CHAPTER-12

INTRODUCTION TO 3D

02 MARK TYPE QUESTIONS

| Q. NO | **QUESTION** | **MARK** |
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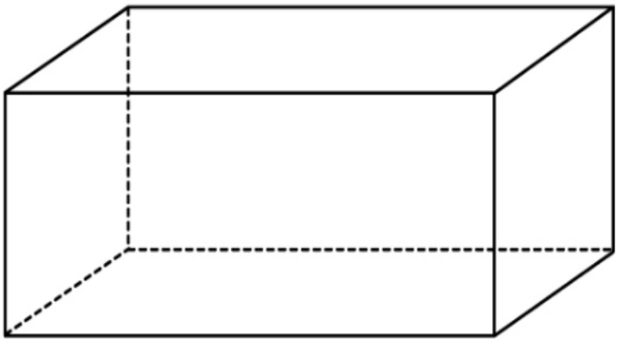
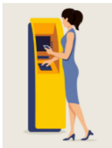
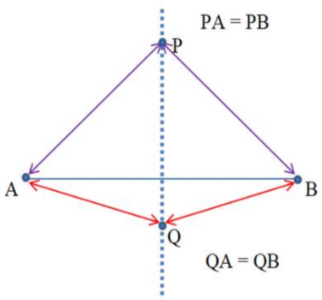
| 1. | <br>If a rectangular parallelopiped is formed by planes drawn through the points (2, 3, 5) and (5, 9, 7) parallel to the coordinate planes, then find the length of edges of a parallelopiped and the length of the diagonal. | 2 |
| 2. | Ritika starts walking from his house to shopping mall. Instead of going to the mall directly, she first goes to a ATM, from there to her daughter school and then reaches the mall. In the diagram A, B, C and D represents the coordinates of house, ATM, school and mall respectively.<br>(a) Find the distance between house (A) and ATM(B).<br>(b) Find the distance between ATM(B) and school (C).<br>A(1,1,1)  B(-2,4,1) <br>C(-1,5,5)  D(2,2,2)  | 2 |
| 3. | In today's world, children want to know how one concept can be related with other or in other words how we can integrate different fields of knowledge. When we talk about 3-dimensional geometry, we took for similarities and how one concept can be represented in different forms.<br><br>Find the equation of the set of points which are equidistant from the points A (1, 2, 3) and B (3, 2, –1). | 2 |
| 4. | The government of india is planning to fix a hoarding board at the face of a building on the road of a busy market for the awareness on COVID-19 protocol. Ram, Robert and Rahim are | 2 |

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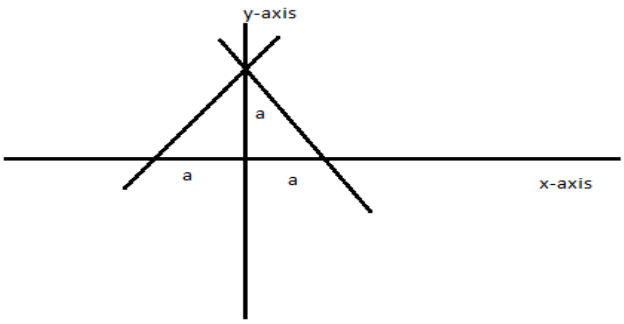
| | the three engineers who are working on this project. A is considered to be a person viewing the hoarding board 20metres away from the building, standing at the edge of a pathway nearby. Ram, Robert and Rahim suggested to firm to place the hoarding board at three different locations namely P, Q and R. we have to prove<br>that P (3, 2, –4), Q (5, 4, –6) and R (9, 8, –10) are collinear. Find the ratio in which Q divides PR. | |
| 5. | Teacher ask a question to the students, He said three trees are at the position of points A, B and C. Prove that the points: A (0, 7, 10), B (–1, 6, 6) and C (–4, 9, 6) are the vertices of a right-angled triangle. | 2 |
| 6. | The top and bottom line of a designer wall is in the form of a square. If the lines are along $5x - 12y + 26 = 0$ and $5x - 12y - 65 = 0$ then find area of the wall ? | 2 |
| 7. | If the image of bird at (3, 8) with respect to a line mirror $ax + 3y - 7 = 0$ is the point (-1, - 4) then find the value of a?<br> | 2 |
| 8. | If the lines $y = 3x + 1$ and $2y = x + 3$ are equally inclined to the line $y = mx + 4$, find the value of m.<br> | 2 |
| 9. | If the image of KAPIL's position at (2, 1) in a line mirror is (4, 3), then find the equation of the line mirror.<br> | 2 |
| 10. | At Indo-China Border Landmines are planted in the form of a Square. With respect to point of intersection of the lines x = 0, y = 0, x = 1 and y = 1 , find the equations of diagonals of the square ? | 2 |

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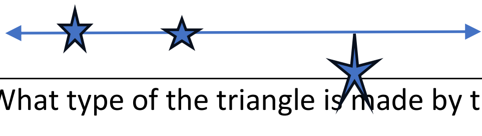
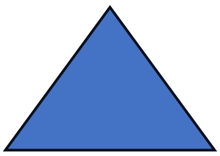
| 11. | Find the point on x-axis which is equidistant from the points A(0,3,2) and B(5,0,4) | 2 |
| 12. | Find the length of the perpendicular drawn from the point P(2,3,4) on Y-axis | 2 |
| 13. | Using distance formula, check whether the points A(0,3,5) B(1,0,3) and (7,0,1) are collinear or not. | 2 |
| 14. | Find the length of the longest piece of a string that can be stretched straight in a rectangular room whose dimensions are 13,10 and 8 unit. | 2 |
| 15. | Find the distance between the points P ( 2,4,5 ) and ( 1,4,3) | 2 |
| 16. | Let L,M,N be the feet of the perpendiculars drawn from a point P(3,4,5) on the X,Y and Z-axes respectively. Find the coordinate of L,M and N. | 2 |
| 17. | Find the point on X axis which is equidistant from the points A(3,2,2) and B(5,5,4). | 2 |
| 18. | Find the centroid of a triangle, the mid-point of whose sides are D(1,2,-3),E(3,0,1) and F(-1,1,-4) | 2 |
| 19. | Find the vertex of triangle whose centroid is origin and two vertices are (2, 4, 6) and (0,-2, 5). | 2 |
| 20. | Show that D(-1,4,-3) is the circumcentre of $\Delta ABC$ with vertices A(3,2,-5), B(-3,8,-5) and C(-3,2,1) | 2 |
| 21. | Given that P (3, 2, –4), Q (5, 4, –6) and R (9, 8, –10) are collinear. Find the ratio in which Q divides PR. | 2 |
| 22. | Find the equation of the set of the points P such that its distances from the points A (3,4,-5) and B (-2, 1, 4) are equal. | 2 |
| 23. | Are the points A (3, 6, 9), B (10, 20, 30) and C (25, – 41, 5), the verticesof a right angled triangle? | 2 |
| 24. | Two vertices of a parallelogram are $(2,5,-3)$ and $(3,7,-5)$; if its diagonals meet at $(4,3,3)$; find the coordinates of the other two vertices. | 2 |
| 25. | Find the equation of the curve formed by the set of all those points the sum of whose distances from the points $A(4,0,0)$ and $B(-4,0,0)$ is 10units. | 2 |
| 26. | For what value of a the points (a,-1,3),(2,-4,5) and (5,-13,11) are collinear?  | 2 |
| 27. | What type of the triangle is made by the point (1,2,3), (2,3,1) and (3,1,2)?  | 2 |

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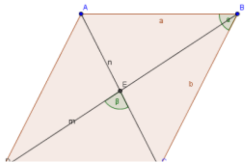
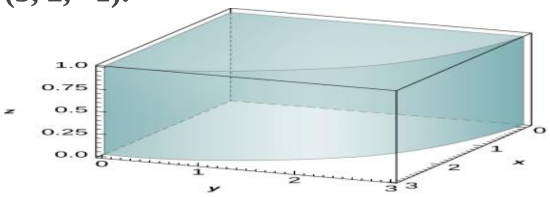
| 28. | If three consecutive vertices of parallelogram are (3, -1,2), (1,2, -4) and (-1,1,2), find the fourth  vertex? | 2 |
| 29. | **Find the equation of the set of points which are equidistant from the points (1, 2, 3) and (3, 2, –1).**   | 2 |
| 30. | If A (-2,2,3) and B (13, -3,13) are two points. Find the locus of a point P which moves in such a way that 3PA = 2PB. | 2 |
| 31. | If A (1, -3, 2) and B (-2, 5, -1) are the endpoints of a diameter of a sphere, find the coordinates of its center. | 2 |
| 32. | Find the locus of the point which is equidistant from the point A (0,2,3) and B (2, -2,1) | 2 |
| 33. | Determine the ratio in which the line joining A (2, 1, -3) and B (4, -1, 5) is divided by the x y-plane. | 2 |
| 34. | If the points A(1, 2, 3), B(4, 5, 6), and C(7, 8, 9) are collinear, then the value of k in the equation B = A + k(C - A) is | 2 |
| 35. | Find the coordinates of the foot of the perpendicular drawn from the point A (4, -3, 5) to the y-z plane | 2 |

**ANSWERS:**

| Q. NO | ANSWER | MARKS |
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| 1. | Let A = (2, 3, 5), B = (5, 9, 7)<br>To find the length of the edges of a parallelopiped = 5 – 2, 9 – 3, 7 – 5<br>It means that 3, 6, 2.<br>Now, to find the length of a diagonal = $\sqrt{(3^2 + 6^2 + 2^2)}$<br>= $\sqrt{(9+36+4)}$ = $\sqrt{49}$ = 7<br>Therefore, the length of a diagonal of a parallelopiped is 7 units. | 2 |
| 2. | $(i)\ A = (1,1,1)\ and\ B = (-2,4,1)$<br>AB=$\sqrt{(-2-1)^2 + (4-1)^2 + (1-1)^2}$<br>= $\sqrt{(-3)^2 + 3^2 + 0}$ = $\sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$<br>(i) $B = (-2,4,1)\ and\ C = (-1,5,5)$<br>$BC = \sqrt{(-1+2)^2 + (5-4)^2 + (5-1)^2}$<br>$= \sqrt{1+1+16} = \sqrt{18} = 3\sqrt{2}$ | 2 |
| 3. | **Solution:**<br>Assume that P (x, y, z) be the point that is equidistant from two points A (1, 2, 3) and B(3, 2, –1).<br>Thus, we can say that, PA = PB<br>Take square on both the sides, we get<br>$PA^2 = PB^2$<br>It means that,<br>$(x-1)^2 + (y-2)^2+(z-3)^2 = (x-3)^2+(y-2)^2+(z+1)^2$<br>$\Rightarrow x^2 - 2x + 1 + y^2 - 4y + 4 + z^2 - 6z + 9 = x^2 - 6x + 9 + y^2 - 4y + 4 + z^2 + 2z + 1$<br>Now, simplify the above equation, we get:<br>⇒ –2x –4y – 6z + 14 = –6x – 4y + 2z + 14<br>⇒ – 2x – 6z + 6x – 2z = 0<br>⇒ 4x – 8z = 0<br>⇒ x – 2z = 0<br>Hence, the required equation for the set of points is x – 2z = 0. | 2 |
| 4. | Assume that the point Q (5, 4, –6) divides the line segment joining points P (3, 2, –4) and R (9, 8, –10) in the ratio k:1.<br>Therefore, by using the section formula, we can write it as:<br>(5, 4, -6) = [ (k(9)+3)/(k+1), (k(8)+2)/(k+1), (k(-10)-4)/(k+1)]<br>⇒(9k+3)/(k+1) = 5<br>Now, bring the L.H.S denominator to the R.H.S and multiply it<br>⇒9k+3 = 5k+5<br>Now, simplify the equation to find the value of k.<br>⇒4k= 2<br>⇒k = 2/4<br>⇒k=½<br>Therefore, the value of k is ½. | 2 |

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| | Hence, the point Q divides PR in the ratio of 1:2. | |
| 5. | Let the given points be A = (0, 7, 10), B = (–1, 6, 6), and C = (–4, 9, 6)<br>Now, find the distance between the points<br>**Finding for AB:**<br>AB = $\sqrt{[(-1-0)^2 + (6-7)^2 + (6-10)^2]}$<br>AB = $\sqrt{[(-1)^2 + (-1)^2 + (-4)^2]}$<br>AB = $\sqrt{(1+1+16)}$<br>AB = $\sqrt{18}$<br>AB = $3\sqrt{2}$ …. (1)<br>**Finding for BC:**<br>BC= $\sqrt{[(-4+1)^2 + (9-6)^2 + (6-6)^2]}$<br>BC = $\sqrt{[(-3)^2 + (3)^2 + (-0)^2]}$<br>BC = $\sqrt{(9+9)}$<br>BC = $\sqrt{18}$<br>BC = $3\sqrt{2}$ …..(2)<br>**Finding for CA:**<br>CA= $\sqrt{[(0+4)^2 + (7-9)^2 + (10-6)^2]}$<br>CA = $\sqrt{[(4)^2 + (-2)^2 + (4)^2]}$<br>CA = $\sqrt{(16+4+16)}$<br>CA = $\sqrt{36}$<br>CA = 6 …..(3)<br>Now, by Pythagoras theorem,<br>$AC^2 = AB^2 + BC^2$ …..(4)<br>Now, substitute (1),(2), and (3) in (4), we get:<br>$6^2 = (3\sqrt{2})^2 + (3\sqrt{2})^2$<br>36 = 18+18<br>36 = 36<br>The given points obey the condition of Pythagoras Theorem.<br>Hence, the given points are the vertices of a right-angled triangle. | 2 |
| 6. | Each side = distance between parallel lines =(26+65)/$\sqrt{5^2 + 12^2}$ =7<br>Area of the square $(side)^2$=49 | 1<br>1 |
| 7. | Midpoint of AB (where A(3,8) and B(-1,-4) ) is C(1,2)<br>Eq. of perpendicular bisector ax+3y-7=0 passes through C(1,2)<br>Hence a=1 | 1<br><br>+1 |
| 8. | Angle between lines y = 3x + 1 and y = mx + 4 is equal to Angle between lines 2y = x + 3 and y = mx + 4<br>$\left\lvert \frac{3-m}{1+3m} \right\rvert = \left\lvert \frac{m-1/2}{1+m/2} \right\rvert$ => $\frac{3-m}{1+3m} = \pm \frac{m-1/2}{1+m/2}$ => $5m^2$=-5 or $7m^2$-2m-7=0<br>⇨ m=$\frac{1\pm5\sqrt{2}}{7}$ | <br>1<br>+1 |
| 9. | Mid point of A(2,1) & B(4,3) is C(3,2) m(AB)=1,=>m(perpendicular)=-1 Eq. of perpendicular bisector y-2=-1(x-3) => x+y-5=0 | 1<br>+1 |
| 10. | Vertices are intersection of lines x=0,y=0,x=1 & y=1<br>O(),A(1,0),B(1,1) & C (0,1)<br>Eq. of diagonals OB y={(1-0)/(1-0)}x i.e. y=x<br>Eq. of diagonal AC y-0={(1-0)/(0-1)}(x-1) i.e. x+y+1=0 | <br>1<br><br>+1 |

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| 11. | Let P(x,0,0) be the point on x-axis which is equidistant from the point A(0,3,2) and B(5,0,4)<br>AP=BP<br>$\sqrt{(X-O)^3+(0-3)^2+(0-2)^2}$<br>= $\sqrt{(X-5)^2+(0-0)^2+(0-4)^2}$<br>Squaring on both sides<br>= $(x-0)^2+9+4 = (x-5)^2+0+16$<br>= $x^2 +13 = x^2 +25-10x+16$<br>= 10x = 28<br>= x = $\frac{14}{5}$<br>Hence the required point is ( $\frac{14}{5}$, 0,0) | 2 |
| 12. | Given point is P ( 2,3,4 )<br>Let Q be the foot of perpendicular drawn from the point P( 2,3,4 ) on y-axis.<br>Then the coordinates of Q are ( 0,3,0 )<br>Hence, the length of the perpendicular is given by<br>PQ = $\sqrt{(0-2)^2+(3-3)^2+(0-4)^2}$<br>= $\sqrt{4+0+16}$ = $\sqrt{20}\ units.$ | 2 |
| 13. | Given points are A(0,3,5) B(1,0,3) and C(7,0,1)<br>Then AB= $\sqrt{(1-0)^2+(0-3)^2+(3-5)^2}$<br>= $\sqrt{1+9+4}$ = $\sqrt{14}$<br>BC = $\sqrt{(7-1)^2+(0-0)^2+(1-3)^2}$<br>= $\sqrt{36+0+4}$ = $\sqrt{40}$ = $2\sqrt{10}$<br>AC = $\sqrt{(7-0)^2+(0-3)^2+(1-5)^2}$<br>= $\sqrt{49+9+16}$ = $\sqrt{74}$<br>Since, AB + BC is not equal to AC.<br>Hence, the points A,B and C are not collinear. | 2 |
| 14. | Since given dimensions are a=10 , b= 13 and c= 8<br>∴ Required length of the string is $\sqrt{a^2+b^2+c^2}$<br>i.e., $\sqrt{(10)^2+(13)^2+(8)^2}$<br>i.e., $\sqrt{100+169+64}$ = $\sqrt{333}$ units<br>i.e., the length of the longest piece of a string that can be stretched straight in a rectangular room with dimensions 10,13 and 8 are $\sqrt{333}$ units | 2 |
| 15. | Given points are P( 2,4,5 ) and Q ( 1,4,3 )<br>Then, the distance between P and Q is given by<br>PQ = $\sqrt{(2-1)^2+(4-4)^2+(5-3)^2}$<br>= $\sqrt{1+0+4}$ = $\sqrt{5}$ units | 2 |
| 16. | L(3,0,0): M(0,4,0) and N(0,0,5) | 2 |
| 17. | Let the point on X-axis be P(x,0,0) | 2 |

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| | Then $(x-3)^2+(0-2)^2+(0-2)^2=(x-5)^2+(0-5)^2+(0-4)^2$<br>(49/4,0,0) | |
| 18. | The centroid of a triangle is equal to the centroid of the triangle formed by mid-points of its sides. therefore The centroid of a triangle is (1,1,-2) | 2 |
| 19. | $0 = \frac{x+2+0}{3} \Rightarrow x = -2$ ; $0 = \frac{y+4-2}{3} \Rightarrow y = -2$ ; $0 = \frac{z+6+5}{3} \Rightarrow z = -11$<br>Therefore Third vertex is (-2,-2,-11) | 2 |
| 20. | Show that AD=BD=CD | 2 |
| 21. | Assume that the point Q (5, 4, –6) divides the line segment joining points P (3, 2, –4) and R (9, 8, –10) in the ratio k:1.<br><br>Therefore, by using the section formula, we can write it as:<br><br>(5, 4, -6) = [ {k(9)+3}/(k+1), {k(8)+2}/(k+1), {k(-10)-4}/(k+1)]<br>⇒(9k+3)/(k+1) = 5<br>⇒9k+3 = 5k+5<br>⇒4k= 2<br>⇒k = 2/4<br>⇒k=½<br><br>Therefore, the value of k is ½.<br>Hence, the point Q divides PR in the ratio of 1:2 | 2 |
| 22. | If P (x, y, z) be any point such that PA = PB.<br><br>√{(x - 3) ^ 2 + (y - 4) ^ 2 + (z + 5) ^ 2} = √{(x + 2) ^ 2 + (y - 1) ^ 2 + (z - 4) ^ 2)}<br>or, 10x + 6y - 18z - 29 = 0 | 2 |
| 23. | By the distance formula, we have<br>$AB^2 = (10 - 3)^2 + (20 - 6)^2 + (30 - 9)^2$<br>= 49 + 196 + 441<br>= 686<br>$BC^2 = (25 - 10)^2 + (-41 - 20)^2 + (5 - 30)^2$<br>= 225 + 3721 + 625<br>= 4571<br>CA2 $= (3 - 25)^2 + (6 + 41)^2 + (9 - 5)^2$<br>= 484 + 2209 + 1<br>= 2709<br>We find that , $CA^2 + AB^2 \neq BC^2$s<br>.Hence, the triangle ABC is not a right angled triangle. | 2 |
| 24. | Since the diagonals of a parallelogram bisect each other, the point $O(4,3,3)$ is the mid points of the diagonals.Let the other two vertices of the parallelogram be $C(x_1, y_1, z_1)$ and $D(x_2, y_2, z_2) A(2,5,-3) and\ B(3,7,-5)$<br>Since $O(4,3,3)$ is the mid point of AC, $\frac{x_1+2}{2} = 4$ or, $x_1 = 6$ $\frac{y_1+5}{2} = 3$ or, | 2 |

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| | $y_1 = 1$<br>$\frac{z_1-3}{2} = 3$ or, $z_1 = 9$<br>Again, $O(4,3,3)$ is the mid point of the diagonal<br>BD, hence we have $\frac{x_2+3}{2} = 4$ or, $x_2 = 5$ $\frac{y_2+7}{2} = 3$ or $y_2 = -1$ $\frac{z_2-5}{2} = 3$ or<br>$z_2 = 11$<br>Therefore the other two vertices of the parallelogram ABCD are<br>$C(6,1,9) and\ D(5,-1,11)$. | |
| 25. | Let $P(x, y, z)$ be an arbitrary point on the given curve. Then<br>$PA + PB = 10$<br>or, $\sqrt{(x-4)^2 + y^2 + z^2} + \sqrt{(x+4)^2 + y^2 + z^2} = 10$<br>or, $\sqrt{(x-4)^2 + y^2 + z^2} = 10 - \sqrt{(x+4)^2 + y^2 + z^2}$<br>On squaring both sides,<br>$(x+4)^2 + y^2 + z^2$<br>$= 100 + (x-4)^2 + y^2 + z^2 - 20\sqrt{(x+4)^2 + y^2 + z^2}$<br>or, $16x = 100 - 20\sqrt{(x+4)^2 + y^2 + z^2}$<br>or, $5\sqrt{(x+4)^2 + y^2 + z^2} = (25 - 4x)$<br>or, $25[(x-4)^2 + y^2 + z^2] = 625 + 16x^2 - 200x$<br>or, $9x^2 + 25y^2 + 25z^2 - 225 = 0$<br>Hence the required equation of the curve is $9x^2 + 25y^2 + 25z^2 - 225 = 0$. | 2 |
| 26. | a=1 | |
| 27. | Equilateral triangle | |
| 28. | (1, -2,8) | |
| 29. | x-2z=0 | |
| 30. | $x^2+y^2+z^2+28x-12y+10z-247=0$ | |
| 31. | : The center of the sphere is ((1 - 2)/2, (-3 + 5)/2, (2 - 1)/2) = (-0.5, 1, 0.5). | 2 |
| 32. | Let $P(x, y, z)$ be any point which is equidistant from A(0,2,3) and B(2,-2,1). Then<br>PA=PB<br>$\Rightarrow \sqrt{(x-0)^2 + (y-2)^2 + (2-3)^2} = \sqrt{(x-2)^2 + (y+2)^2 + (z-1)^2}$<br>$\Rightarrow 4x - 8y - 42 + 4 = 0$ or $x - 2y - 2 + 1 = 0$ | 2 |
| 33. | Answer: Step 1: Find the distance between point A and the xy-plane.<br>- The distance between a point $(x_1, y_1, z_1)$ and the xy-plane (z = 0) is given by:<br>distance = $\|z_1\|$.<br>Step 2: Calculate the distance. | 2 |

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| | - Substituting the z-coordinate of point A:<br>distance = \|-3\| = 3.<br>Step 3: Find the ratio.<br>- The ratio is the part in which the line is divided by the xy-plane.<br>- Ratio = Distance from A to xy-plane / Total distance between A and B = 3 / Distance between A and B. | |
| 34. | 1 | 2 |
| 35. | The foot of the perpendicular is (4, 0, 0). | 2 |