PLANES

PREVIOUS EAMCET BITS

1. The image of the point (3, 2, 1) in the plane $2x - y + 3z = 7$ is **[EAMCET 2009]**

   1) (1, 2, 3) 2) (2, 3, 1) 3) (3, 2, 1) 4) (2, 1, 3)

   Ans: 3

Sol. Since point lies on the plane, image is itself.

2. If (2, –1, 3) is the foot of the perpendicular drawn from the origin to the plane, then the equation of the plane is **[EAMCET 2004]**

   1) $2x + y - 3z + 6 = 0$ 2) $2x - y + 3z - 14 = 0$

   3) $2x - y + 3z - 13 = 0$ 4) $2x + y + 3z - 10 = 0$

   Ans: 2

Sol. $O(0,0,0), A(2,-1,3), P = (x, y, z)$

$\overline{OA}.\overline{PA} = 0 \Rightarrow 2x - y + 3z - 14 = 0$

3. If the plane $3x - 2y - z - 18 = 0$ meets the coordinates axes in A, B, C then the centroid of ΔABC is **[EAMCET 2004]**

   1) $(2,3,-6)$ 2) $(2,-3,6)$ 3) $(-2,-3,6)$ 4) $(2,-3,-6)$

   Ans: 4

Sol. $\frac{x}{6} + \frac{y}{-9} + \frac{z}{-18} = 1$

$\therefore$ Centroid = $(2,-3,-6)$

4. A plane π makes intercepts 3 and 4 respectively on Z-axis and X-axis. If π is parallel to Y-axis, then its equation is **[EAMCET 2003]**

   1) $3x + 4z = 12$ 2) $3z + 4x = 12$ 3) $3y + 4z = 12$ 4) $3z + 4y = 12$

   Ans: 1

Sol. The equation of the required plane is $\frac{x}{4} + \frac{z}{3} = 1 \Rightarrow 3x + 4z = 12$

5. The equation of the plane passing through (1, 1, 1) and (1, –1, –1) ; and perpendicular to $2x - y + z + 5 = 0$ is **[EAMCET 2003]**

   1) $2x + 5y + z - 8 = 0$ 2) $x + y - z - 1 = 0$

   3) $2x + 5y + z + 4 = 0$ 4) $x - y + z - 1 = 0$

   Ans: 2

Sol. The equation of the plane passing through (1, 1, 1) and (1, –1, –1) is $x + y - z = 1$ and it is $\perp^{ar}$ to $2x - y + z + 5 = 0$

6. If P=(0, 1, 0), Q = (0, 0, 1), then the projection of PQ on the plane $x + y + z = 3$ is **[EAMCET 2002]**

   1) 2 2) 3 3) $\sqrt{2}$ 4) $\sqrt{3}$

   Ans: 3

Sol. Perpendicular distances from P, Q to the plane are equal and the point P, Q lies on same side of the plane.

$\therefore$ The distance between P and Q is the projection of $\overrightarrow{PQ}$ on the given plane $= \sqrt{2}$

7 In the space the equation by by + cz + d = 0 represents a plane perpendicular to the….. plane **[EAMCET 2002]**

1) YOZ 2) ZOX 3) XOY 4) z = k

Ans: 1

Sol. $by + cz + d = 0$

Plane is parallel to x-axis

$\therefore$ It is perpendicular to y o z plane.

8. A plane π 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 π is **[EAMCET 2002]**

1) $29x + 31y + 3z = 63$ 2) $23x + 29y - 29z = 23$

3) $23x + 29y + 3z = 55$ 4) $31x + 37y + 3z = 71$

Ans: 3

Sol. By verification $2001 = 23 \times 29 \times 3$

$\therefore 23x + 29y + 3z = 55$

9. If the foot of the perpendicular from (0, 0, 0) to a plane is (1, 2, 2) then the equation of the plane is **[EAMCET 2001]**

1) – x + 2y + 8z – 9 = 0 2) x + 2y + 2z – 9 = 0

3) x + y + z – 5 = 0 4) x + 2y – 3z + 1= 0

Ans: 2

Sol. The plane passing through (1, 2, 2) with normal D.r.s 1, 2, 2

$\therefore$ 1(x – 1) + 2(y – 2) + 2(z – 2) = 0

$\Rightarrow x + 2y + 2z = 9$

10. A variable plane is at a constant distance k from the origin and meets the co-ordinate axes in A, B, C. Then the locus of the centroid of ΔABC is **[EAMCET 2001]**

1) $x^{-2} + y^{-2} + z^{-2} = k^{-2}$ 2) $x^{-2} + y^{-2} + z^{-2} = 4k^{-2}$

3) $x^{-2} + y^{-2} + z^{-2} = 16k^{-2}$ 4) $x^{-2} + y^{-2} + z^{-2} = 9k^{-2}$

Ans: 4

Sol. Let $A(h,0,0)B(0,k,0),C(0,0,P)$

$\therefore$ centroid $= \left(\frac{h}{3}, \frac{k}{3}, \frac{p}{3}\right) = G(x_1, y_1, z_1)$

The perpendicular distance from origin to $\frac{x}{h} + \frac{y}{k} + \frac{z}{p} = 1$ is $\frac{1}{\sqrt{h^2 + k^2 + p^2}} = k$

$\Rightarrow x^{-2} + y^{-2} + z^{-2} = 9k^{-2}$