MATHS

BOOKS - OBJECTIVE RD SHARMA MATHS VOL I (HINGLISH)

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 $-4, 2 and 3$ 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. $\vec{r}.\left(2\hat{i} - \hat{j} + 2\hat{k}\right) = 7$

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

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. Convert the equation of the plane $\vec{r} = (\hat{i} - \hat{j}) + \lambda(-\hat{i} + \hat{j} + 2\hat{k}) + \mu(\hat{i} + 2\hat{j} + \hat{k})$ into scalar product form.

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

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

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

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

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

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

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 distance 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 : (1) $2\sqrt{14}$ (2) 8 (3) $3\sqrt{21}$ (4) 27

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 $\vec{r}.\left(3\hat{i}-\hat{j}+\hat{k}\right)=1$ and $\vec{r}.\left(\hat{i}+4\hat{j}-2\hat{k}\right)=2$ 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

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

and $\overrightarrow{r} = \left(\hat{i} + \hat{j} + \hat{k}\right) + \mu\left\{\left(-\sqrt{3} - 1\right)\hat{i} + \left(\sqrt{3} - 1\right)\hat{j} + 4\hat{k}\right\}$ 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. Fid the condition if lines $x = ay + b, z = cy + dandx = a'y + b', z = c'y + d'$ are perpendicular.

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) 0^0 (B) 90^0 (C) 45^0 (D) 30^0

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 $\vec{r} = \left(2\hat{i} - 3\hat{j} + 7\hat{k}\right) + \lambda\left(2\hat{i} + p\hat{j} + 5\hat{k}\right)$ 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 it $p =$

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. If the equation of the plane through the line of interesection of $\overrightarrow{r}.\left(2\hat{i}-3\hat{j}+\hat{k}\right)=1$ and $\overrightarrow{r}.\left(\hat{i}-\hat{j}\right)+4=0$ and perpendicular to $\overrightarrow{r}.\left(2\hat{i}+\hat{j}+\hat{k}\right)+8=0$ is $\overrightarrow{r}.\left(5\hat{i}-2\hat{j}-12\hat{k}\right)=\lambda$ Then $\lambda=$

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 2 3 from the point (3, 1, 1) is (A) 5x 11y + z = 17 (B) 2x y 3 2 1 (C) x + y + z = 3 (D) x 2y 1 2

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

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. The equation of the plane through the intersection of the planes $\vec{r}.\left(2\hat{i}+6\hat{j}\right)+12=0$ and $\vec{r}.\left(3\hat{i}-\hat{j}+4\hat{k}\right)=0$ and at a unit distance from the origin, is

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

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

$\frac{x-1}{1}=\frac{y+2}{-2}=\frac{z-4}{3} and \frac{x-2}{2}=\frac{y+1}{-1}=\frac{z+7}{-1} is: \frac{5}{\sqrt{83}}$ (2) $\frac{10}{\sqrt{74}}$ (3) $\frac{20}{\sqrt{74}}$ (4) $\frac{10}{\sqrt{83}}$

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

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

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

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 $(1, 2, 2)$ 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

$\overrightarrow{r} = \left(11\hat{i} - 2\hat{j} - 8\hat{k}\right) + \lambda\left(10\hat{i} - 4\hat{j} - 11\hat{k}\right)$ 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 : `

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 $\overrightarrow{r} = \left(6\hat{i} + 7\hat{j} + 7\hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} - 2\hat{k}\right)$ 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. The shortest distance between the lines

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

and $\overrightarrow{r} = \left(\hat{i} - \hat{j} + 2\hat{k}\right) + \mu\left(2\hat{i} + 4\hat{j} - 5\hat{k}\right)$ is

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 lines $\frac{x}{2} = \frac{y}{2} = \frac{z}{1}$ and $\frac{x+2}{-1} = \frac{y-4}{8} = \frac{z-5}{4}$ 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 $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})$ and the plane $ver.\ (2\hat{i} - \hat{j} + \hat{k}) = 4$

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. The value of m for which the line $\frac{x-1}{2}=\frac{y-1}{3}=\frac{z-1}{m}$ is perpendicular to normal to the plane $\vec{r}.\left(2\hat{i}+3\hat{j}+4\hat{k}\right)=0$ is

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

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

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

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

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

Answer: B

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68. If the line, $\dfrac{x-3}{2} = \dfrac{y+2}{-1} = \dfrac{z+4}{3}$ lies in the place, $lx + my - z = 9$, then $l^2 + m^2$ is equal to: (1) 26 (2) 18 (3) 5 (4) 2

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 $\overrightarrow{r} = \left(-2\hat{i} - 3\hat{j} + 4\hat{k}\right) + \lambda\left(3\hat{i} - 2\hat{j} - \hat{k}\right)$ and the point $\hat{i} + 2\hat{j} + 3\hat{k}$ is

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

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

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

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. the mirror image of point $(3, 1, 7)$ with respect to the plane $x - y + z = 3$ is P. then equation plane which is passes through the point P and contains the 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 $\vec{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(3\hat{i} - \hat{j}\right)$ and $\vec{r} = \left(4\hat{i} - \hat{k}\right) + \mu\left(2\hat{i} + 3\hat{k}\right)$, is

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

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

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

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 $\frac{x-2}{1}=\frac{y-3}{1}\Big)\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar then k can have (A) exactly two values (B) exactly thre values (C) any value (D) exactly one value

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 $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z+3}{\lambda^2}$ and $\frac{x-3}{1}=\frac{y-2}{\lambda^2}=\frac{z-1}{2}$ 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. line parallel to z-axis

B. plane parallel to xy-plane

C. line parallel to y-axis

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 space the equation $x^2 - 5x + 6 = 0$ represents

a. points b. planes c. curves d. pair of straight lines

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 $xy = c^{I2}, z = 0$ if c is equal to a. ± 1 b. $\pm 1/3$ 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 vector $\overrightarrow{a}$ is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i}+\hat{j}$ and thepane determined by the vectors $\hat{i}-\hat{j}, \hat{i}+\hat{k}$ then angle between $\overrightarrow{a}$ and $\hat{i}-2\hat{j}+2\hat{k}$ is = (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. none of these

Answer: B

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12. The distance between the line

$\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\vec{r}.(\hat{i} + 5\hat{j} + \hat{k}) = 5$ 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. Equation of the line passing through $(1, 1, 1)$ and parallel to the plane $2x + 3y + z + 5 = 0$ is

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

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

Answer: B

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14. 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: D

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15. For the $l: \frac{x-1}{3} = \frac{y+1}{2} = \frac{z-3}{-1}$ and the plane $P: x - 2y - z = 0$ of the following assertions the ony one which is true is (A) l lies in P (B) l is parallel to P (C) l is perpendiculr to P (D) none of these

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

$\overrightarrow{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$ is

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

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 $\vec{r}.\left(\hat{i}-2\hat{j}+3\hat{k}\right)=17$ divides the line joining points $-2\hat{i}+4\hat{j}+7\hat{k}$ and $3\hat{i}-5\hat{j}+8\hat{k}$ 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 straight 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. The plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 1$ cuts the co-ordinate axes in A, B, C: then the area of the ΔABC is

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 pair of vector $\vec{a}, \vec{b}$ and $\vec{c}, \vec{c} d$ 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 contaiing the lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}$ and $\vec{r} = \vec{a}_2 + \mu \vec{b}$ 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 coplanar points A, B, C, D are $(2 - x, 2, 2), (2, 2 - y, 2), (2, 2, 2 - z)$ and $(1, 1, 1)$ respectively then

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

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

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

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 points $\vec{a}$ and containing the line $\vec{r}=\vec{b}+\lambda\vec{c}$ is

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

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 $P\left(\vec{c}\right)$ from the line $\vec{r} = \vec{a} + \lambda\vec{b}$ is

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

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

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

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 $\dfrac{x-x_1}{l}=\dfrac{y-y_1}{m}=\dfrac{z-z_1}{n}$, where l, m, n are the direction cosines of the line, is

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

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

C.

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

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

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

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

D. none of these

Answer: B

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31. If $P = (0, 1, 0)$ and $Q = (0, 0, 1)$ 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 II 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 dr. of normal to the plane through $(1, 0, 0), (0, 1, 0)$ which makes an angle $\frac{\pi}{4}$ with 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. The plane which passes through the point $(3, 2, 0)$ and the line $\frac{x-3}{1} = \frac{y-6}{5} = \frac{z-4}{4}$ is a. $x - y + z = 1$ b. $x + y + z = 5$ c. $x + 2y - z = 1$ d. $2x - y + z = 5$

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 $\frac{x-1}{k} = \frac{y-4}{1} = \frac{z-5}{1}$ are coplanar if k=?

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 $a, b, c and a', b', c'$ 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 $O(0, 0, 0), A(1, 2, 1), B(2, 1, 3), and C(-1, 1, 2)$, then angle between face $OAB and ABC$ will be a. $\cos^{-1}\left(\frac{17}{31}\right)$ b. 30^0 c. 90^0 d. $\cos^{-1}\left(\frac{19}{35}\right)$

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

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 directional cosines prontional to $2, 1, 2$ meets each of the lines $x = y + a = z$ and $x + a = 2y = 2z$. The coordinates of each of the points deintersection 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 straighat lines $x = 1 + s, y = -3 - \lambda s, z = 1 + \lambda s$ and $x = \frac{t}{2}, y = 1 + t, z = 2 - t$ with parameters s and t respectively, are coplanar, then λ equals (A) $-\frac{1}{2}$ (B) -1 (C) -2 (D) 0

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 vector $\vec{a}$ is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i} + \hat{j}$ and thepane determined by the vectors $\hat{i} - \hat{j}, \hat{i} + \hat{k}$ then angle between $\vec{a}$ and $\hat{i} - 2\hat{j} + 2\hat{k}$ is = (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

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

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

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

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

Answer: A

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55. The 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. $\frac{10}{3}$

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

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

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

Answer: C

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56. If the angle θ between 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 $\sin\theta=\frac{1}{3}$, the value of λ is

A. $-4/3$

B. $3/4$

C. $-3/5$

D. $5/3$

Answer: D

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57. then 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. 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 (1) -5 (2) 5 (3) 2 (4) -2

A. 2

B. -2

C. -5

D. 5

Answer: C

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61. Let the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lie in the plane $x+3y-\alpha z+\beta=0. Then(\alpha, \beta) equals (A)$(6,-17)$(B)$(-6,7)$(C)$(5,15)$(D)$ (-5,5)`

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

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

The unit vector perpendicualr to both 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 $\overrightarrow{P}Q$ 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 passes through (1,-2,1) and is perpendicualr to two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$, then 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 vector parallel to line of intersection of planes P_1 and P_2 through origin. If $P_1$is parallel to the vectors $2\bar{j}+3\bar{k}$ and $4\bar{j}-3\bar{k}$ and P_2 is parallel to $\bar{j}-\bar{k}$ and $3\bar{I}+3\bar{j}$, then the angle between $\overrightarrow{a}$ and $2\bar{i}+\bar{j}-2\bar{k}$ 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 $\vec{a}=\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}, \hat{k}\times\left(\hat{k}\times\vec{a}\right)=\vec{0}$ 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. $1/9$

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 place 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 $\frac{x}{2} = \frac{y}{4} = \frac{z}{2}$ 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 $A[xyz] = [100]$ 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 $x\frac{y-1}{2}=\frac{z-3}{\lambda}$ and the plane $x+2y+3z=4$ is $\cos^{-1}\left(\sqrt{\frac{5}{14}}\right), then\lambda=$ (A) $\frac{2}{5}$ (B) $\frac{5}{3}$ (C) $\frac{2}{3}$ (D) $\frac{3}{2}$

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 satistying $[a,b,c]\begin{bmatrix}1&9&7\\8&2&7\\7&3&7\end{bmatrix}=[0,0,0]$ Let ω be a solution of $x^3-1=0$ with $Im(\omega)>0. If a=2$ with b nd c satisfying (E) then the vlaue of $\frac{3}{\omega^a}+\frac{1}{\omega^b}+\frac{3}{\omega^c}$ is equa to (A) -2 (B) 2 (C) 3 (D) -3

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 equation of the perpendicular from point $(3, -1, 11)$ to line $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$. Also, find the coordinates of foot of perpendicular and the length of perpendicular.

A. $\sqrt{33}$

B. $\sqrt{53}$

C. $\sqrt{66}$

D. $\sqrt{29}$

Answer: B

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77. The point P is the intersection of the straight line joining the points $Q(2, 3, 5)$ and $R(1, -1, 4)$ with the plane $5x - 4y - z = 1$. If S is the

foot of the perpendicular drawn from the point $T(2, 1, 4)$ to QR, then the length of the line segment PS is (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{2}$ (C) 2 (D) $2\sqrt{2}$

A. $1/\sqrt{2}$

B. $\sqrt{2}$

C. 2

D. $2\sqrt{2}$

Answer: A

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78. If the straight lines x 1 y 1 z 2 k 2 and x 1 y 1 z 5 2 k are coplanar, then the plane (s) containing these two lines is (are) (A) y + 2z = 1 (B) y + z = 1 (C) y z = 1 (D) y 2z = 1 55

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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80. Perpendiculars are drawn from points on the line $\frac{x+2}{2}=\frac{y+1}{-1}=\frac{z}{3}$ to the plane $x+y+z=3$ The feet of perpendiculars lie on the line (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) $\frac{x}{2}=\frac{y-1}{-7}=\frac{z-2}{5}$

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. A line l passing through the origin is perpendicular to the lines

$l_1:(3+t)\hat{i}+(-1+2t)\hat{j}+(4+2t)\hat{k}, \infty<t<\infty, l_2:(3+s)\hat{i}+(3+2$

then the coordinates of the point on l_2 at a distance of $\sqrt{17}$ from the point of intersection of $l \& l_1$ is/are:

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 vector $V = \left\{a\hat{i} + b\hat{j} + c\hat{k}; a, bc \in \{-1, 1\}\right\}$. Three non-coplanar vectors can be chosen from V is 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 (1) $\frac{x+3}{3}=\frac{y-5}{1}=\frac{z-2}{-5}$ (2) $\frac{x+3}{-3}=\frac{y-5}{-1}=\frac{z+2}{5}$ (3) $\frac{x-3}{3}=\frac{y+5}{1}=\frac{z-2}{-5}$ (3) $\frac{x-3}{-3}=\frac{y+5}{-1}=\frac{z-2}{5}$

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

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 $2x + y + z - 1 = 0 = 3x + y + 2z - 2$ and $x = y = z$, 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 OPQR of the pyramid is asqu are 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 $\overrightarrow{r} = \hat{k} + \lambda\left(\hat{i} + \hat{j}\right)$ an $\overrightarrow{r} = -\hat{k} + \mu\left(\hat{i} - \hat{j}\right)$, 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 $\vec{r} = 6\vec{a} - \vec{c} + \lambda\left(2\vec{c} - \vec{a}\right)$ and $\vec{r} = \vec{a} - \vec{c} + \mu\left(\vec{a} + 3\vec{c}\right)$ 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 1: The lines $\frac{x-1}{1}=\frac{y}{-1}=\frac{z+1}{1}$ and $\frac{x-2}{2}=\frac{y+1}{2}=\frac{z}{3}$ are coplanar and the equation of the plnae containing them is $5x+2y-3z-8=0$

Statement 2: The line $\frac{x-2}{1}=\frac{y+1}{2}=\frac{z}{3}$ is perpendicular to the plane $3x+5y+9z-8=0$ 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 $\frac{x+7}{5}=\frac{y+t}{4}=\frac{z-2}{1}$

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. 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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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 1: 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 2: The plane $x - y + z = 5$ bisects 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-1 : 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-2 : The line : $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ bisects the line segment joining A(1, 0, 7) and B(1, 6, 3). Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1. Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1. Statement-1 is true, Statement-2 is false. Statement-1 is false, Statement-2 is true.

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 $\frac{x-1}{-2}=\frac{y-1}{-2}=\frac{z-1}{4}$ 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. $\frac{13}{\sqrt{74}}$

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

C. 13

D. none of these

Answer: A

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

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

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

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

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

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

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 $\overrightarrow{r}\cdot\left(5\hat{i}+2\hat{j}-7\hat{k}\right)=0$ 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 $\vec{r}.\left(4\hat{i} - 12\hat{j} - 3\hat{k}\right) - 7 = 0$, 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. Find the vector equation to the plane through the point $(2, 1, -1)$ passing through the line of intersection of the planes $\vec{r}.\left(\hat{i} + 3\hat{j} - \hat{k}\right) = 0ad\vec{r}.\left(\hat{j} + 2\hat{k}\right) = 0$

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 $\vec{r} = 2\hat{i} + \lambda\left(\hat{j} - \hat{k}\right)$ and perpendicular to the plane $\vec{r}.\left(\hat{i} + \hat{k}\right) = 3$ is

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

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

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

D. none of these

Answer: A

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

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

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 contaiing the lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}$ and $\vec{r} = \vec{a}_2 + \mu \vec{b}$ is

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

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

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

D. none of these

Answer: A

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13. 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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14. 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. $\vec{r}.(\hat{i}-\hat{j}-\hat{k})=0$

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

D. none of these

Answer: B

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15. The Cartesian equation of the plane $\vec{r}=(1+\lambda-\mu)\hat{i}+(2-\lambda+\mu)\hat{j}+(3-2\lambda+2\mu)\hat{k}$ is

A. $2x+y=5$

B. $2x-y=5$

C. $2x+z=5$

D. $2x-z=5$

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 $\vec{r}.\left(\hat{i}\left|5\hat{j}\right|\hat{k}\right) = 5$ is

:

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

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

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 $\vec{r}.\vec{n} = 0 atp.$ 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. $\vec{a} - \frac{\vec{a}.\vec{n}}{\vec{b}.\vec{n}}$

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

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 $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$ 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. $\frac{a}{l}=\frac{b}{m}=\frac{c}{n}$ 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 lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4} and \frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$.

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 axes is A,B,C. Then the locus of the centroid of ΔABC 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 $perpendic\underline{a}r \rightarrow thepla \neq$ 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 $\frac{x}{3}=\frac{y-1}{-2}=\frac{z}{1}$ 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 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. $2x + 3y + 6z + 28 = 0$

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 points $\overrightarrow{a}$ and containing the line $\overrightarrow{r} = \overrightarrow{b} + \lambda \overrightarrow{c}$ is

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

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

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

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

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 $\frac{x}{3}=\frac{y-1}{-2}=\frac{z}{1}$ is
$\frac{x-2}{3}=\frac{y+1}{-2}, z=2$ and $\frac{x-1}{1}=(2y+3).3=\frac{z+5}{2}$ 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 $a'x+b'y+c'z+d'=0$ 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 perpendicular to the lines $\overrightarrow{r} = \left(\hat{i} + 2\hat{j} - \hat{k}\right) + \lambda\left(2\hat{i} + \hat{j} + \hat{k}\right)$ and $\overrightarrow{r} = \left(2\hat{i} + 6\hat{j} + \hat{k}\right) + \mu\left(\hat{i} + 2\hat{j} + 3\hat{k}\right)$ 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 from the point $-\hat{i} + 2\hat{j} + 6\hat{k}$ to the straight line 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) *[Math Processing Error]*

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. The lies $\vec{r} = \vec{a}_1 + \lambda \vec{b}_1$ and $\vec{r} - \vec{a}_2 + \mu \vec{b}_2$ are coplanar 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. $\left[\vec{a}_1 \ \vec{b}_1 \ \vec{b}_1\right] = \left[\vec{a}_2 \ \vec{b}_2 \ \vec{b}_2\right]$

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

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

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

D. none of these

Answer: C

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

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

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

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

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

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

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 $\vec{r} = (\hat{i}i + 2\hat{j} + \hat{k}) + \lambda(2\hat{i} + \hat{j} = 2\hat{k})$ and $\vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu(2\hat{i} + \hat{j}$

.

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 $perpendic\underline{a}r \rightarrow thepla \neq$ 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

$\overrightarrow{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} + \hat{j} + 4\hat{k}\right)$ is

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

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

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

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. $\frac{1 - 2x}{4} = \frac{4y \pm 5}{12} = \frac{-z}{4}$

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 from 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. $\vec{r}\cdot\left(\hat{i}+\hat{j}+2\hat{k}\right)=1$

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

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

D. $\vec{r}\cdot\left(\hat{i}+\hat{j}-2\hat{k}\right)=10$

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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