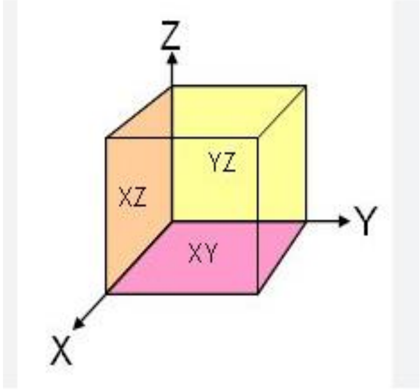
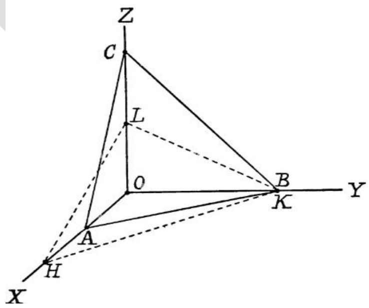
CHAPTER-12

INTRODUCTION TO 3D

04 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	 (i) x-axis is the intersection of the planes (a) xy and xz (b) yz and zx (c) xy and yz (d) none of these (ii) Equation y-axis is considered as (a) x=0,y=0 (b) y=0,z=0 (c) z=0,x=0 (d) none of these (iii) The locus of the point x=0 is (a) xy-plane (b) yz-plane (c) zx-plane (d) none of these (iv) A plane is parallel to yz-plane, so it is perpendicular to (a) x-axis (b) y-axis (c) z-axis (d) none of these	4
2.	A triangular board is supported at its centroid which is at origin, if the three vertices of triangle are A(2a,2,6), B(-4,3b,-10), C(8,14,2c), then (i) Find the value of a, b and c. (ii) Find the length of median through vertex A. (iii) If the point D is at AB and divide it in 2:3. Find coordinates of mid-point of CD. (iv) Find the coordinates of mid-point of CD.  	4
3.	Determine the co-ordinates of a point where Ramesh is standing equidistant from the point (1, 2) and (3, 4) and the shortest distance from the line joining the point (1, 2) and (3, 4) to Ramesh is √2 .	4
4.	During a Thunderstorm the Meteorological Dept. of Odisha predicted a trough line 2x - 3y = 4 is the perpendicular bisector of the line two cities A&B. If the co-ordinates of A are (-3, 1), find the co-ordinates of B.	4

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	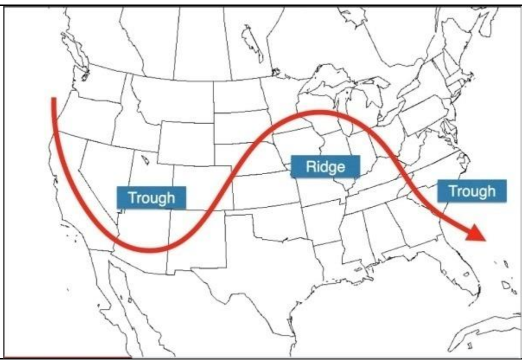	
5.	If the origin is the centroid of ▲PQR with vertices P (a,0,6) Q(4,b,-1) and R (2,4,c) then find the values of a,b and c.	4
6.	Show that the points (-2,6,-2) (0,4,-1) (-2,3,1) and (-4,5,0) are the vertices of a square	4
7.	Four students in traditional dress represent four states of india, standing at the points represented by O(0,0,0), A(a,0,0),B(0,b,0) and C(0,0,c).Find the place, in terms of coordinate ,where a girl representing "BHARATMATA" be replaced so that "BHARATMATA" is equidistant from the four students.	4
8.	Three students are standing in a park with three different sign boards "SAVE ENVIRONMENT", "DON'T LITTER", "KEEP PLACE CLEAN". Their positions are marked by the points A(0,7,10),B(-1,6,6) and C(-4,9,6). The three students are holding GREEN colored ribbon together. Answer the following questions which are based on above information:- (i) Find the difference between lengths of ribbon AB and ribbon BC. (ii) Ribbons form the sides of a right angled triangle". Is this statement correct? Justify.	4
9.	A(1, 2, 3), B(0, 4, 1), C(-1, -1, -3) are the vertices of a triangle ABC. Find the point in which the bisector of the angle <BAC meets BC	4
10.	A boy is standing at point O and observe three kites A, B and C in space. Taking O as origin if the coordinates of three kites A, B and C are (3,4,5), (1, 3, 4) and (2,-1,4) respectively, then (i). the distance between kites A and B is (a) √6 units. (b) 3√2 units (c) 5 units. (d) 9√2 units (ii). The coordinates of a point on the y-axis which is at a distance of √35 units from kite A are (a) (0,0, 5). (b) (0,7,0) (c) (3,0,0). (d) (0.5,0) (iii). The coordinates of point D so that ABCD is a parallelogram are (a) (6, 0,5). (c) (-1,3,2)	4

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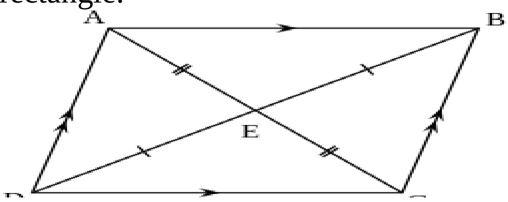
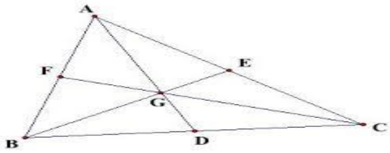
	(b) (4,9,5). (d) (5,6,0) (iv). If the points (0,-1,-7), (2, 1-9) and (6,5.-13) represent kites A, B and C then the kites (a) are collinear. (b) form right angled triangle (c) form an isosceles triangles. (d) form a rhombus	
11.	Show that the points A (1,2,3), B (-1, -2, -1), C (2,3,2) and D (4,7,6) are the vertices of a parallelogram ABCD, but it is not a rectangle. 	4
12.	The mid-points of the sides of a triangle are (1,5,-1),(0,4,-2) and (2,3,4). Find its vertices. 	4
13.	You are an urban planner working on a new park design. The park has a triangular playground with vertices A (2, 3, 4), B (5, 6, 7), and C (8, 9, 10). The park also features a jogging track that passes through the centroid of the triangular playground. Answer the following questions: MCQ 1: What are the coordinates of the centroid of triangle ABC? a) (5, 6, 7) b) (5, 6, 5) c) (5, 6, 6) d) (5, 6, 8) MCQ 2: What is the equation of the line passing through the centroid of triangle ABC? a) x = 5 b) y = 6 c) z = 6 d) x + y + z = 17 MCQ 3: At what coordinates does the jogging track intersect the x-y plane? a) (5, 6, 0) b) (5, 0, 7) c) (0, 6, 7) d) (0, 6, 0) **MCQ 4: What is the equation of the plane containing the triangular playground ABC and parallel to the x-z plane? a) y = 6 b) x = 5 c) y + z = 13 d) x - y = -1	4
14.	**1. Find the Co-ordinate of a point equidistant from the four points**	4

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	O (0,0,0) A (a,0,0) B(0,b,0) and c (0,0,c)	

ANSWERS:

Q. NO	ANSWER	MARKS
1.	(i) (a) xy and yz (ii) (c) z=0,x=0 (iii) (b) yz-plane (iv) (a) x-axis	4
2.	(i) $\frac{2a-4+8}{3} = 0 \implies a = -2$ $\frac{2+3b+14}{3} = 0 \implies b = \frac{-16}{3}$ $\frac{6-10+2c}{3} = 0 \implies c = 2$ (ii) Mid point of BC=$\left(\frac{-4+8}{2}, \frac{-16+14}{2}, \frac{-10+4}{2}\right)$ = (2,-1,-3) Length of median through vertex A $= \sqrt{(-4-2)^2 + (2+1)^2 + (6+3)^2}$ $= \sqrt{36+9+81} = 3\sqrt{14}$. (iii) Points A (-4,2,6) and B(-4,-16,-10) Ratio 2:3 Coordinates of point D $= \left(\frac{2(-4)+3(-4)}{2+3}, \frac{2(-16)+3\times 2}{2+3}, \frac{2(-10)+3\times 6}{2+3}\right)$ $= \left(-4, \frac{-26}{5}, \frac{-2}{5}\right)$ (iv) Mid point of CD= $\left(\frac{8-4}{2}, \frac{14-\frac{26}{5}}{2}, \frac{4-\frac{2}{5}}{2}\right)$ $= \left(2, \frac{22}{5}, \frac{9}{5}\right)$	4
3.	Eq. of line through A(1,2) & B(3,4) is y-2=1(x-1) => x-y+1=0 Shortest distance $\left\lvert\frac{x-y+1}{\sqrt{2}}\right\rvert = \sqrt{2}$ => x-y-1=0 (eq.1) Let P(x,y) such that PA=PB $(x-1)^2+(y-2)^2=(x-3)^2+(y-4)^2$ => x+y-5=0 (eq.2) Solving eq.1 & 2 point is (3,2)	1 +1 +1 +1
4.	Let C is M.P. of AB with A(-3.1) Now eq. of perpendicular bisector CD is 2x-3y=4 (eq.1) m(CD)=2/3 =>m(AB)=-3/2 ,	1 +1 +1

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	Eq. of AB y-1=(-3/2)(x+3) => 3x+2y+8=0 (eq.2) Solving (1) & (2), C(-16/13,-28/13) ⇨ B (7/13,-43/13)	+1
5.	Given, vertices of ▲PQR are P (a,0,6) Q(4,b,-1) and R(2,4,c) Then, the coordinates of the centroid of ▲PQR are given by $\left(\frac{a+4+2}{3}, \frac{0+b+4}{3}, \frac{6-1+c}{3}\right)$ $= \left(\frac{a+6}{3}, \frac{b+4}{3}, \frac{c+5}{3}\right)$ Given, that the centroid of ▲PQR is the point (0,0,0) $\therefore \frac{a+6}{3} = 0$ $\Rightarrow$ a = - 6 $\frac{b+4}{3} = 0$ $\Rightarrow$ b = - 4 $\frac{c+5}{3} = 0$ $\Rightarrow$ c = -5 Hence, a = - 6, b = -4 and c = -5.	4
6.	Let A (-2,6,-2) B (0,4,-1) C (-2,3,1) and D (-4,5,0) be the given points. AB = $\sqrt{(0+2)^2+(4-6)^2+(-1+2)^2}$ [using the distance formula] = $\sqrt{4+4+1}$ = $\sqrt{9}$ = 3 units BC = $\sqrt{(-2-0)^2+(3-4)^2+(1+1)^2}$ = $\sqrt{4+4+1}$ = $\sqrt{9}$ = 3 units CD = $\sqrt{(-4+2)^2+(5-3)^2+(0-1)^2}$ = $\sqrt{4+4+1}$ = $\sqrt{9}$ = 3 units. AD = $\sqrt{(-4+2)^2+(5-6)^2+(0+2)^2}$ = $\sqrt{4+1+4}$ = $\sqrt{9}$ = 3 units Here, AB = BC = CD = DA So, ABCD is a square or a rhombus. Now, AC = $\sqrt{(-4+2)^2+(5-3)^2+(0-1)^2}$ = $\sqrt{0+9+9}$ = $\sqrt{18}$ units And BD = $\sqrt{(-4+2)^2+(5-3)^2+(0-1)^2}$ = $\sqrt{16+1+1}$ = $\sqrt{18}$ units Since, diagonal AC = diagonal BD Hence ABCD is a square.	4
7.	Let O(0,0,0), A(a,0,0),B(0,b,0) and C(0,0,c) be four points equidistant from the point P(x,y,z). Then PA=PB=PC=OP	4

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	Now, OP=PA⇒ $OP^2=PA^2$ $\Rightarrow x^2+y^2+z^2=(x-a)^2+(y-0)^2+(z-0)^2$ $\Rightarrow x=a/2$ Similarly, OP=PB⇒ $y=\frac{b}{2}$ and OP=PC⇒ $z=\frac{c}{2}$ Hence, the coordinate of the required points are(a/2,b/2,c/2)	
8.	AB=$3\sqrt{2}$,BC=$3\sqrt{2}$,CA=6 (i) Difference between lengths of ribbon AB and ribbon BC is Zero. (ii) $AB^2+BC^2=CA^2$ Hence, ΔABC is right angled triangle at B	4
9.	The distance between the points A (1, 2, 3) and B (0, 4, 1) is AB, =$\sqrt{\{(1-0)^2+(2-4)^2+(3-1)^2\}}$ = $\sqrt{1^2+2^2+2^2}$ =$\sqrt{1+4+4}$ = 3 The distance between the points A (1, 2, 3) and C (-1,-1,-3) is AC, = $\sqrt{(1+1)^2+(2+1)^2+(3+3)^2}$ = $\sqrt{4+9+36}$ =7 So, AB/AC =3/7 AB: AC = 3:7 BD: DC = 3:7 The coordinates of D are (-3/10, 5/2, -1/5).	4
10.	(i) b (ii) d (iii) a (iv) a	4
11.	ANSWER	
12.	(1,2,3) ,(3,4,5),(-1,6,-7)	
13.	Answer: MCQ 1: b) (5, 6, 5) MCQ 2: c) z = 6 MCQ 3: a) (5, 6, 0) MCQ 4: c) y + z = 13	4
14.	P(x,y,z) be the required point OP=PA=PB=PC	4

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	Now $OP = PA$ $\Rightarrow OP^2 = PA^2$ $\Rightarrow x^2 + y^2 + z^2 = (x-a)^2 + (y-0)^2 + (z-0)^2$ $\Rightarrow x^2 + y^2 + z^2 = x^2 - 2ax + a^2 + y^2 + z^2$ $2ax = a^2$ $\therefore x = \frac{a}{2}$ Similarly $OP = PB$ $\Rightarrow y = \frac{b}{2}$ $A(x, y, z,)$ $B(x_2, y_2, z_2)$ and $C(x_3, y_3, z_3)$ D, E and F are mid points of side $BC, CA,$ and AB respectively, Then $\frac{x_1 + x_2}{2} = -1$ $x_1 + x_2 = -2......(1)$ $\frac{y_1 + y_2}{2} = 1$ $y_1 + y_2 = 2.......(2)$ $\frac{z_1 + z_2}{2} = -4$ $z_1 + z_2 = -8.......(3)$ $\frac{x_2 + x_3}{2} = 1$ $x_2 + x_3 = 2.......(4)$ $\frac{y_2 + y_3}{2} = 2$ $y2 + y3 = 4.......(5)$ $\frac{z_2 + z_3}{2} = -3$ $z_2 + z_3 = -6.......(6)$ $\frac{x_1 + x_3}{2} = 3$ $x_1 + x_3 = 6.......(7)$ $\frac{y_1 + y_3}{2} = 0$ $y_1 + y_3 = 0.......(8)$ $\frac{z_1 + z_3}{2} = 1$ $z_1 + z_3 = 2.......(9)$ Adding eq (1),(4) and (7) we get	

	$2(x_1+x_2+x_3)=-2+2+6$ Adding eq. (2),(5) and (8) $2(y_1+y_2+y_3)=6$ $y_1+y_2+y_3=3......(11)$ And $OP=PC$ $\Rightarrow z=\frac{c}{2}$ Hence co-ordinate of $P\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right)$	
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