



MATHS

BOOKS - NEW JYOTHI MATHS (TAMIL ENGLISH)

INTRODUCTION TO THREE DIMENSIONAL GEOMETRY

Examples

1. Name the octants in which the following points lie:

$(1, 2, 3)$, $(4, -2, 3)$, $(4, -2, -5)$, $(4, 2, -5)$, $(-4, 2, -5)$, $(-4, 2, 5)$.

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2. Find the distance between the points $(-1, 1, 1)$ and $(1, 2, 3)$.

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3. Determine the point on x-axis which is equidistant from the points $(-2, 3, 5)$ and $(1, 2, 3)$.



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4. i. Show that the points $A(-2, 3, 5)$, $B(1, 2, 3)$, $C(7, 0, -1)$ are collinear.

ii. Find the ratio in which B divides line segment AC.



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5. Show that $(0, 7, 10)$, $(-1, 6, 6)$ and $(-4, 9, 6)$ are the vertices of a right triangle.



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6. Find the equation of the set of points which are equidistant from the points $(1, 2, 3)$ and $(3, 2, -1)$.



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7. The equation of the set of points P, the sum of whose distances from $A(4, 0, 0)$ and $B(-4, 0, 0)$ is equal to 10



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8. 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.



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9. Find the coordinates of the point which divides the line segment joining the points $(4, -3)$ and $(8, 5)$ in the ratio $3 : 1$ internally

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10. i. Find the coordinates of the point which trisect the line segment joining the points $P(4, 0, 1)$ and $Q(2, 4, 0)$.

(ii) Find the locus of the set of points P such that the distance from $A(2, 3, 4)$ is equal to twice the distance from $B(-2, 1, 2)$.

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11. Consider the points $A(3, 2, -4)$, $B(5, 4, -6)$ and $C(9, 8, -10)$.

i. Find AB , BC and AC and show that A, B, C are collinear.

ii. Find the ratio in which B divides AC using distance formula.

iii. Verify the result using section formula.

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12. Consider the points $A(5,1,6)$ and $B(3,4,1)$

i. Find the cartesian equation of the line through A and B.

ii. Find the point where the line crosses the yz plane.



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13. Consider the points $A(-2, 4, 7)$ and $B(3, -5, 8)$.

i. If P divides AB in the ratio $k : 1$, then find the coordinates of P.

ii. Find the coordinates of the point where the line segment AB crosses the YZ-plane.



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14. Three vertices of a parallelogram ABCD are $A(3, -1, 2)$, $B(1, 2, -4)$ and $C(-1, 1, 2)$. The coordinates of the fourth vertex is



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15. Let $A(x_1, y_1, z_1)$, $B(x_2, y_2, z_2)$ and $C(x_3, y_3, z_3)$ be the vertices of ΔABC .

i. Find the midpoint D of BC.

ii. Find the coordinates of the centroid of ΔABC .

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16. The centroid of a triangle ABC is at the point $(1, 1, 1)$. If the coordinates of A and B are $(3, -5, 7)$ and $(-1, 7, -6)$, respectively, find the coordinates of the point C.

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17. Consider the triangle with vertices $A(0, 7, -10)$, $B(1, 6, -6)$, $C(4, 9, -6)$.

i. Find the sides AB, BC and AC.

ii. Prove that the triangle is right angles.

iii. Find the centroid of the triangle.



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18. i. If $\left(\frac{5}{3}, \frac{22}{3}, \frac{-22}{3}\right)$ is the centroid of ΔPQR with vertices $P(a, 7, -10)$, $Q(1, 2b, -6)$, $R(4, 9, 3c)$, find the values of a , b and c .
- ii. Prove ΔPQR is isosceles.



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19. Find the ratio in which the YZ -plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.



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20. The coordinates of a point which trisect the line segment joining the points $P(4, 2, -6)$ and $Q(10, -16, 6)$



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21. If the origin is the centroid of the triangle PQR with vertices $P(2a, 2, 6)$, $Q(-4, 3b, -10)$ and $R(8, 14, 2c)$, then find the values of a, b and c.



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22. A point R with x-coordinate 4 lies on the line segment joining the points $P(2, -3, 4)$ and $Q(8, 0, 10)$. Find the coordinates of the point R.



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23. If A and B be the points $(3, 4, 5)$ and $(-1, 3, -7)$, respectively, find the equation of the set of points P such that $PA^2 + PB^2 = k^2$, where k is a constant.



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1. The distance between $P(1, -3, 4)$ and $Q(-4, 1, 2)$ is

A. $3\sqrt{5}$

B. $2\sqrt{5}$

C. $5\sqrt{5}$

D. $5\sqrt{3}$

Answer: A



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2. The points $A(3, 6, 9)$, $B(10, 20, 30)$ and $C(25, -41, 5)$

A. A. are collinear

B. B. form the vertices of a isosceles triangle

C. C. equilateral triangle

D. D. None of these

Answer:



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3. Show that the points $(1, 2, -1)$, $(2, 5, 1)$ and $(0, -1, -3)$ are collinear.

- A. are collinear
- B. are vertices of a parallelogram
- C. vertices of a rhombus
- D. vertices of a rectangle

Answer: B



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4. Find the equation of the set of points which are equidistant from the points $(1, 2, 3)$ and $(3, 2, -1)$.

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

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

C. $2x - y = 0$

D. $x - 2z = 0$

Answer:

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5. The equation of the set of points P, the sum of whose distances from $A(4, 0, 0)$ and $B(-4, 0, 0)$ is equal to 10

A. $\frac{x^2}{25} + \frac{y^2}{9} + \frac{z^2}{9} = 1$

B. $25x^2 + 9y^2 + 9z^2 = 1$

C. $100x^2 + 36y^2 + 36z^2 = 900$

D. $36x^2 - 100y^2 - 100z^2 = 1$

Answer: A

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6. The points $(-4, 6, 10)$, $(2, 4, 6)$ and $(14, k, -2)$ are collinear then k is

A. A. 0

B. B. 1

C. C. -1

D. D. 2

Answer: A

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7. The ratio in which the point $Q(5, 4, -6)$ divides the line joining the points $P(3, 2, -4)$ and $R(9, 8, -10)$ is

A. 2:1

B. 1:3

C. 2:3

D. 1:2

Answer: D



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8. Find the ratio in which the YZ-plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.

A. 3:2

B. 2:3

C. 1:2

D. 2:1

Answer: B



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9. The coordinates of a point which trisect the line segment joining the points $P(4, 2, -6)$ and $Q(10, -16, 6)$

A. $(6, -4, 2)$

B. $(6, 4, -2)$

C. $(8, -10, 2)$

D. $(8, 10, -2)$

Answer: C



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10. Three vertices of a parallelogram ABCD are $A(3, -1, 2)$, $B(1, 2, -4)$ and $C(-1, 1, 2)$. The coordinates of the fourth vertex is

A. $(1, -2, 4)$

B. $(1, -2, 8)$

C. $(2, -2, 8)$

D. $(1, 0, 8)$

Answer: B

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11. Three vertices of a rectangle are $(3,2), (-4,2)$ and $(-4,5)$. Plot the points and find the coordinates of the fourth vertex.

A. $(-1, 13, 13)$

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

C. $(7, 1, -5)$

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

Answer: D

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12. If the origin is the centroid of the triangle PQR with vertices $P(2a, 2, 6)$, $Q(-4, 3b, -10)$ and $R(8, 14, 2c)$, then find the values of a, b and c.

A. $(-2, 12, 2)$

B. $\left(2, \frac{-16}{3}, 2\right)$

C. $\left(2, \frac{-16}{3}, -2\right)$

D. $\left(-2, \frac{-16}{3}, 2\right)$

Answer: D



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13. Find the distance of the following pair of point: find the coordinates of the points on y-axis which are at a distance of $5\sqrt{2}$ from the point $P(3, -2, 5)$.

A. $(0, 4, 0)$

B. $(0, -2, 0)$

C. $(0, -6, 0)$

D. $(0, 3, 0)$

Answer: C



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14. A point R with x-coordinate 4 lies on the line segment joining the points $P(2, -3, 4)$ and $Q(8, 0, 10)$. Find the coordinates of the point R.

A. $(2, 6)$

B. $(2, -6)$

C. $(-2, 6)$

D. $(-2, -6)$

Answer: C

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15. The vertices of a triangle have integer co-ordinates then the triangle cannot be

A. isosceles or equilateral

B. right angles

C. equilateral

D. right angled isosceles

Answer: C

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16. The vertices of a triangle are $(3, 2, 5)$, $(3, 2, -1)$ and $(7, 2, 5)$. The circumcentre is

A. $(4, 3, 1)$

B. b. $(5, -2, 1)$

C. c. $(5, 2, 2)$

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

Answer: C



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17. 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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18. The distance of the point $P(a, b, c)$ from the z axis is

A. $\sqrt{a^2 + b^2}$

B. $\sqrt{a^2 + c^2}$

C. $\sqrt{b^2 + c^2}$

D. $\sqrt{a^2 + b^2 - c^2}$

Answer: A



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19. $A(3, 2, 0)$, $B(5, 3, 2)$ and $C(-9, 6, -3)$ are the vertices of triangle

ABC. If the bisector of $\angle BAC$ meets BC at D then D is

A. $\left(\frac{19}{8}, \frac{57}{16}, \frac{17}{16}\right)$

B. $\left(\frac{-19}{8}, \frac{57}{16}, \frac{17}{16}\right)$

C. $\left(\frac{19}{8}, \frac{-57}{16}, \frac{17}{16}\right)$

D. $\left(\frac{19}{8}, \frac{57}{16}, \frac{-17}{16}\right)$

Answer: A



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Questions From Competitive Exams

1. The distance of the point $A(2, 3, 4)$ from X-axis is

A. 5

B. $\sqrt{13}$

C. $2\sqrt{5}$

D. $5\sqrt{2}$

Answer: A



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2. The point in the xy -plane which is equidistant from the points $(2, 0, 3)$, $(0, 3, 2)$ and $(0, 0, 1)$ is

- A. $(1, 2, 3)$
- B. $(-3, 2, 0)$
- C. $(3, -2, 0)$
- D. $(3, 2, 0)$

Answer: D



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3. The projection of a line segment on the axes are 9, 12 and 8. Then the length of the line segment is

- A. 15
- B. 16
- C. 17

D. 18

Answer: C



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4. The point which divides the line joining the points $(1, 3, 4)$ and $(4, 3, 1)$ internally in the ratio $2:1$, is

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

B. $(2, 3, 3)$

C. $\left(\frac{5}{2}, 3, \frac{5}{2}\right)$

D. $(3, 3, 2)$

Answer:



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5. The distance between x axis and the point (3,12,5) is

A. 3

B. 13

C. 14

D. 12

Answer: B



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6. A line makes the same angle θ , with each of the x and axis. If the angle β , which it makes with y-axis, is such that $\sin^2 \beta = 3 \sin^2 \theta$, then $\cos^2 \theta$ equals:

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

B. $\frac{1}{5}$

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

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

Answer: A



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7. If a line makes an angle of $\frac{\pi}{4}$ with the positive directions of each of x-axis and y-axis, then the angle that the line makes with the positive direction of the z-axis is (1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$

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

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

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

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

Answer: B



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8. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + 2\hat{k}$ and $\vec{c} = x\hat{i} + (x - 2)\hat{j} - \hat{k}$. If the vector \vec{c} lies in the plane of \vec{a} and \vec{b} then x equals

A. -4

B. -2

C. 0

D. 1

Answer: B



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9. 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. $a = 8, b = 2$

B. $a = 2, b = 8$

C. $a = 4, b = 6$

D. $a = 6, b = 4$

Answer: D



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