NDA 1 2025

LIVE

MATHS

ANALYTICAL GEOMETRY 3D

CLASS 3

NAVJYOTI SIR

Crack
EXAMS

30 Oct 2024 Live Classes Schedule

8:00AM	30 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	30 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

11:30AM	GK - ANCIENT HISTORY - CLASS 1	RUBY MA'AM
1:00PM	CHEMISTRY - POLYMERS	SHIVANGI MA'AM
4:00PM	MATHS - ANALYTICAL GEOMETRY 3D - CLASS 3	NAVJYOTI SIR
5:30PM	ENGLISH - CLOZE TEST - CLASS 1	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	GK - ANCIENT HISTORY - CLASS 1	RUBY MA'AM
1:00PM	CHEMISTRY - POLYMERS	SHIVANGI MA'AM
5:30PM	ENGLISH - CLOZE TEST - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - MENSURATION 2D - CLASS 4	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - INTERNATIONAL DAYS, SUMMITS AND MEETING 2024	DIVYANSHU SIR
5:30PM	ENGLISH - CLOZE TEST - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - MENSURATION 2D - CLASS 4	NAVJYOTI SIR

A line through $(1, -1, 2)$ with direction ratios $<3, 2, 2>$ meets the plane $x + 2y + 3z = 18$. What is the point of intersection of line and plane ?

(PYQ – 2024 – I)

(a) (4, 4, 1)

(b) (2, 4, 1)

(c) (4, 1, 4) ✓

(d) (3, 4, 7)

eqn of line,

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

eqn of plane,

$$x + 2y + 3z = 18$$

Intersecting point has to satisfy

If p is the perpendicular distance from origin to the plane passing through (1, 0, 0), (0, 1, 0) and (0, 0, 1), then what is $3p^2$ equal to ?

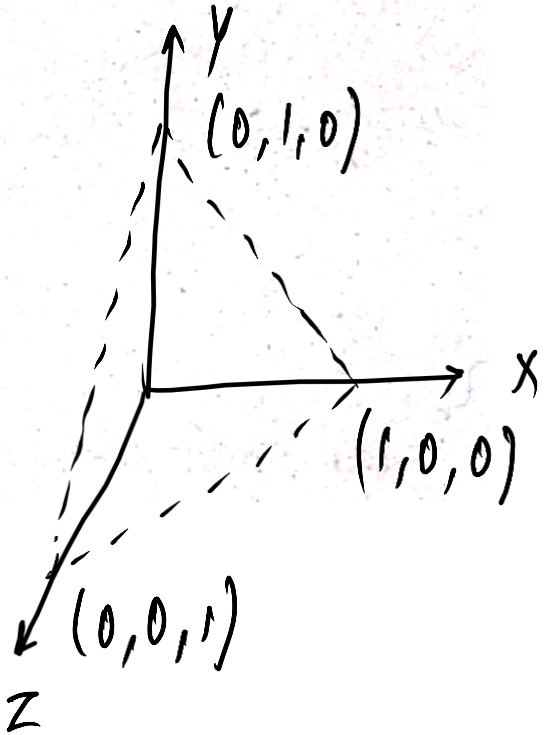
(PYQ – 2024 – I)

(a) 4

(b) 3

(c) 2

(d) 1 ✓



eqn of plane

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

$a = 1$
$b = 1$
$c = 1$

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

$$x + y + z - 1 = 0$$

$x + y + z - 1 = 0$

distance of plane from origin $(0,0,0)$

$$p = \frac{|0+0+0-1|}{\sqrt{1^2+1^2+1^2}} = \frac{1}{\sqrt{3}}$$

$$p^2 = \frac{1}{3} \Rightarrow 3p^2 = 1$$

(OR)

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}$$

$$\frac{1}{p^2} = \frac{1}{1} + \frac{1}{1} + \frac{1}{1}$$

$$\frac{1}{p^2} = 3 \Rightarrow 3p^2 = 1$$

Let $2x^2 + 2y^2 + 2z^2 + 3x + 3y + 3z - 6 = 0$ be a sphere. **(PYQ – 2024 – II)**

What is the diameter of the sphere?

(a) $\frac{5\sqrt{3}}{4}$

(b) $\frac{5\sqrt{3}}{2}$ ✓

(c) $\frac{3\sqrt{5}}{4}$

(d) $\frac{3\sqrt{5}}{2}$

for, eqn of sphere $\longrightarrow$ coeff. of x^2 = coeff. of y^2 = coeff. of z^2

standard form $\longrightarrow$ $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$

$x^2 + y^2 + z^2 + \frac{3}{2}x + \frac{3}{2}y + \frac{3}{2}z - 3 = 0$

$2u = \frac{3}{2} \Rightarrow u = \frac{3}{4}$

$v = \frac{3}{4}$; $w = \frac{3}{4}$; $d = -3$

$$\text{radius} = \sqrt{u^2 + v^2 + w^2 - d}$$

$$r = \sqrt{\left(\frac{3}{4}\right)^2 + \left(\frac{3}{4}\right)^2 + \left(\frac{3}{4}\right)^2 + 3}$$

$$= \frac{\sqrt{27 + 48}}{4} = \frac{\sqrt{75}}{4} = \frac{5\sqrt{3}}{4}$$

$$\text{diameter} = 2 \times \text{radius} = 2 \times \frac{5\sqrt{3}}{4} = \frac{5\sqrt{3}}{2}$$

Let $2x^2 + 2y^2 + 2z^2 + 3x + 3y + 3z - 6 = 0$ be a sphere. **(PYQ – 2024 – II)**

The centre of the sphere lies on the plane

(a) $2x + 2y + 2z - 3 = 0$

(b) $4x + 4y + 4z - 3 = 0$

(c) $4x + 8y + 8z - 15 = 0$

(d) $4x + 8y + 8z + 15 = 0$ ✓

coordinates of centre

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

$(-u, -v, -w)$

Let S be the line of intersection of two planes $x+y+z=1$ and $2x+3y-4z=8$.

(PYQ – 2024 – II)

Which of the following are the direction ratios of S?

(a) $\langle -7, -6, 1 \rangle$

(b) $\langle -7, 6, 1 \rangle$ ✓

(c) $\langle -6, 5, 1 \rangle$

(d) $\langle 6, 5, 1 \rangle$

Intersection of 2 planes ⟶ line | dir. ratios normal to both planes

$x+y+z=1$ ⟶ dir. ratios of normal — $\langle 1, 1, 1 \rangle$

$2x+3y-4z=8$ ⟶ " " " — $\langle 2, 3, -4 \rangle$

$$\begin{vmatrix} i & j & k \\ 1 & 1 & 1 \\ 2 & 3 & -4 \end{vmatrix} \longrightarrow \underbrace{(1\times -4 - 3\times 1)}_{x} - \underbrace{(1\times -4 - 2\times 1)}_{y} + \underbrace{(1\times 3 - 1\times 2)}_{z}$$

$\langle -7, 6, 1 \rangle$

Let S be the line of intersection of two planes $x+y+z=1$ and $2x+3y-4z=8$.

(PYQ – 2024 – II)

If $\langle l, m, n\rangle$ are direction cosines of S, then what is the value of $43(l^2-m^2-n^2)$?

(a) 6 ✓

(b) 5

(c) 4

(d) 1

$\langle -7, 6, 1 \rangle$

$\sqrt{49+36+1} = \sqrt{86}$

$l = \frac{-7}{\sqrt{86}}$; $m = \frac{6}{\sqrt{86}}$; $n = \frac{1}{\sqrt{86}}$

$43(l^2-m^2-n^2) = 43\left(\frac{49}{86} - \frac{36}{86} - \frac{1}{86}\right) = \frac{43}{86}(12) = \frac{1}{2} \times 12 = 6$

Let $L: x+y+z+4=0=2x-y-z+8$ be a line and $P: x+2y+3z+1=0$ be a plane. **(PYQ – 2024 – II)**

What are the direction ratios of the line?

(a) $\langle 2, 1, -1 \rangle$

(b) $\langle 0, -1, 2 \rangle$

(c) $\langle 0, 1, -1 \rangle$ ✓

(d) $\langle 2, 3, -3 \rangle$

$L: x+y+z+4=0=2x-y-z+8$

(eqn of planes)

(Line is being formed from the intersection of planes)

$$\begin{matrix} 1 & 1 & 1 \\ 2 & -1 & -1 \end{matrix} \longrightarrow$$

(x) $(1\times-1-(1\times-1))=0$

(y) $-(-1-2)=3$

(z) $(-1-2)=-3$ (simplest)

(no common factor)

$0, 3, -3 \rightarrow \langle 0, 1, -1 \rangle$

(PYQ – 2024 – II)

Let $L: x+y+z+4=0=2x-y-z+8$ be a line and $P: x+2y+3z+1=0$ be a plane.

What is the point of intersection of L and P?

(a) (4, 3, −3)

(b) (4, −3, 3)

(c) (−4, −3, −3)

(d) (−4, −3, 3) ✓

(a) ✗

(b) ✗

(c) ✗

(d) ✓

$P: x+2y+3z+1=0$

point of intersection should satisfy eqn of plane.

Q) Consider the following statements:

1. Equations $ax + by + cz + d = 0$, $a'x + b'y + c'z + d' = 0$ represent a straight line.
2. Equation of the form

$$\frac{x-\alpha}{\ell} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$$

represent a straight line passing through the point (α, β, γ) and having direction ratio proportional to l, m, n.

Which of the statements given above is/are correct ?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Q) Consider the following statements:

1. Equations $ax + by + cz + d = 0$, $a'x + b'y + c'z + d' = 0$ represent a straight line.
2. Equation of the form

$$\frac{x-\alpha}{\ell} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$$

represent a straight line passing through the point (α, β, γ) and having direction ratio proportional to l, m, n.

Which of the statements given above is/are correct ?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Ans: (c)

Q) If the centre of the sphere $ax^2 + by^2 + cz^2 - 2x + 4y + 2z - 3 = 0$ is $(1/2, -1, -1/2)$, what is the value of b ?

(a) 1 (b) -1

(c) 2 ✓ (d) -2

$a = b = c$

$bx^2 + by^2 + bz^2 - 2x + 4y + 2z - 3 = 0$

Dividing by b,

$x^2 + y^2 + z^2 - \frac{2}{b}x + \frac{4}{b}y + \frac{2}{b}z - 3 = 0$

standard form,

centre $\rightarrow \left(\frac{1}{b}, \frac{-2}{b}, \frac{-1}{b}\right)$

$\left(\frac{1}{2}, -1, \frac{-1}{2}\right) \Big/ \frac{1}{b} = \frac{1}{2} \Rightarrow b = 2$

$2u = \frac{-2}{b} \Rightarrow u = \left(\frac{-1}{b}\right)$

Q) If the centre of the sphere $ax^2 + by^2 + cz^2 - 2x + 4y + 2z - 3 = 0$ is $(1/2, -1, -1/2)$, what is the value of b ?

(a) 1 (b) -1

(c) 2 (d) -2

Ans: (c)

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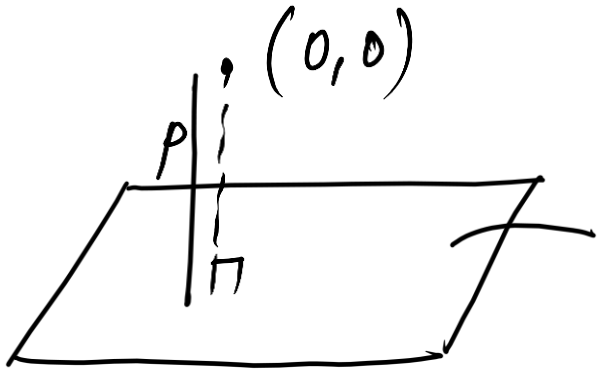
Q) What is the length of the perpendicular from the origin to the plane $ax + by + \sqrt{2ab}\, z = 1$?

(a) $1/(ab)$ (b) $1/(a+b)$

(c) $a+b$ (d) ab



$ax + by + abz - 1 = 0$

$$p = \frac{|a(0)+b(0)+\sqrt{2ab}(0)-1|}{\sqrt{a^2+b^2+2ab}} = \frac{1}{\sqrt{(a+b)^2}} = \frac{1}{a+b}$$

Q) What is the length of the perpendicular from the origin to the plane $ax + by + \sqrt{2ab}\, z = 1$?

(a) $1/(ab)$ (b) $1/(a+b)$

(c) $a+b$ (d) ab

Ans: (b)

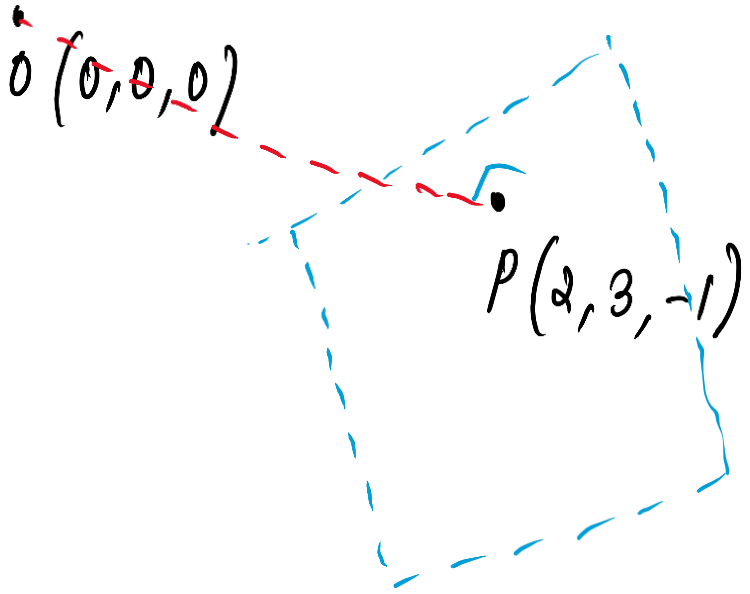
Q) If O, P are the points (0, 0, 0), (2, 3, –1) respectively, then what is the equation to the plane through P at right angles to OP ?

(a) $2x+3y+z=16$ (b) $2x+3y-z=14$ ✓

(c) $2x+3y+z=14$ (d) $2x+3y-z=0$

direction ratios $\longrightarrow \langle 2-0 \quad 3-0 \quad -1-0 \rangle$

$\langle 2, 3, -1 \rangle$



plane $\longrightarrow 2x + 3y - z + d = 0$

As P lies on plane,

$2(2) + 3(3) - (-1) + d = 0$

$4 + 9 + 1 + d = 0 \Rightarrow d = -14$

$2x + 3y - z - 14 = 0$

Q) If O, P are the points (0, 0, 0), (2, 3, –1) respectively, then what is the equation to the plane through P at right angles to OP ?

(a) $2x+3y+z=16$ (b) $2x+3y-z=14$

(c) $2x+3y+z=14$ (d) $2x+3y-z=0$

Ans: (b)

Q) Under what condition do $\left\langle \frac{1}{\sqrt{2}}, \frac{1}{2}, K \right\rangle$ represent direction cosines of a line?

(a) $k = \frac{1}{2}$

(b) $k = -\frac{1}{2}$

(c) $k = \pm\frac{1}{2}$ ✓

(d) k can take any value

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

$\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{2}\right)^2 + k^2 = 1$

$\frac{1}{2} + \frac{1}{4} + k^2 = 1$

$k^2 = \frac{1}{4}$

$\left(k = \pm\frac{1}{2}\right)$

Q) Under what condition do $\left\langle \frac{1}{\sqrt{2}}, \frac{1}{2}, K \right\rangle$ represent direction cosines of a line?

(a) $k = \frac{1}{2}$

(b) $k = -\frac{1}{2}$

(c) $k = \pm\frac{1}{2}$

(d) k can take any value

Ans: (c)

Q) A plane which passes through the point $(3, 2, 0)$ and the line

$$\frac{x-4}{1} = \frac{y-7}{5} = \frac{z-4}{4}$$ is

(a) $x - y + z = 1$ ✓
(b) $x + y + z = 5$
(c) $x + 2y - z = 1$
(d) $2x - y + z = 5$

$(4, 7, 4)$ should pass through the plane and $(3, 2, 0)$

$$\frac{x - x_1}{a} = \frac{y - y_1}{b} = \frac{z - z_1}{c}$$ ((x_1, y_1, z_1) → passing point)

$(3,2,0)$	$(4,7,4)$
(a) ✓	✓ (c) ✗
(b) ✓	✗ (d) ✗

Q) A plane which passes through the point $(3, 2, 0)$ and the line

$$\frac{x-4}{1}=\frac{y-7}{5}=\frac{z-4}{4}$$ is

(a) $x-y+z=1$

(b) $x+y+z=5$

(c) $x+2y-z=1$

(d) $2x-y+z=5$

Ans: (a)

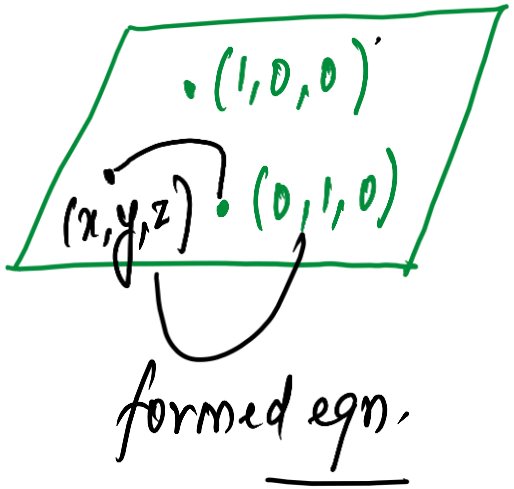
Q) The d.r. of normal to the plane through (1, 0, 0), (0, 1, 0) which makes an angle $\pi/4$ with plane $x+y=3$ are

(a) $1, \sqrt{2}, 1$ Let a, b, c

(b) $1, 1, \sqrt{2}$ ✓

(c) $1, 1, 2$

(d) $\sqrt{2}, 1, 1$



eqn of plane $\longrightarrow$ $a(x-0)+b(y-1)+c(z-0)=0$

(1,0,0) lies on the plane,

$$a(1-0)+b(0-1)+c(0-0)=0$$

$$a-b=0 \Rightarrow a=b$$

$$a(x-0) + b(y-1) + c(z-0) = 0$$

$$ax + by + cz - b = 0$$

$$x + y - 3 = 0$$

$$\theta = \frac{\pi}{4}$$

$$\cos\theta = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}}$$

$$\cos\frac{\pi}{4} = \frac{(a\times1) + (b\times1) + (c\times0)}{\sqrt{a^2+a^2+c^2}\sqrt{1^2+1^2+0^2}}$$

$a_1 = a$, $b_1 = b$, $c_1 = c$ | $a_2 = 1$, $b_2 = 1$, $c_2 = 0$

$$\frac{1}{\sqrt{2}} = \frac{a+a}{\sqrt{2(2a^2+c^2)}}$$

$$2a = \sqrt{2a^2+c^2}$$

$$2a^2 + c^2 = 4a^2$$

$$2a^2 = c^2$$

$$c = \pm\sqrt{2}a$$

a	b	c
a	a	$\pm\sqrt{2}\,a$

$\langle 1, 1, \sqrt{2} \rangle$

Q) The d.r. of normal to the plane through (1, 0, 0), (0, 1, 0) which makes an angle $\pi/4$ with plane $x+y=3$ are

(a) $1, \sqrt{2}, 1$

(b) $1, 1, \sqrt{2}$

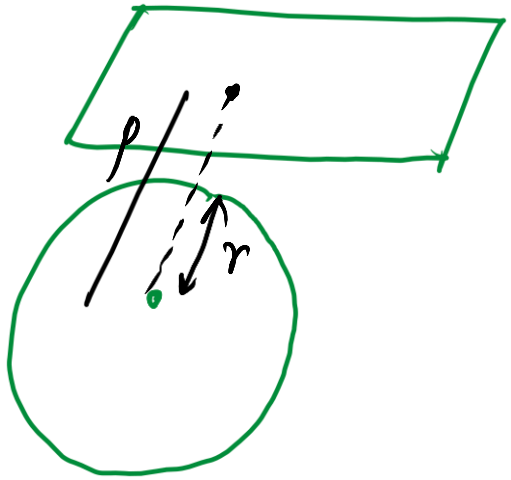
(c) $1, 1, 2$

(d) $\sqrt{2}, 1, 1$

Ans: (b)

Q) The shortest distance from the plane $12x+4y+3z=327$ to the sphere $x^2+y^2+z^2+4x-2y-6z=155$ is

(a) 39 (b) 26 (c) $11\frac{4}{13}$ (d) 13



Distance of centre of sphere from plane − radius of sphere

(p) − (r)

Q) The shortest distance from the plane $12x+4y+3z=327$ to the sphere $x^2+y^2+z^2+4x-2y-6z=155$ is

(a) 39 (b) 26 (c) $11\frac{4}{13}$ (d) 13

Ans: (d)

Q) The two lines $x = ay + b, z = cy + d$ and $x = a`y + b`, z = c`y + d`$ will be perpendicular, if and only if

(a) $aa` + cc` + 1 = 0$ ✓

(b) $aa` + bb` + cc` + 1 = 0$

(c) $aa` + bb` + cc` = 0$

(d) $(a + a`)(b + b`) + (c + c`) = 0.$

$x = ay + b \qquad z = cy + d$

$\frac{x - b}{a} = y \qquad \frac{z - d}{c} = y$

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

$\langle a \;\; 1 \;\; c \rangle$

$\langle a', 1, c' \rangle$

Q) The two lines $x = ay + b, z = cy + d$ and $x = a`y + b`, z = c`y + d`$ will be perpendicular, if and only if

(a) $aa` + cc` + 1 = 0$

(b) $aa` + bb` + cc` + 1 = 0$

(c) $aa` + bb` + cc` = 0$

(d) $(a + a`)(b + b`) + (c + c`) = 0.$

Ans: (a)

Q) 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

(a) $k=3$ or -2

(b) $k=0$ or -1

(c) $k=1$ or -1

(d) $k=0$ or -3

Q) 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

(a) $k=3$ or -2

(b) $k=0$ or -1

(c) $k=1$ or -1

(d) $k=0$ or -3

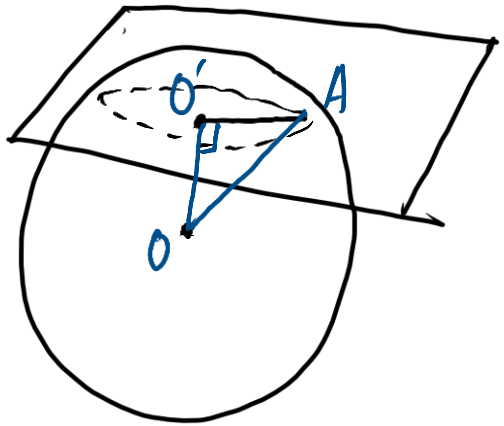
Ans: (d)

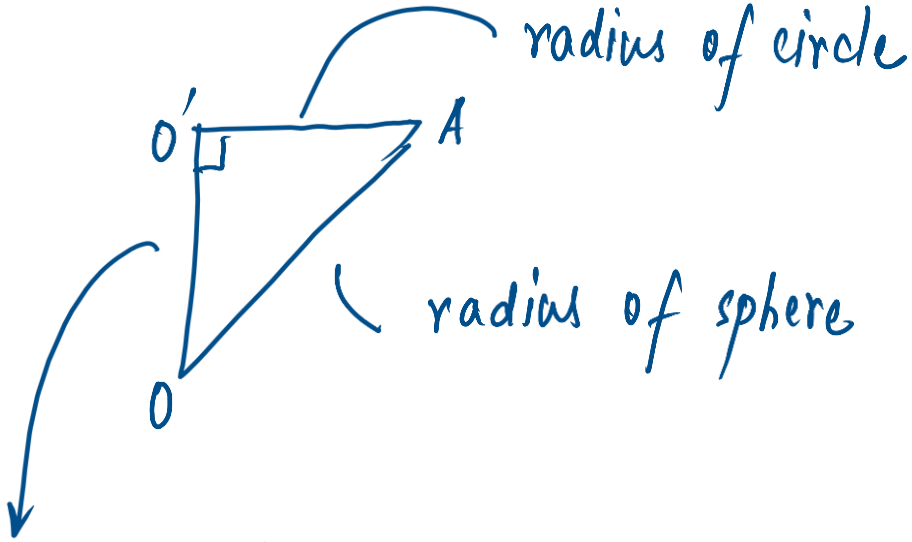
Q) The radius of the circle in which the sphere

$x^2 + y^2 + z^2 + 2x - 2y - 4z - 19 = 0$ is cut by the plane

$x + 2y + 2z + 7 = 0$ is

(a) 4 (b) 1 (c) 2 (d) 3





$O'A^2 = OA^2 - OO'^2$

Q) The radius of the circle in which the sphere $x^2 + y^2 + z^2 + 2x - 2y - 4z - 19 = 0$ is cut by the plane $x + 2y + 2z + 7 = 0$ is

(a) 4 (b) 1 (c) 2 (d) 3

Ans: (d)

Q) Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is

(a) $\frac{9}{2}$ (b) $\frac{5}{2}$ (c) $\frac{7}{2}$ (d) $\frac{3}{2}$

$$\frac{|d_1 - d_2|}{\sqrt{a^2 + b^2 + c^2}}$$

Q) Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is

(a) $\frac{9}{2}$ (b) $\frac{5}{2}$ (c) $\frac{7}{2}$ (d) $\frac{3}{2}$

Ans: (c)

Q) The intersection of the spheres

$x^2 + y^2 + z^2 + 7x - 2y - z = 13$ and

$x^2 + y^2 + z^2 - 3x + 3y + 4z = 8$

is the same as the intersection of one of the sphere and the plane

(a) $2x - y - z = 1$

(b) $x - 2y - z = 1$

(c) $x - y - 2z = 1$

(d) $x - y - z = 1$

$S_1 - S_2 = 0$

Q) The intersection of the spheres

$x^2 + y^2 + z^2 + 7x - 2y - z = 13$ and

$x^2 + y^2 + z^2 - 3x + 3y + 4z = 8$

is the same as the intersection of one of the sphere and the plane

(a) $2x - y - z = 1$

(b) $x - 2y - z = 1$

(c) $x - y - 2z = 1$

(d) $x - y - z = 1$

Ans: (a)

Q) If the angel 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 $\sin\theta = \frac{1}{3}$ then the value of λ is

(a) $\frac{5}{3}$

(b) $\frac{-3}{5}$

(c) $\frac{3}{4}$

(d) $\frac{-4}{3}$

Q) If the angel 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 $\sin\theta = \frac{1}{3}$ then the value of λ is

(a) $\frac{5}{3}$

(b) $\frac{-3}{5}$

(c) $\frac{3}{4}$

(d) $\frac{-4}{3}$

Ans: (a)

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

(a) $0°$ (b) $90°$

(c) $45°$ (d) $30°$

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

(a) $0°$ (b) $90°$

(c) $45°$ (d) $30°$

Ans: (b)

Q) What is the equation of the sphere with unit radius having centre at the origin ?

(a) $x^2+y^2+z^2=0$

(b) $x^2+y^2+z^2=1$

(c) $x^2+y^2+z^2=2$

(d) $x^2+y^2+z^2=3$

Q) What is the equation of the sphere with unit radius having centre at the origin ?

(a) $x^2+y^2+z^2=0$ (b) $x^2+y^2+z^2=1$

(c) $x^2+y^2+z^2=2$ (d) $x^2+y^2+z^2=3$

Ans: (b)

Q) What is the sum of the squares of direction cosines of x-axis ?

(a) 0

(b) $\frac{1}{3}$

(c) 1

(d) 3

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(a) 0

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Ans: (c)

Q) What is the distance of the line $2x + y + 2z = 3$ from the origin ?

(a) 1 units

(b) 1.5 units

(c) 2 units

(d) 2.5 units

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(a) 1 units
(b) 1.5 units
(c) 2 units
(d) 2.5 units

Ans: (a)

Q) What is the angle between the lines $\frac{x-2}{1}=\frac{y+1}{-2}=\frac{z+2}{1}$ and $\frac{x-1}{1}=\frac{2y+3}{3}=\frac{z+5}{2}$?

(a) $\frac{\pi}{2}$

(b) $\frac{\pi}{3}$

(c) $\frac{\pi}{6}$

(d) None of the above

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Ans: (a)

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