} 1 \\ 0 \\ 0 \end{vmatrix}$ has exactly two distinct solution is a. 0 b. $2^9 - 1$ c. 168 d. 2

A. 0

B. $2^9 - 1$

C. 168

D. 2

Answer: A

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73. If the angle between the line $x = \frac{y-1}{2} = (z-3)(\lambda)$ and the plane $x + 2y + 3z = 4 is \cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then λ equals

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

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

C. $\frac{2}{5}$

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

Answer: A

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74. Let a,b and c be three real numbers satisfying

[a b c] $\begin{vmatrix} 1 & 9 & 7 \\ 8 & 2 & 7 \\ 7 & 3 & 7 \end{vmatrix}$ =[0 0 0] ....(i)

Let ω be a solution of $x^3 - 1 = 0$ with $\lim (\omega) > 0$. If a=2 with b and c satisfying Eq.(i) then the value of $\frac{3}{\omega^4} + \frac{1}{\omega^b} + \frac{1}{\omega^c}$ is :

A. 0

B. 12

C. 7

D. 6

Answer: D

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75. The distance of the point $(1, \ -5, 9)$ from the plane $x - y + z = 5$ measured along the line $x = y = z$ is

A. $5\sqrt{3}$

B. $3\sqrt{10}$

C. $3\sqrt{5}$

D. $10\sqrt{3}$

Answer: D

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76. Find the perpendicular distance of the point (3, -1, 11) from the line $\frac{x}{y} = \frac{y-2}{-3} = \frac{z-3}{4}$.

A. $\sqrt{33}$

B. $\sqrt{53}$

C. $\sqrt{66}$

D. $\sqrt{29}$

Answer: B

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77. about to only mathematics

A. $1/\sqrt{2}$

B. $\sqrt{2}$

C. 2

D. $2\sqrt{2}$

Answer: A

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78. If the straight lines $\frac{x-1}{2} = \frac{y+1}{k} = \frac{z}{2}$ and $\frac{x+1}{5} = \frac{y+1}{2} = \frac{z}{k}$ are coplanar, then the plane(s) containing these two lines is/are

A. $y + 12z = -1$

B. $y + 1z = -1$

C. $y \pm 2z = 1$

D. $y \pm z = 1$

Answer: B

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79. If the three planes $x = 5, 2x - 5ay + 3z - 2 = 0$ and $3bx + y - 3z = 0$ contain a common line, then (a, b) is equal to

A. $\left(-\frac{1}{5}, \frac{8}{15}\right)$

B. $\left(\frac{1}{5}, -\frac{8}{15}\right)$

C. $\left(-\frac{8}{15}, \frac{1}{5}\right)$

D. $\left(\frac{8}{15}, -\frac{1}{5}\right)$

Answer: B

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A. $\frac{x}{5} = \frac{y-1}{8} = \frac{z-2}{-13}$

B. $\frac{x}{2}\frac{y-1}{3} = \frac{z-2}{-5}$

C. $\frac{x}{4} = \frac{y-1}{3} = \frac{z-2}{-7}$

D. $\frac{x}{2} = \frac{y-1}{-7} = \frac{z-2}{5}$

Answer: D

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81. about to only mathematics

A. $\left(\frac{7}{3}, \frac{7}{3}, \frac{5}{3}\right)$ and $(-1, -1, 0)$

B. $(-1, -1, 0)$ and $(1, 1, 1)$

C. $\left(\frac{7}{9}, \frac{7}{9}, \frac{8}{9}\right)$ and $\left(\frac{7}{3}, \frac{7}{3}, \frac{5}{3}\right)$

D. $(1, 1, 1)$ and $\left(\frac{7}{9}, \frac{7}{9}, \frac{8}{9}\right)$

Answer: D

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82. Consider the set of eight vectors $V\left[a\hat{i} + b\hat{j} + c\hat{k} : a, b, c \in \{1 - 1\}\right]$.

Three non-coplanar vectors cann be chosen from V in 2^p ways, then p is

A. 3

B. 5

C. 6

D. 4

Answer: B

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83. The image of the line $\frac{x-1}{3}=\frac{y-3}{1}=\frac{z-4}{-5}$ in the plane $2x-y+z+3=0$ is the line

A. $\frac{x-3}{3}=\frac{y+5}{1}=\frac{z-2}{-5}$

B. $\frac{x-3}{-3}=\frac{y+5}{-1}=\frac{z-2}{5}$

C. $\frac{x+3}{3}=\frac{y-5}{1}=\frac{z-2}{-5}$

D. $\frac{x+3}{-3}=\frac{y-5}{-3}=\frac{y-5}{-1}=\frac{z+2}{5}$

Answer: C

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84. From a point $P(\lambda, \lambda, \lambda)$, perpendicular PQ and PR are drawn respectively on the lines $y=x, z=1$ and $y=-x, z=-1$. If P is such tthat $\angle QPR$ is a right angle , then the possible value(s) of λ is (are)

A. $\sqrt{2}$

B. 1

C. -1

D. $-\sqrt{2}$

Answer: C

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85. let L be a straight line passing through the origin. Suppose that all the points on L are at a constant distance from the two planes $P_1 : x + 2y - z + 1 = 0$ and $P_2 : 2x - y + z - 1 = 0$, Let M be the locus of the feet of the perpendiculars drawn from the points on L to the plane P_1. Which of the following points lie(s) on M? (a) $\left(0, -\frac{5}{6}, -\frac{2}{3}\right)$ (b) $\left(-\frac{1}{6}, -\frac{1}{3}, \frac{1}{6}\right)$ (c) $\left(-\frac{5}{6}, 0, \frac{1}{6}\right)$ (d) $\left(-\frac{1}{3}, 0, \frac{2}{3}\right)$

A. $\left(0, -\frac{5}{6}, -\frac{2}{3}\right)$

B. $\left(-\frac{1}{6}, -\frac{1}{3}, \frac{1}{6}\right)$

C. $\left(-\frac{5}{6}, 0, \frac{1}{6}\right)$

D. $\left(-\frac{1}{3}, 0, \frac{2}{3}\right)$

Answer: A::B

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86. The distance between the line $x = 2 + t, y = 1 + t, z = -\frac{1}{2} - \frac{t}{2}$ and the plane $\vec{r}.\left(\hat{i} + 2\hat{j} + 6\hat{k}\right) = 10$, is

A. $\frac{1}{6}$

B. $\frac{1}{\sqrt{41}}$

C. $\frac{1}{7}$

D. $\frac{9}{\sqrt{41}}$

Answer: D

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87. The shortest distance between the lines $x = y = x$

and the line $2x + y + z - 1 = 0 = 3x + y + 2z - 2$ is

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

B. $\sqrt{2}$

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

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

Answer: A

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88. Consider a pyramid OPQRS located in the first octant $(x \geq 0, y \geq 0, z \geq 0)$ with O as origin and OP and OR along the X-axis and the Y-axis , respectively. The base OPQRS of the pyramid is a square with OP=3. The point S is directly above the mid point T of diagonal OQ such that TS=3. Then,

A. $x - y = 0$

B. $y - z = 0$

C. $z - x = 0$

D. $x - y - z = 0$

Answer: A

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89. From a point A with positon vector $p\left(\hat{i} + \hat{j} + \hat{k}\right)$, AB and AC are drawn perpendicular to the lines $\vec{r} = \hat{k} + \lambda\left(\hat{i} + \hat{j}\right)$ an $\vec{r} = -\hat{k} + \mu\left(\hat{i} - \hat{j}\right)$, respectively. A value of p is equal to

A. -2

B. -1

C. $\sqrt{2}$

D. all of these

Answer: D

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Section II - Assertion Reason Type

1. Consider the planes $3x - 6y - 2z = 15$ and $2x + y - 2z = 5$. Statement 1:The parametric equations of the line intersection of the given planes are $x = 3 + 14t, y = 2t, z = 15t$. Statement 2: The vector $14\hat{i} + 2\hat{j} + 15\hat{k}$ is parallel to the line of intersection of the given planes.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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2. Consider three planes $P_1 : x - y + z = 1, P_2 : x + y - z = -1$ and $P_3 : x - 3y + 3z = 2$. Let L_1, L_2, L_3 be the lines of intersection of the planes P_2 and P_3, P_3 and P_1, P_1 and P_2 respectively.

Statement I Atleast two of the lines L_1, L_2 and L_3 are non-parallel.

Statement II The three planes do not have a common point.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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3. Statement 1: Let A,B,C be the image of point $P(a, b, c)$ in YZ, ZX and XY planes respectively. Then, the equation of the plane passing through points A,B,C cuts intercepts a,b,c on the coordinate axes. Statement 2: The image (α, β, γ) of a point (x_1, y_1, z_1) in the plane $ax + by + cz + d = 0$ is given by $\frac{\alpha - x_1}{a} = \frac{\beta - y_1}{b} = \frac{\gamma - z_1}{c} = -\frac{2(ax_1 + by_1 + cz_1 + d)}{a^2 + b^2 + c^2}$

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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4. Consider the plane $\pi : x + y - 2z = 3$ and two points $P(2, 1, 6)$ and $Q(6, 5, \ -2)$.

Statement 1: PQ is parallel to the normal to the plane.

Statement 2: Q is the image of point P in he plane π

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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5. Statement 1: Lthe cartesian equation of the plane $\vec{r} = \left(\hat{i} - \hat{j}\right) + \lambda\left(\hat{i} + \hat{j} + \hat{k}\right) + \mu\left(\hat{i} - 2\hat{j} + 3\hat{k}\right)$ is $5x - 2y - 3z = 7$

Statement 2: The non parametric form of the plane $\vec{r} = \vec{a} + \lambda\vec{b} + \mu\vec{c}$ is $\left[\vec{r} \ \vec{b} \ \vec{c}\right] = \left[\vec{a} \ \vec{b} \ \vec{c}\right]$

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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6. Statement 1: If the vectors $\vec{a}$ and $\vec{c}$ are non collinear, then the lines $\vec{r} = 6\vec{a} - \vec{c} + \lambda(2\vec{c} - \vec{a})$ and $\vec{r} = \vec{a} - \vec{c} + \mu(\vec{a} + 3\vec{c})$ are coplanar.

Statement 2: There exists λ and μ such that the two values of $\vec{r}$ in statement -1 become same

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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7. Statement 1: If a is an integer the the straight lines

$$\overrightarrow{r} = \hat{i} + 2\hat{i} + 3\hat{k} + \lambda\left(a\hat{i} + 2\hat{j} + 3\hat{k}\right)$$

and $\overrightarrow{r} = 2\hat{i} + 3\hat{j} + \hat{k} + \mu\left(3\hat{i} + \hat{j} + 2\hat{k}\right)$ intersect at a point for $a = -5$.

Statement 2: Two straight lines intersect if the shortest distance between them is zero.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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8. Statement-I The lines $\frac{x-1}{1}=\frac{y}{-1}=\frac{z+1}{1}$ and $\frac{x-2}{1}=\frac{y+1}{2}=\frac{z}{3}$ are coplanar and equation of the plane containing them is $5x+2y-3z-8=0$

Statement-II The line $\frac{x-2}{1}=\frac{y+1}{2}=\frac{z}{3}$ is perpendicular to the plane $3x+6y+9z-8=0$ and parallel to the plane $x+y-z=0$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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9. Statement 1: A point on the line $\frac{x+2}{3}=\frac{y+1}{2}=\frac{z-3}{2}$ at a distance $3\sqrt{2}$ from the point $(1, 2, 3)$ lies on the lne $\frac{x+7}{5}=\frac{y+5}{4}=\frac{z-2}{1}$

Statement 2: If d is the distance between the point $(\,-1,\,-5,\,-10)$ and the point of intersectionof the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ with the plane $x-y+z=5$ then $d=13$

A. A.Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. C. Statement-1 is True, Statement-2 is False.

D. D. Statement-1 is False, Statement-2 is True.

Answer: B

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10. Consider the line $L: \vec{r}\left(\hat{i}+3\hat{j}-\hat{k}\right)+\lambda\left(\hat{j}+2\hat{k}\right)$ and the plane $\pi: \vec{r}\left(\hat{i}+4\hat{j}+\hat{k}\right)+6=0$

Statement 1: The line L intersects the plane π at the point (1,0,-7).

Statement 2: The angle θ between the line L and the plane π is given by $\theta=\frac{1}{2}\cos^{-1}\left(\frac{1}{5}\right)$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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11. Statement 1: The plane $5x + 2z - 8 = 0$ contains the line $2x - y + z - 3 = 0$ and $3x + y + z = 5$, and is perpendicular to $2x - y - 5z - 3 = 0$. Statement 2: The plane $3x + y + z = 5$, meets the line $x - 1 = y + 1 = z - 1$ at the point (1,1,1)

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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12. Statement-I The point $A(3, 1, 6)$ is the mirror image of the point $B(1, 3, 4)$ in the plane $x - y + z = 5$.

Statement-II The plane $x - y + z = 5$ bisect the line segment joining $A(3, 1, 6)$ and $B(1, 3, 4)$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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13. Statement-I The point $A(1, 0, 7)$ is the mirror image of the point $B(1, 6, 3)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.

Statement-II The line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ bisect the line segment joining $A(1, 0, 7)$ and $B(1, 6, 3)$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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14. The equations of two straight lines are

$$\frac{x-1}{2}=\frac{y+3}{1}=\frac{z-2}{-3} \text{ and } \frac{x-2}{1}=\frac{y-1}{-3}=\frac{z+3}{2}$$

Statement 1: The given lines are coplanar.

Statement 2: The equations

$2r-s=1$

$r+3s=4$

$3r+2s=5$

are consistent.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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15. Given two straight lines whose equations are

$$\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1} \text{ and } \frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$$

Statement 1: The line of shortest distance between the given lines is perpendicular to the plane $x+3y+5z=0$.

Statement 2 : The direction ratios of the normal to the plane $ax+by+cz+d=0$ are proportonal to $\frac{a}{d}, \frac{b}{d}, \frac{c}{d}$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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16. Statement 1: The shortest distance between the lines $\frac{x}{2}=\frac{y}{-1}=\frac{z}{2}$ and $\frac{x-1}{4}=\frac{y-1}{-2}=\frac{z-1}{4}$ is $\sqrt{2}$. Statement 2: The shortest distance between two parallel lines is the perpendicular distance from any point on one of the lines to the other line.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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Exercise

1. The perpendicular distance from the origin to the plane through the point (2,3,-1) and perpendicular to the vector $3\hat{i} - 4\hat{j} + 7\hat{k}$ is

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

B. $\dfrac{-13}{\sqrt{74}}$

C. 13

D. none of these

Answer: A

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2. The equation of the plane perpendicular to the line $\dfrac{x-1}{1} = \dfrac{y-2}{-1} = \dfrac{z+1}{2}$ and passing through the point (2,3,1), is

A. $\overrightarrow{r}.\left(\hat{i} + \hat{j} + 2\hat{k}\right) = 1$

B. $\overrightarrow{r}.\left(\hat{i} - \hat{j} + 2\hat{k}\right) = 1$

C. $\overrightarrow{r}.\left(\hat{i} - \hat{j} + 2\hat{k}\right) = 7$

D. none of these

Answer: B

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3. The locus of a point which moves so that the difference of the squares of its distance from two given points is constant, is a

A. straight line

B. plane

C. sphere

D. none of these

Answer: B

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4. If the position vectors of the points A and B are $3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} - 2\hat{j} - 4\hat{k}$ respectively then the equation of the plane through B and perpendicular to AB is

A. $\overrightarrow{r}.\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right) = 28$

B. $\overrightarrow{r}.\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right) = 32$

C. $\hat{r}.\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right) + 28 = 0$

D. none of these

Answer: C

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5. The vector equation of the plane passing through the origin and the line of intersection of the planes $\overrightarrow{r}.\overrightarrow{a} = \lambda$ and $\overrightarrow{r}.\overrightarrow{b} = \mu$ is

A. $\overrightarrow{r}.\left(\lambda\overrightarrow{a} - \mu\overrightarrow{b}\right) - 0$

B. $\overrightarrow{r}.\left(\lambda\overrightarrow{b} - \mu\overrightarrow{a}\right) = 0$

C. $\vec{r}.\left(\lambda\vec{a}+\mu\vec{b}\right)=0$

D. $\vec{r}.\left(\lambda\vec{b}+\mu\vec{a}\right)=0$

Answer: B

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6. The position vectors of points A and B are $\hat{i}-\hat{j}+3\hat{k}$ and $3\hat{i}+3\hat{j}-\hat{k}$ respectively. The equation of a plane is $\vec{r}\cdot\left(5\hat{i}+2\hat{j}-7\hat{k}\right)=0$ The poinys A and B

A. lie on the plane

B. are on the same side of the plane

C. are on the opposite side of the plane

D. none of these

Answer: C

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7. The vector equation of the plane through the point $2\hat{i} - \hat{j} - 4\hat{k}$ and parallel to the plane $r \cdot \left(4\hat{i} - 12\hat{j} - 3\hat{k}\right) - 7 = 0$ is

A. $\vec{r}.\left(4\hat{i} - 12\hat{j} - 3\hat{k}\right) = 0$

B. $\vec{r}.\left(4\hat{i} - 12\hat{j} - 3\hat{k}\right) = 32$

C. $\vec{r}.\left(4\hat{i} - 12\hat{j} - 3\hat{}\right) = 12$

D. none of these

Answer: B

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8. The vector equation of the plane through the point $(2, 1, -1)$ and passing through the line of intersection of the plane $r \cdot \left(\hat{i} + 3\hat{j} - \hat{k}\right) = 0 \text{ and } r \cdot \left(\hat{j}2\hat{k}\right) = 0,$ is

A. $\vec{r}.\left(\hat{i} + 9\hat{j} + 11\hat{k}\right) = 0$

B. $\hat{r}.\left(\hat{i}+9\hat{j}+11\hat{k}\right)=6$

C. $\hat{r}.\left(\hat{i}-3\hat{j}-13\hat{k}\right)=0$

D. none of these

Answer: A

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9. Equation of a plane passing through the intersection of the planes $\overrightarrow{r}.\left(3\hat{i}-\hat{j}+\hat{k}\right)=1$ and $\overrightarrow{r}.\left(\hat{i}+4\hat{j}-2\hat{k}\right)=2$ and passing through the point $\left(\hat{i}+2\hat{j}-\hat{k}\right)$ is :

A. $\overrightarrow{r}.\left(2\hat{i}+7\hat{j}-13\hat{k}\right)=1$

B. $\overrightarrow{r}.\left(2\hat{i}-7\hat{j}-13\hat{k}\right)=1$

C. $\overrightarrow{r}.\left(2\hat{i}+7\hat{j}+13\hat{k}\right)=0$

D. none of these

Answer: B

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10. The vector equation of a plane which contains the line $\vec{r} = 2\hat{i} + \lambda(\hat{j} - \hat{k})$ and perpendicular to the plane $\vec{r}.(\hat{i} + \hat{k}) = 3$ is

A. $\vec{r}.(\hat{i} - \hat{j} - \hat{k}) = 2$

B. $\vec{r}.(\hat{i} + \hat{j} - \hat{k}) = 2$

C. $\vec{r}.(\hat{i} + \hat{j} + \hat{k}) = 2$

D. none of these

Answer: A

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11. The equation of the plane containing the lines $\vec{r} = \vec{a}_1 + \lambda\vec{b}$ and $= \vec{a}_2 + \mu\hat{b}$ is :

A. $\vec{r}.(\vec{a}_1 - \vec{a}_2) \times \vec{b} = [\vec{a}_1 \ \ \vec{a}_2 \ \ \vec{b}]$

B. $\vec{r}.\left(\vec{a}_2-\vec{a}_1\right)\times\vec{b}=\left[\vec{a}_1\ \ \vec{a}_2\ \ \vec{b}\right]$

C. $\vec{r}.\left(\vec{a}_1+\vec{a}_2\right)\times\vec{b}=\left[\vec{a}_2\ \ \vec{a}_1\ \ \vec{b}\right]$

D. none of these

Answer: B

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12. The equation of the plane containing the lines $\vec{r}=\vec{a}_1+\lambda\vec{b}$ and $=\vec{a}_2+\mu\hat{b}$ is :

A. $\left[\vec{r}\ \ \vec{a}_1\ \ \vec{a}_2\right]=0$

B. $\left[\vec{r},\vec{a}_1,\vec{a}_2)\right]=\vec{a}_1.\vec{a}_2$

C. $\left[\vec{r}\ \ \vec{a}_2\ \ \vec{a}_1\right]=\vec{a}_1.\vec{a}_2$

D. none of these

Answer: A

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13. Find the equation of plane passing through the line of intersection of planes $\vec{r}.\left(\hat{i}+3\hat{j}\right)+6=0$ and $\vec{r}.\left(3\hat{i}-\hat{j}-4\hat{k}\right)=0$, whose perpendicular distance from origin is one unit.

A. $-2\hat{i}+7\hat{j}+13\hat{k}$

B. $2\hat{i}+7\hat{j}-13\hat{k}$

C. $-2\hat{i}-7\hat{j}+13\hat{k}$

D. $2\hat{i}+7\hat{j}+13\hat{k}$

Answer: A

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14. Find the vector equation of the plane in which the lines $\vec{r}=\hat{i}+\hat{j}+\lambda\left(\hat{i}+2\hat{j}-\hat{k}\right)$ and $\vec{r}=\left(\hat{i}+\hat{j}\right)+\mu\left(-\hat{i}+\hat{j}-2\hat{k}\right)$ lie.

A. $\overrightarrow{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)=0$

B. $\overrightarrow{r}.\left(\hat{i}-\hat{j}-\hat{k}\right)=0$

C. $\overrightarrow{r}.\left(\hat{i}+\hat{j}+\hat{k}\right)=3$

D. none of these

Answer: B

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15. The Cartesian equation of the plane $\overrightarrow{r}=(1+\lambda-\mu)\hat{i}+(2-\lambda)\hat{j}+(3-2\lambda+2\mu)\hat{k}$ is a. $2x+y=5$ b. $2x-y=5$ c.$2x+z=5$ d.$2x-z=5$

A. $2x+y=5$

B. $2x-y=5$

C. $2x+z=5$

D. $2x-z=5$

Answer: C

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16. The perpendicular distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda\left(\hat{i} - \hat{j} + 4\hat{k}\right)$ and the plane $\vec{r}.\left(\hat{i} + 5\hat{j} + \hat{k}\right) = 5$ is :

A. $\frac{10}{3\sqrt{3}}$

B. $\frac{10}{3}$

C. $10/9$

D. none of these

Answer: A

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17. The vector equation of the line of intersection of the planes $\vec{r}.\left(2\hat{i}+3\hat{k}\right)=0$ and $\vec{r}.\left(3\hat{i}+2\hat{j}+\hat{k}\right)=0$ is

A. $\vec{r}=\lambda\left(\hat{i}+2\hat{j}+\hat{k}\right)$

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

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

D. none of these

Answer: B

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18. A straight line $\vec{r}=\vec{a}+\lambda\vec{b}$ meets the plane $\vec{r}.\vec{n}=0atp.$ Then position vector of P is

A. $\vec{a}+\frac{\vec{a}.\vec{n}}{\vec{b}.\vec{n}}\vec{b}$

B. $\vec{a}\frac{\vec{b}.\vec{n}}{\vec{a}.\vec{n}}\vec{b}$

C. $\vec{a} - \dfrac{\vec{a} \,.\, \vec{n}}{\vec{b} \,.\, \vec{n}}$

D. none of these

Answer: C

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19. The equation of the plane passing through three non - collinear points with positions vectors a,b,c, is

A. $\vec{r} \,.\, \left(\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right) = 0$

B. $\vec{r} \times \left(\vec{a} \times \vec{b} + \vec{b} \times \vec{c}\right) = \left[\vec{a} \ \ \vec{b} \ \ \vec{c}\right]$

C. $\vec{r} \,.\, \left(\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right) + \left[\vec{a} \ \ \vec{b} \ \ \vec{c}\right] = 0$

D. none of these

Answer: D

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20. The length of the perpendicular from the origin to the plane passing though three non-collinear points $\vec{a}, \vec{b}, \vec{c}$ is

A. $\dfrac{\left[\vec{a} \ \vec{b} \ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{c} \times \vec{a} + \vec{b} \times \vec{c}\right|}$

B. $\dfrac{2\left[\vec{a} \ \vec{b} \ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|}$

C. $\left[\vec{a} \ \vec{b} \ \vec{c}\right]$

D. none of these

Answer: A

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21. The equation of the plane containing the line $\dfrac{x - x_1}{l} = \dfrac{y - y_1}{m} = \dfrac{z - z_1}{n}$ is $a(x - x_1) + b(y - y_1) + c(z - z_1) = 0$, where $ax_1 + by_1 + cz_1 = 0$ b. $al + bm + cn = 0$ c. $\dfrac{a}{l} = \dfrac{b}{m} = \dfrac{c}{n}$ d. $lx_1 + my_1 + nz_1 = 0$

A. $ax_1 + by_1 + cz_1 = 0$

B. $al + bm + cn = 0$

C. $a/l = b/m = c/n$

D. $lx_1 + my_1 + nz_1 = 0$

Answer: B

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22. Find the shortest distance between the following pairs of lines whose Cartesian equation are:

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} and \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-5}{5}$$

A. $1/\sqrt{6}$

B. $1/6$

C. $1/3$

D. $1/\sqrt{3}$

Answer: A

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23. If the lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-1}{1}=\frac{z-6}{-5}$ are perpendicular, find the value of k.

A. $-7/10$

B. $-10/7$

C. -10

D. $10/7$

Answer: B

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24. The direction ratios of a normal to the plane passing throuhg (0,0,1) , (0,1,2) and (1,2,3) are proportional to

A. 0,1,-1

B. 1,0,-1

C. 0,0,-1

D. 1,0,1

Answer: A

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25. A variable plane is at a distance, k from the origin and meets the coordinates axis in A, B , C. Then, the locus of the centroid of $\triangle ABC$ is

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

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

C. $x^{-2}+y^{-2}+z^{-2}=16k^{-2}$

D. $x^{-2}+y^{-2}+z^{-2}=9k^{-2}$

Answer: D

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26. Find the equation of the plane perpendicular to the line $\frac{x-1}{2}=\frac{y-3}{-1}=\frac{z-4}{2}$ and passing through the origin.

A. $2x-y+2z-7=0$

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

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

D. $2x-y-z=0$

Answer: C

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27. Find the equation of the plane through the points (2,2,1) and (9,3,6) and $perpendic\underline{a}r \rightarrow thepla \ne$ 2x+6y+6z=1`

A. $3x+4y+6z=9$

B. $3x + 4y - 5z + 9 = 0$

C. $3x + 4y - 5z - 9 = 0$

D. none of these

Answer: C

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28. The equation of the plane containing the two lines $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{3}$ and $\frac{x}{-1} = \frac{y-2}{3} = \frac{z+1}{-1}$ is

A. $8x + y - 5z - 7 = 0$

B. $8x + y + 5z - 7 = 0$

C. $8x - y - 5z - 7 = 0$

D. none of these

Answer: A

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29. The direction ratios of the normal to the plane passing through the points $(1, -2, 3), (-1, 2, -1)$ and paralle to the line $\frac{x-2}{2} = \frac{y+1}{3} = \frac{z}{4}$ are proportional to

A. $2, 3, 4$

B. $4, 0, 7$

C. $-2, 0, -1$

D. $2, 0, -1$

Answer: D

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30. The equation of a plane through the point (2, 3, 1) and (4, -5, 3) and parallel to x- axis

A. $y - 4z = 7$

B. $y + 4z = 7$

C. $7 + 4z = -7$

D. $x + 4z = 7$

Answer: B

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31. The angle between the lines $\frac{x+4}{1} = \frac{y-3}{2} = \frac{z+2}{3}$ and $\frac{x}{3} = \frac{y}{-2} = \frac{z}{1}$ is

A. $\sin^{-1}\frac{1}{7}$

B. $\cos^{-1}\frac{2}{7}$

C. $\cos^{-1}\frac{1}{7}$

D. none of these

Answer: C

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32. The equation of the plane which is perpendicular bisector of the line joining the points $A(1, 2, 3)$ and $B(3, 4, 5)$ is

A. $x + y + z = 9$

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

C. $2 \times 3y + 4z = 9$

D. $2x + 3y + 4z = -9$

Answer: A

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33. If the position vectors of the point A and B are $3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} - 2\hat{j} - 4\hat{k}$ respectively. Then the eqaution of the plane through B and perpendicular to AB is

A. $2x + 3y + 6z + 28 = 0$

B. $3x + 2y + 6z = 28$

C. $2x - 3y + 6z + 28 = 0$

D. $3x - 2y + 6z = 28$

Answer: A

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Chapter Test

1. The length of the perpendicular from the origin to the plane passing through the point $\vec{a}$ and containing the line $\vec{r} = \vec{b} + \lambda \vec{c}$

A. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|}$

B. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c}\right|}$

C. $\dfrac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|}$

D. $\frac{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}{\left|\vec{c}\times\vec{a}+\vec{a}\times\vec{b}\right|}$

Answer: C

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2. The value of λ for which the lines $\frac{x-1}{1}=\frac{y-2}{\lambda}=\frac{z+1}{-1}$ and $\frac{x+1}{-\lambda}=\frac{y+1}{2}=\frac{z-2}{1}$ are perpendicular to each other is

A. 0

B. 1

C. -1

D. none of these

Answer: B

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3. The angle between the lines $\frac{x+4}{1}=\frac{y-3}{2}=\frac{z+2}{3}$ and $\frac{x}{3}=\frac{y}{-2}=\frac{z}{1}$ is

A. $\pi/2$

B. $\pi/3$

C. $\pi/6$

D. none of these

Answer: A

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4. The direction cosines of the line $6x-2=3y+1=2z-2$ are

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

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

C. $1, 2, 3$

D. none of these

Answer: B

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5. A line passes through two points $A(2, -3, -1)$ and $B(8, -1, 2)$.

The coordinates of a point on this lie at distance of 14 units from a are

A. $(14, 1, 5)$

B. $(-10, -7, 7)$

C. $(86, 25, 41)$

D. none of these

Answer: A

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6. The position vector of a point at a distance of $3\sqrt{11}$ units from $\hat{i} - \hat{j} + 2\hat{k}$ on a line passing through the points $\hat{i} - \hat{j} + 2\hat{k}$ and parallel to the vector $3\hat{i} + \hat{j} + \hat{k}$ is

A. $10\hat{i} + 2\hat{j} - 5\hat{k}$

B. $-8\hat{i} - 4\hat{j} - \hat{k}$

C. $8\hat{i} + 4\hat{j} + \hat{k}$

D. $-10\hat{i} - 2\hat{j} - 5\hat{k}$

Answer: B

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7. The line joining the points $6\vec{a} - 4\vec{b} + 4\vec{c}, -4\vec{c}$ and the line joining the points $-\vec{a} - 2\vec{b} - 3\vec{c}, \vec{a} + 2\vec{b} - 5\vec{c}$ intersect at

A. $-4\vec{a}$

B. $4\vec{a} - \vec{b} - \vec{c}$

C. $4\vec{c}$

D. none of these

Answer: D

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8. The image (or reflection) of the point (1,2-1) in the plane $\vec{r}.\left(3\hat{i}-5\hat{j}+4\hat{k}\right)=5$ is

A. $\left(73/5, -6/4, \frac{39}{25}\right)$

B. $(73/25, 6/5, 39/25)$

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

D. none of these

Answer: D

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9. The equation of the plane through the line of intersection of the planes $ax+by+cz+d=0$ and $dx+b'y+c'z+d'=0$ and parallel to the line $y=0$ and $z=0$ is

A. $(ab' - a'b)x + (bc' - b'c)y + (ad' - a'd) = 0$

B. $(ab' - a'b)x + (bc' - c'c)h + (ad' - a'd)z = 0$

C. $(ab' - a'b)y + (ac' - a'c)z + (ad' - a'd) = 0$

D. none of these

Answer: C

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10. Angle between the line $\vec{r} = \left(2\hat{i} - \hat{j} + \hat{k}\right) + \lambda\left(-\hat{i} + \hat{j} + \hat{k}\right)$ and the plane $\vec{r}.\left(3\hat{i} + 2\hat{j} - \hat{k}\right) = 4$ is

A. $\cos^{-1}\left(\frac{2}{\sqrt{42}}\right)$

B. $\cos^{-1}\left(\frac{-2}{\sqrt{42}}\right)$

C. $\sin^{-1}\left(\frac{2}{\sqrt{42}}\right)$

D. $\sin^{-1}\left(\frac{-2}{\sqrt{42}}\right)$

Answer: D

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11. The line through $\hat{i}+3\hat{j}+2\hat{k}$ and $\perp$ to the line $\overrightarrow{r}=\left(\hat{i}+2\hat{j}-\hat{k}\right)+\left(2\hat{i}+\hat{j}+\hat{k}\right)$ and

is

A. $\overrightarrow{r}=\left(\hat{i}+2\hat{j}-\hat{k}\right)+\lambda\left(-\hat{i}+5\hat{j}-3\hat{k}\right)$

B. $\overrightarrow{r}=\hat{i}+3\hat{j}+2\hat{k}+\lambda\left(\hat{i}-5\hat{j}+3\hat{k}\right)$

C. $\overrightarrow{r}=\hat{i}+3\hat{j}+2\hat{k}+\lambda\left(\hat{i}+5\hat{j}+3\hat{k}\right)$

D. $\overrightarrow{r}=\hat{i}+3\hat{j}+2\hat{k}+\lambda\left(-\hat{i}-5\hat{j}-3\hat{k}\right)$

Answer: B

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12. The distance of the point having position vector $-\hat{i}+2\hat{j}+6\hat{k}$ from the straight line passing through the point $(2, 3, -4)$ and parallel to the vector, $6\hat{i}+3\hat{j}-4\hat{k}$ is:

A. 7

B. 10

C. 9

D. none of these

Answer: D

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13. The position vector of the point in which the line joining the points $\hat{i}-2\hat{j}+\hat{k}$ and $3\hat{k}-2\hat{j}$ cuts the plane through the origin and the points $4\hat{j}$ and $2\hat{i}+\hat{k}$ is

A. $5\hat{i}-10\hat{j}+3\hat{k}$

B. $\frac{1}{5}\left(6\hat{i}-10\hat{j}+3\hat{k}\right)$

C. $-6\hat{i}+10\hat{j}-3\hat{k}$

D. none of these

Answer: B

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14. The two lines $\vec{r}=\vec{a}+\vec{\lambda}\left(\vec{b}\times\vec{c}\right)$ and $\vec{r}=\vec{b}+\mu\left(\vec{c}\times\vec{a}\right)$ intersect at a point where $\vec{\lambda}$ and μ are scalars then (A) $\vec{a},\vec{b},\vec{c}$ are non coplanar (B) $\left|\vec{a}\right|=\left|\vec{b}\right|=\left|\vec{c}\right|$ (C) $\vec{a}.\vec{c}=\vec{b}.\vec{c}$ (D) $\lambda\left(\vec{b}\,x\,\vec{c}\right)+\mu\left(\vec{c}\,x\,\vec{a}\right)=\vec{c}$

A. $\vec{a}\times\vec{c}=\vec{b}\times\vec{c}$

B. $\vec{a}.\vec{c}=\vec{b}.\vec{c}$

C. $\vec{b}\times\vec{a}=\vec{c}\times\vec{a}$

D. none of these

Answer: B

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15. Lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}$ and $\vec{r} = \vec{a}_2 + s\vec{b}$ will lie in a Plane if

A. $\vec{a}_1 \times \vec{a}_2 = \vec{0}$

B. $\vec{b}_1 \times \vec{b}_2 = 0$

C. $\left(\vec{a}_2 - \vec{a}_1\right) \times \left(\vec{b}_1 \times \vec{b}_2\right) = 0$

D. $\left[\vec{a}_1 \quad \vec{b}_1 \quad \vec{b}_1\right] = \left[\vec{a}_2 \quad \vec{b}_2 \quad \vec{b}_2\right]$

Answer: D

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16. Equation of a line passing through $(-1, 2, -3)$ and perpendicular to the plane $2x + 3y + z + 5 = 0$ is

A. $\dfrac{x-1}{-1}=\dfrac{y+2}{1}=\dfrac{z-3}{-1}$

B. $\dfrac{x+1}{-1}=\dfrac{y-2}{1}=\dfrac{z+3}{1}$

C. $\dfrac{x+1}{2}=\dfrac{y-2}{3}=\dfrac{z+3}{1}$

D. none of these

Answer: C

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17. Find the Vector and Cartesian equation of line passing through (1, -2, 3) and parallel to the planes $x-y+2z=5$ and $3x+2y-z=6$

A. $\dfrac{x-1}{-1}=\dfrac{y+2}{1}=\dfrac{z-3}{-1}$

B. $\dfrac{x-1}{2}=\dfrac{y+2}{3}=\dfrac{z-3}{1}$

C. $\dfrac{x+1}{-1}=\dfrac{y-2}{1}=\dfrac{z-3}{-1}$

D. none of these

Answer: A

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18. The distance between the planes given by

$\vec{r}.\left(\hat{i}+2\hat{j}-2\hat{k}\right)+5=0$ and $\vec{r}.\left(\hat{i}+2\hat{j}-2\hat{k}\right)-8=0$ is

A. 1 unit

B. $\frac{13}{3}$ units

C. 13 units

D. none of these

Answer: B

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19. Find shortest distance between the line

$\vec{r}=\left(5\hat{i}+7\hat{j}+3\hat{k}\right)+\lambda\left(5\hat{i}-6\hat{j}+2\hat{k}\right)$ and $\vec{r}=\left(9\hat{i}+13\hat{j}+15\hat{k}\right)+$

A. 10 units

B. 12 units

C. 14 units

D. none of these

Answer: C

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20. Find the shortest distance between the lines $\overrightarrow{r} = \left(\hat{i}i + 2\hat{j} + \hat{k}\right) + \lambda\left(2\hat{i} + \hat{j} = 2\hat{k}\right)$ and $\overrightarrow{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu\left(2\hat{i} + \hat{j}\right.$

.

A. 0

B. $\sqrt{101}/3$

C. $101/3$

D. none of these

Answer: B

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21. Find the equation of the plane through the points $(2, 2, 1)$ and $(9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z = 1$

A. $3x + 4y + 5z = 9$

B. $3x + 4y - 5z = 9$

C. $3x + 4y - 5z - 9 = 0$

D. none of these

Answer: B

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22. The equation of the plane containing the line $\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$ and origin is :

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

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

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

D. none of these

Answer: A

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23. Find ten equation of the plane passing through the point $(0, 7, -7)$ and containing the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$.

A. $x + y + z = 1$

B. $x + y + z = 2$

C. $x + y + z = 0$

D. none of these

Answer: C

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24. Equation of the plane passing through the point (1,1,1) and perpendicular to each of the planes$x+2y+3z=7$ and $2x-3y+4z=0$l is

A. $17x-2y+7z=12$

B. $17x+2y-7z=12$

C. $17x+2y+7z=12$

D. $17x-2y-7z=12$

Answer: B

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25. A variable plane at constant distance p form the origin meets the coordinate axes at P,Q, and R. Find the locus of the point of intersection of planes drawn through P,Q, r and parallel to the coordinate planes.

A. $\frac{a}{x}+\frac{b}{y}+\frac{c}{z}=1$

B. $ax+by+cz=1$

C. $\frac{a}{x}+\frac{b}{y}+\frac{c}{z}=-1$

D. $ax+by+cz=-1$

Answer: A

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26. The equation of the line of intersection of the planes $x+2y+z=3$ and $6x+8y+3z=13$ can be written as

A. $\frac{1-2x}{1}=\frac{4y-5}{3}=\frac{-z}{1}$

B. $\frac{x-2}{2}=\frac{y+1}{3}=\frac{z-3}{4}$

C. $\frac{x+2}{2}=\frac{y-1}{-3}=\frac{z-3}{4}$

D. $\frac{x+2}{2}=\frac{y+2}{3}=\frac{z-3}{4}$

Answer: A

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27. Find the Cartesian form the equation of the plane $\vec{r} = (s - 2t)\hat{i} + (3 - t)\hat{j} + (2s + t)\hat{k}$.

A. $2x - 5y - z - 15 = 0$

B. $2x - 5y + z - 15 = 0$

C. $2x - 5y - z + 15 = 0$

D. $2x + 5y - z + 15 = 0$

Answer: C

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28. If the planes $\vec{r}.\left(2\hat{i} - \lambda\hat{j} + 3\hat{k}\right) = 0$ and $\vec{r}.\left(\lambda\hat{i} + 5\hat{j} - \hat{k}\right) = 5$ are perpendicular to each other then value of $\lambda^2 + \lambda$ is

A. 0

B. 2

C. 3

D. 1

Answer: A

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29. The equation of the plane perpendicular to the line $\frac{x-1}{1}=\frac{y-2}{-1}=\frac{z+1}{2}$ and passing through the point (2,3,1), is

A. $\overrightarrow{r}.\left(\hat{i}+\hat{j}+2\hat{k}\right)=1$

B. $\overrightarrow{r}.\left(\hat{i}-\hat{j}+2\hat{k}\right)=1$

C. $\overrightarrow{r}.\left(\hat{i}-\hat{j}+2\hat{k}\right)=7$

D. $\overrightarrow{r}.\left(\hat{i}+\hat{j}-2\hat{k}\right)=10$

Answer: B

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30. Find the equation of a plane which passes through the point (3, 2, 0) and contains the line $\frac{x-3}{1} = \frac{y-6}{5} = \frac{z-4}{4}$.

A. $x - y + z = 1$

B. $x + y + z = 5$

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

D. $2x - y + z = 5$

Answer: A

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31. Determine the point in XY-plane which is equidistant from thee points $A(2, 0, 3), B(0, 3, 2) and C(0, 0, 1)$.

A. (1,2,3)

B. (-3,2,0)

C. (3,-2,0)

D. (3,2,0)

Answer: D

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