PRACTICE QUESTIONS FOR COMPETITIVE EXAMINATIONS

SUBJECT: MATHEMATICS

TOPIC: COORDINATE GEOMETRY (3 - D)

1. Which one of the following statement is INCORRECT ?

(A) If $\vec{n}.\vec{a} = 0$, $\vec{n}.\vec{b} = 0$ and $\vec{n}.\vec{c} = 0$ for some non zero vector $\vec{n}$, then $[\vec{a}\ \vec{b}\ \vec{c}] = 0$

(B) there exist a vector having direction angles $\alpha = 30$ and $\beta = 45$

(C) locus of point in space for which $x = 3$ and $y = 4$ is a line parallel to the z-axis whose distance from the z-axis is 5

(D) In a regular tetrahedron OABC where 'O' is the origin, the vector $\overline{OA} + \overline{OB} + \overline{OC}$ is perpendicular to the plane ABC.

2. Consider the following 5 statements

(I) There exists a plane containing the points (1, 2, 3) and (2, 3, 4) and perpendicular to the vector $\vec{V}_1 = \hat{i} + \hat{j} - \hat{k}$

(II) There exist no plane containing the point (1, 0, 0); (0, 1, 0); (0, 0, 1) and (1, 1, 1)

(III) If a plane with normal vector $\vec{N}$ is perpendicular to a vector $\vec{V}$ then $\vec{N}\ \ \vec{V} = 0$

(IV) If two planes are perpendicular then every line in one plane is perpendicular to every line on the other plane

(v) Let P_1 and P_2 are two perpendicular planes. If a third plane P_3 is perpendicular to P_1 then it must be either parallel or perpendicular or at an angle of 45 to P_2.

Choose the correct alternative.

(A) exactly one is false (B) exactly 2 are false (C) exactly 3 are false (D) exactly four are false

3. If from the point P(f, g, h) perpendiculars PL, PM be drawn to yz and zx planes then the equation to the plane OLM is -

(A) $\frac{x}{f} + \frac{y}{g} + \frac{z}{h} = 0$ (B) $\frac{x}{f} + \frac{y}{g} - \frac{z}{h} = 0$

(C) $\frac{x}{f} - \frac{y}{g} + \frac{z}{h} = 0$ (D) $-\frac{x}{f} + \frac{y}{g} + \frac{z}{h} = 0$

4. If the plane $2x - 3y + 6z - 11 = 0$ makes an angle $\sin^{-1}(k)$ with x-axis, then k is equal to -

(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{2}{7}$ (C) $\frac{\sqrt{2}}{3}$ (D) 1

5. The expression in the vector form for the point $\vec{r}_1$ of intersection of the plane $\vec{r} \cdot \vec{n} = d$ and the perpendicular line $\vec{r} = \vec{r}_0 + t\vec{n}$ where t is a parameter given by -

(A) $\vec{r}_1 = \vec{r}_0 + \left(\frac{d - \vec{r}_0 \cdot \vec{n}}{\vec{n}^2}\right)\vec{n}$

(B) $\vec{r}_1 = \vec{r}_0 - \left(\frac{\vec{r}_0 \cdot \vec{n}}{\vec{n}^2}\right)\vec{n}$

(C) $\vec{r}_1 = \vec{r}_0 - \left(\frac{\vec{r}_0 \cdot \vec{n} - d}{|\vec{n}|}\right)\vec{n}$

(D) $\vec{r}_1 = \vec{r}_0 + \left(\frac{\vec{r}_0 \cdot \vec{n}}{|\vec{n}|}\right)\vec{n}$

6. If the line $\vec{r} = 2\hat{i} - \hat{j} + 3\hat{k} + \lambda(\hat{i} + \hat{j} + \sqrt{2}\,\hat{k})$ makes angles α, β, γ with xy, yz and zx planes respectively then which one of the following are not possible ?

(A) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$ and $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$

(B) $\tan^2\alpha + \tan^2\beta + \tan^2\gamma = 7$ and $\cot^2\alpha + \cot^2\beta + \cot^2\gamma = 5/3$

(C) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 1$ and $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 2$

(D) $\sec^2\alpha + \sec^2\beta + \sec^2\gamma = 10$ and $\text{cosec}^2\alpha + \text{cosec}^2\beta + \text{cosec}^2\gamma = 14/3$

7. Points that lie on the lines bisecting the angle between the lines $\frac{x-2}{2} = \frac{y-3}{3} = \frac{z-6}{6}$ and $\frac{x-2}{3} = \frac{y-3}{6} = \frac{z-6}{2}$ are -

(A) (7, 12, 14) (B) (0, –3, 14) (C) (1, 0, 10) (D) (–3, –6, –2)

ASSERTION & REASON

These questions contains, Statement I (assertion) and Statement II (reason).

(A) Statement-I is true, Statement-II is true ; Statement-II is correct explanation for Statement-I.

(B) Statement-I is true, Statement-II is true ; Statement-II is NOT a correct explanation for statement-I.

(C) Statement-I is true, Statement-II is false.

(D) Statement-I is false, Statement-II is true.

8. Statement - I : If a plane contains point $A(\vec{a})$ and is parallel to vectors $\vec{b}$ and $\vec{c}$, then its vector equation is $\vec{r} = \vec{a} + \lambda\vec{b} + \mu\vec{c}$, where λ & μ are parameters and $\vec{b} \nparallel \vec{c}$.

Because

Statement - II : If three vectors are co-planar, then any one can be expressed as the linear combination of other two.

(A) A (B) B (C) C (D) D

9. Statement - I : If $ax + by + cz = \sqrt{a^2+b^2+c^2}$ be a plane and (x_1, y_1, z_1) and (x_2, y_2, z_2) be two points on this plane then $a(x_1 - x_2) + b(y_1 - y_2) + c(z_1 - z_2) = 0$.

Because

Statement - II : If two vectors $p_1\hat{i} + p_2\hat{j} + p_3\hat{k}$ and $q_1\hat{i} + q_2\hat{j} + p_3\hat{k}$ are orthogonal then $p_1q_1 + p_2q_2 + p_3q_3 = 0$.

(A) A (B) B (C) C (D) D

10. Statement - I : If the lines $\frac{x-x_1}{a_1} = \frac{y-y_1}{b_1} = \frac{z-z_1}{c_1}$ and $\frac{x-x_2}{a_2} = \frac{y-y_2}{b_2} = \frac{z-z_2}{c_2}$ are coplanar then

$$\begin{vmatrix} x_1 & y_1 & z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = \begin{vmatrix} x_2 & y_2 & z_2 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

Because

Statement - II : If the two lines are coplanar then shortest distance between them is zero.

(A) A (B) B (C) C (D) D

11. Statement - I : If $2a + 3b + 6c = 14$, where a, b & c $\in$ R, then the minimum value of $a^2 + b^2 + c^2$ is 4.

Because

Statement - II : The perpendicular distance of the plane $px + qy + rz = 1$ from origin is $\frac{1}{\sqrt{p^2+q^2+r^2}}$.

(A) A (B) B (C) C (D) D

COMPREHENSION BASED QUESTIONS

Consider a triangular pyramid ABCD the position vectors of whose angular point are A(3, 0, 1); B(–1, 4, 1); C(5, 2, 3) and D(0, –5, 4). Let G be the point of intersection of the medians of the triangle BCD.

On the basis of above information, answer the following questions :

12. The length of the vector $\overline{AG}$ is-

(A) $\sqrt{17}$ (B) $\frac{\sqrt{51}}{3}$ (C) $\frac{\sqrt{51}}{9}$ (D) $\frac{\sqrt{59}}{4}$

13. Area of the triangle ABC in sq. units is-

(A) 24 (B) $8\sqrt{6}$ (C) $4\sqrt{6}$ (D) none of these

14. The length of the perpendicular from the vertex D on the opposite face is -

(A) $\frac{14}{\sqrt{6}}$ (B) $\frac{2}{\sqrt{6}}$ (C) $\frac{3}{\sqrt{6}}$ (D) none of these

15. Equation of the plane ABC is -

(A) $x + y + 2z = 5$ (B) $x - y - 2z = 1$ (C) $2x + y - 2z = 4$ (D) $x + y - 2z = 1$

16. Let L be the line of intersection of the planes $2x + 3y + z = 1$ and $x + 3y + 2z = 2$. If L makes an angle α with the positive x-axis, then $\cos\alpha$ equals -

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

17. 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) $\pi/6$ (2) $\pi/3$ (3) $\pi/4$ (4) $\pi/2$

18. If (2, 3, 5) is one end of a diameter of the sphere $x^2 + y^2 + z^2 - 6x - 12y - 2z + 20 = 0$, then the coordinates of the other end of the diameter are-

(1) (4, 9, -3) (2) (4, -3, 3) (3) (4, 3, 5) (4) (4, 3, -3)

19. 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-

(1) a = 2, b = 8 (2) a = 4, b = 6 (3) a = 6, b = 4 (4) a = 8, b = 2

20. If the straight lines $\frac{x-1}{k} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x-2}{3} = \frac{y-3}{k} = \frac{z-1}{2}$ intersect at a point, then the integer k is equal to-

(1) -5 (2) 5 (3) 2 (4) -2

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	D	B	B	A	ABD	BC	C	A	C	A	B	C	A	D	1	4	1	3	1