Assertion- Reason

Some questions (Assertion–Reason type) are given below. Each question contains **Statement – 1 (Assertion)** and **Statement – 2 (Reason)**. Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. So select the correct choice :***Choices are :***

(A)**Statement – 1** is True, **Statement – 2** is True; **Statement – 2 is** a correct explanation for **Statement – 1**.
(B)**Statement – 1** is True, **Statmnt – 2** is True; **Statement – 2 is NOT** a correct explanation for **Statement – 1**.
(C) **Statement – 1** is True, **Statement – 2** is False.
(D) Statement – 1 is False, Statement – 2 is True.

452. Let $\bar{a}, \bar{b}, \bar{c}$ be three non-coplanar vectors then $(\bar{b}-\bar{c}).[(\bar{c}-\bar{a})\times(\bar{a}-\bar{b})] = 0$

Statement 1: $\bar{b}-\bar{c}$ can be expressed as linear combination of $\bar{c}-\bar{a}$ and $\bar{a}-\bar{b}$.

Statement 2: Given non-coplanar vectors one vector can be expressed as a linear combination of other two.

453. A vector has components p and 1 with respect to a rectangular cartesian system. If the axes are rotated through an angle α about the origin in the anticlockwise sense.

Statement–1 : If the vector has component $p + 2$ and 1 with respect to the new system then $p = -1$

Statement–2 : Magnitude of vector original and new system remains same

454. Let $|\vec{a}|=4$, $|\vec{b}|=2$ and angle between $\vec{a}$ and $\vec{b}$ is $\pi/6$

Statement–1 : $(\vec{a}\times\vec{b})^2 = 4$ **Statement–2 :** $(\vec{a}\times\vec{b})^2 = |\vec{a}|^2$

455. **Statement–1 :** $\left[\vec{b}\times\vec{c} \;\; \vec{c}\times\vec{a} \;\; \vec{a}\times\vec{b}\right] = 0$

Statement–2 : If $\vec{a}$, $\vec{b}$, $\vec{r}$ are linearly dependent vectors then they are coplanar.

456. **Statement–1 :** If $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}-\vec{b}\right|$ then $\vec{a}$ is parallel to $\vec{b}$.

Statement–2 : If $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}-\vec{b}\right|$ then $\vec{a}.\vec{b} = 0$.

457. Let $\vec{r}$ be a non-zero vector satisfying $\vec{r}.\vec{a} = \vec{r}.\vec{b} = \vec{r}.\vec{c} = 0$ for given non–zero vectors $\vec{a}, \vec{b}$ and $\vec{c}$.

Statement–1 : $\vec{a}, \vec{b}$ and $\vec{c}$ are coplanar vectors.

Statement–2 : $\vec{r}$ is perpendicular to the vectors $\vec{a}, \vec{b}$ and $\vec{c}$.

458. Let $\vec{a}$ and $\vec{r}$ be two non–collinear vectors.

Statement–1 : vector $\vec{a}\times(\vec{a}\times\vec{r})$ is a vector in the plane of $\vec{a}$ and $\vec{r}$, perpendicular to $\vec{a}$.

Statement–2 : $\vec{a}\times(\vec{a}\times\vec{b}) = \vec{0}$, for any vector $\vec{b}$.

459. **Statement–1 :** If three points P, Q, R have position vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ respectively and $2\vec{a}+3\vec{b}-5\vec{c} = 0$, then the points P, Q, R must be collinear. **Statement–2 :** If for three points A, B, C; $\overrightarrow{AB} = \lambda\overrightarrow{AC}$, then the points A, B, C must be collinear.

460. **Statement–1 :** Let $\vec{a}$ and $\vec{b}$ be two non collinear unit vectors. If $\vec{u} = \vec{a}-(\vec{a}.\vec{b})\vec{b}$ and $\vec{v} = \vec{a}\times\vec{b}$ then $|\vec{v}| = |\vec{u}|$.

Statement–2 : The vector $\frac{1}{3}(2\hat{i}-2\hat{j}+\hat{k})$ is makes an angle of $\frac{\pi}{3}$ with the vector $(5\hat{i}-4\hat{j}+3\hat{k})$.

461. **Statement-1:** If $\vec{u}$ & $\vec{v}$ are unit vectors inclined at an angle α and $\vec{x}$ is a unit vector bisecting the angle between them, then $\vec{x} = \dfrac{\vec{u}+\vec{v}}{2\cos\frac{\alpha}{2}}$

Statement-2: If ΔABC is an isosceles triangle with AB = AC = 1, then vector representing bisector of angle A is given by $\overrightarrow{AD} = \dfrac{\vec{AB}+\vec{AC}}{2}$

462. **Statement-1:** The direction ratios of line joining origin and point (x, y, z) must be x, y, z.

Statement-2: If P is a point (x, y, z) in space and OP = r, then direction cosines of OP are $\frac{x}{r}, \frac{y}{r}, \frac{z}{r}$.

463. **Statement-1:** If the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} - \lambda\hat{j} + 5\hat{k}$ are coplanar, then $|\lambda|^2$ is equal to 16.

Statement-2: The vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are coplanar iff $\vec{a}, (\vec{b} \times \vec{c}) = 0$

464. **Statement-1:** A line L is perpendicular to the plane $3x - 4y + 5z = 10$

Statement-2: Direction co-sines of L be $< \frac{3}{5\sqrt{2}}, -\frac{4}{5\sqrt{2}}, \frac{1}{\sqrt{2}} >$

465. **Statement-1 :** The points with position vectors $\vec{a} - 2\vec{b} + 3\vec{c}, -2\vec{a} + 3\vec{b} - \vec{c}$, $4\vec{a} - 7\vec{b} + 7\vec{c}$ are collinear.

Statement-2: The position vectors $\vec{a} - 2\vec{b} + 3\vec{c}$, $-2\vec{a} + 3\vec{b} - \vec{c}$, $4\vec{a} - 7\vec{b} + 7\vec{c}$ are linearly dependent vectors.

466. **Statement-1:** If $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{1}{2}\vec{b}$ then the angle between $\vec{a}$ & $\vec{b}$ is $\pi/2$

Statement-2: If $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{1}{2}\vec{b}$, then $\vec{a}.\vec{b} = 0$.

467. **Statement-1:** If $\cos\alpha$, $\cos\beta$, $\cos\gamma$ are the direction cosine of any line segment, $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$.
Statement-2: If $\cos\alpha$, $\cos\beta$, $\cos\gamma$ are the direction cosine of line segment,
$\cos 2\alpha + \cos 2\beta + \cos 2\gamma = -1$.

468. **Statement-1:** The direction cosines of one of the angular bisector of two intersecting lines having direction cosines as l_1, m_1, n_1, & l_2, m_2, n_2 is proportional to $l_1 + l_2$, $m_1 + m_2$, $n_1 + n_2$.
Statement-2: The angle between the two intersecting lines having direction cosines as l_1, m_1, n_1 & l_2, m_2, n_2 is given by $\cos\theta = l_1 l_2 + m_1 m_2 + n_1 n_2$.

469. **Statement-1:** If $\vec{a}.\vec{b} = 0 \Rightarrow \vec{a} \perp \vec{b}$ **Statement-2:** $\vec{a}.\vec{b} = 0 \Rightarrow$ either $\vec{a} = 0$ or $\vec{b} = 0$ or $\vec{a} \perp \vec{b}$

470. **Statement-1:** $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$

Statement-2: $\vec{A} \times \vec{B} = |\vec{A}||\vec{B}| \sin\theta \ \hat{n}$, when θ is angle, when your fingers curls from A to B

471. **Statement-1 :** A vector $\perp^r$ the plane of (1, -1, 0), (2, 1, -1) & (-1, 1, 2) is $6\hat{i} + 6\hat{k}$

Statement-2 : $\vec{A} \times \vec{B}$ always gives a vector perpendicular to plane of $\vec{A}$ & $\vec{B}$

472. **Statement-1 :** Angle between planes $\vec{r}.\vec{n}_1 = \vec{q}_1$ & $\vec{r}.\vec{n}_2 = \vec{q}_2$.
(acute angle) is given by $\cos\theta = \vec{n}_1.\vec{n}_2$
Statement-2 : Angle between the planes in same as acute angle formed by their normals.

473. **Statement-1:** In ΔABC, $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = 0$

Statement-2 : If $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = \vec{b}$ then $\overrightarrow{AB} = \vec{a} + \vec{b}$

474. **Statement-1:** $\vec{a} = 3\vec{i} + p\vec{j} + 3\vec{k}$ and $\vec{b} = 2\vec{i} + 3\vec{j} + q\vec{k}$ are parallel vectors it p = 9/2 and q = 2.

Statement-2 : If $\vec{a} = a_1\vec{i} + a_2\vec{j} + a_3\vec{k}$ and $\vec{b} = b_1\vec{i} + b_2\vec{j} + b_3\vec{k}$ are parallel $\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$

475. **Statement-1:** The direction ratios of line joining origin and point (x, y, z) must be x, y, z

Statement-2: If P is a point (x,y, z) in space and OP = r then directions cosines of OP are $\frac{x}{r}, \frac{y}{r}, \frac{z}{r}$

476. **Statement-1:** The shortest distance between the skew lines $\vec{r} = \vec{a} + \alpha\vec{b}$ and $\vec{r} = \vec{c} + \beta\vec{d}$ is $\frac{|[\vec{a} - \vec{c}\ \vec{b}\vec{d}]|}{|\vec{b} \times \vec{d}|}$

Statement-2: Two lines are skew lines if three axist no plane passing through them.

477. **Statement-1:** $\vec{a} = \hat{i} + p\hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} + 3\hat{j} + q\hat{k}$ are parallel vectors of p = 3/2 and q = 4.

Statement-2: $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ are parallel if $\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$.

478. **Statement-1:** If $\vec{a}=2\hat{i}+\hat{k}, \vec{b}=3\hat{j}+4\hat{k}$ and $\vec{c}=8\hat{i}-3\hat{j}$ are coplanar then $\vec{c}=4\vec{a}-\vec{b}$.

Statement-2: A set of vectors $\vec{a}_1, \vec{a}_2 ... \vec{a}_n$ is said to be linearly independent if every relation of the form $l_1\ \vec{a}_1 + l_2\ \vec{a}_2 + ... + l_n\ \vec{a}_n = 0$ implies that $l_1 = l_2 = ... = l_n = 0$ (scalars).

479. **Statement-1:** The shortest distance between the skew lines $\vec{r}=\vec{a}+\alpha\vec{b}$ and $\vec{r}=\vec{c}+\beta\vec{d}$ is $\left|\dfrac{(\vec{a}-\vec{c}).(\vec{b}\times\vec{d})}{|\vec{b}\times\vec{d}|}\right|$

Statement-2: Two lines are skew lines if there exists no plane passing through them.

480. **Statement-1:** The curve which is tangent to a sphere at a given point is the equation of a plane.

Statement-2: Infinite number of lines touch the sphere at a given point.

481. **Statement-1:** In ΔABC $\overrightarrow{AB}+\overrightarrow{BC}+\overrightarrow{CA}=\vec{O}$

Statement-2: If $\overrightarrow{OA}=\vec{a}$, $\overrightarrow{OB}=\vec{b}$, then $\overrightarrow{AB}=\vec{a}+\vec{b}$ (Δ law of addition).

482. **Statement-1:** $\vec{a}=\hat{i}+p\hat{j}+2\hat{k}$ and $\vec{b}=2\hat{i}+3\hat{j}+q\hat{k}$ are parallel vectors if $P=\dfrac{3}{2}$, $q=4$

Statement-2: If $\vec{a}=a_1\hat{i}+a_2\hat{j}+a_3\hat{k}$ and $\vec{b}=b_1\hat{i}+b_2\hat{j}+b_3\hat{k}$ are parallel then $\dfrac{a_1}{b_1}=\dfrac{a_2}{b_2}=\dfrac{a_3}{b_3}$.

483. **Statement-1:** If $\vec{a}=2\hat{i}+\hat{k}\vec{a}_1, \vec{a}_3, \vec{a}_3 .....\vec{a}_n, \vec{b}=3\hat{j}+4\hat{k}$ and $\vec{c}=8\hat{i}-3\hat{j}$ are coplanar then $\vec{c}=4\vec{a}-\vec{b}$

Statement-2: A set of vectors is said to be linearly independent if every relation of the form $l_1\vec{a}+l_2\vec{a}_2+.....+l_n\vec{a}_n=0 \Rightarrow l_1=l_2=.....=l_n=0$.

484. **Statement-1:** The shortest distance between the skew lines $\vec{r}=\vec{a}_1+\alpha\vec{b}_1$ and $\vec{r}=\vec{a}_2+\beta\vec{b}_2$ is $\left|\dfrac{[\vec{b}_1\,\vec{b}_2(\vec{a}_2-\vec{a}_1)]}{(\vec{b}_1\times\vec{b}_2)}\right|$ **Statement-2:** Two lines are skew lines if there exists no plane passing through them.

485. **Statement-1 :** The value of expression $\hat{i}(\hat{j}\times\hat{k})+\hat{j}(\hat{k}\times\hat{i})+\hat{k}(\hat{i}\times\hat{j})=3$

Statement-2 : $\hat{i}(\hat{j}\times\hat{k})=[\hat{i}.\hat{j}.\hat{k}]=1$

486. **Statement-1:** A relation between the vectors $\vec{r},\vec{a}$ and $\vec{b}$ is $\vec{r}\times\vec{a}=\vec{b} \Rightarrow \vec{r}=\dfrac{\vec{a}\times\vec{b}}{\vec{a}.\vec{a}}$ **Statement-2 :** $\vec{r}.\vec{a}=0$

3-Dimension

487. The equation of two straight line are $\dfrac{x-1}{2}=\dfrac{y+3}{1}=\dfrac{z-2}{-3}$ and $\dfrac{x-2}{1}=\dfrac{y-1}{-3}=\dfrac{z+3}{2}$

Statement–1 : The given lines are coplanar

Statement–2 : The equation $2x_1 - y_1 = 1$, $x_1 + 3y_1 = 4$, $3x_1 + 2y_1 = 5$ are consistent.

488. **Statement–1** : The distance between the planes $4x - 5y + 3z = 5$ and $4x - 5y + 3z + 2 = 0$ is $\dfrac{3}{5\sqrt{2}}$. **Statement–2** The distance between $ax + by + cz + d_1 = 0$ and $ax + by + cz + d_2 = 0$ is $\left|\dfrac{d_1-d_2}{\sqrt{a^2+b^2+c^2}}\right|$.

489. Given the line $\dfrac{x-1}{3}=\dfrac{y+1}{2}=\dfrac{z-3}{-1}$ and the plane $\pi : x - 2y - z = 0$

Statement-1: L lies in π **Statement-2:** L is parallel to π

490. The image of the point (1, b, 3) in the **Statement-1:** Line $\dfrac{x}{1}=\dfrac{y-1}{2}=\dfrac{z-2}{3}$ will be (1, 0, 7)

Statement-2: Length of the perpendicular from the point A($\bar{\alpha}$) on the line $\vec{r}=\vec{a}+t\vec{b}$, is given by d = $\frac{|(\bar{a}-\bar{\alpha})\times\bar{b}|}{|\bar{b}|}$

Answer

452. C	453. A	454. D	455. D	456. D	457. A	458. C
459. A	460. C	461. A	462. A	463. A	464. A	465. A
466. A	467. B	468. B	469. D	470. D	471. A	472. A
473. C	474. A	475. A	476. B	477. A	478. B	479. B
480. A	481. C	482. A	483. B	484. B	485. A	486. A
487. A	488. D	489. C	490. B			

Que from Compt. Exams

Co-ordinate Geometry of Three Dimensions

1. The direction cosines of a line segment AB are $-2/\sqrt{17},\ 3/\sqrt{17},\ -2/\sqrt{17}$. If $AB=\sqrt{17}$ and the co-ordinates of A are (3, –6, 10), then the co-ordinates of B are
(a) $(1,-2,4)$ (b) $(2,5,8)$ (c) $(-1,3,-8)$ (d) $(1,-3,8)$

2. The projection of any line on co-ordinate axes be respectively 3, 4, 5 then its length is **[MP PET 1995; RPET 2001]**
(a) 12 (b) 50 (c) $5\sqrt{2}$ (d) None of these

3. If centroid of the tetrahedron $OABC$, where A,B,C are given by $(a,2,3),(1,b,2)$ and $(2,1,c)$ respectively be $(1,2,-1)$, then distance of $P(a,b,c)$ from origin is equal to
(a) $\sqrt{107}$ (b) $\sqrt{14}$ (c) $\sqrt{107/14}$ (d) None of these

4. If $P\equiv(0,1,0), Q\equiv(0,0,1)$, then projection of PQ on the plane $x+y+z=3$ is **[EAMCET 2002]**
(a) $\sqrt{3}$ (b) 3 (c) $\sqrt{2}$ (d) 2

5. The points $A(4,5,1), B(0,-1,-1), C(3,9,4)$ and $D(-4,4,4)$ are **[Kurukshetra CEE 2002]**
(a) Collinear (b) Coplanar (c) Non- coplanar
(d) Non- Collinear and non-coplanar

6. The angle between two diagonals of a cube will be **[MP PET 1996, 2000; RPET 2000, 02; UPSEAT 2004]**
(a) $\sin^{-1}1/3$ (b) $\cos^{-1}1/3$ (c) Variable (d) None of these

7. The equations of the line passing through the point (1,2,–4) and perpendicular to the two lines $\frac{x-8}{3}=\frac{y+19}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$, will be **[AI CBSE 1983]**
(a) $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6}$ (b) $\frac{x-1}{-2}=\frac{y-2}{3}=\frac{z+4}{8}$ (c) $\frac{x-1}{3}=\frac{y-2}{2}=\frac{z+4}{8}$ (d) None of these

8. If three mutually perpendicular lines have direction cosines $(l_1,m_1,n_1),(l_2,m_2,n_2)$ and (l_3,m_3,n_3), then the line having direction cosines $l_1+l_2+l_3$, $m_1+m_2+m_3$ and $n_1+n_2+n_3$ make an angle of ..... with each other
(a) 0° (b) 30° (c) 60° (d) 90°

9. The straight lines whose direction cosines are given by $al+bm+cn=0, fmn+gnl+hlm=0$ are perpendicular, if
(a) $\frac{f}{a}+\frac{g}{b}+\frac{h}{c}=0$ (b) $\sqrt{\frac{a}{f}}+\sqrt{\frac{b}{g}}+\sqrt{\frac{c}{h}}=0$ (c) $\sqrt{af}=\sqrt{bg}=\sqrt{ch}$ (d) $\sqrt{\frac{a}{f}}=\sqrt{\frac{b}{g}}=\sqrt{\frac{c}{h}}$

10. If the straight lines $x=1+s,\ y=-3-\lambda s,\ z=1+\lambda s$ and $x=t/2, y=1+t, z=2-t$, with parameters s and t respectively, are co-planar, then λ equals **[AIEEE 2004]**
(a) 0 (b) –1 (c) –1/2 (d) – 2

11. The co-ordinates of the foot of perpendicular drawn from point $P(1,0,3)$ to the join of points $A(4,7,1)$ and $B(3,5,3)$ is **[RPET 01]**
(a) (5, 7, 1) (b) $\left(\frac{5}{3},\frac{7}{3},\frac{17}{3}\right)$ (c) $\left(\frac{2}{3},\frac{5}{3},\frac{7}{3}\right)$ (d) $\left(\frac{5}{3},\frac{2}{3},\frac{7}{3}\right)$

12. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{1}=\frac{z}{1}$ intersect, then $k=$ **[IIT Screening 2004]**

(a) $\frac{2}{9}$ (b) $\frac{9}{2}$ (c) 0 (d) None of these

13. A square $ABCD$ of diagonal $2a$ is folded along the diagonal AC so that the planes DAC and BAC are at right angle. The shortest distance between DC and AB is **[Kurukshetra CEE 1998]**
(a) $\sqrt{2}a$ (b) $2a/\sqrt{3}$ (c) $2a/\sqrt{5}$ (d) $(\sqrt{3}/2)a$

14. A line with direction cosines proportional to 2,1, 2 meets each of the lines $x = y + a = z$ and $x + a = 2y = 2z$. The co-ordinates of each of the points of intersection are given by **[AIEEE 2004]**
(a) $(2a, a, 3a), (2a, a, a)$ (b) $(3a, 2a, 3a), (a, a, a)$ (c) $(3a, 2a, 3a), (a, a, 2a)$ (d) $(3a, 3a, 3a), (a, a, a)$

15. The equation of the planes passing through the line of intersection of the planes $3x - y - 4z = 0$ and $x + 3y + 6 = 0$ whose distance from the origin is 1, are
(a) $x - 2y - 2z - 3 = 0$, $2x + y - 2z + 3 = 0$ (b) $x - 2y + 2z - 3 = 0$, $2x + y + 2z + 3 = 0$
(c) $x + 2y - 2z - 3 = 0$, $2x - y - 2z + 3 = 0$ (d) None of these

16. The co-ordinates of the points A and B are (2, 3, 4) (–2, 5,– 4) respectively. If a point P moves so that $PA^2 - PB^2 = k$ where k is a constant, then the locus of P is
(a) A line (b) A plane (c) A sphere (d) None of these

17. The equation of the plane passing through the points (1,–3,–2) and perpendicular to planes $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$, is **[AISSE 1987]**
(a) $2x - 4y + 3z - 8 = 0$ (b) $2x - 4y - 3z + 8 = 0$ (c) $2x + 4y + 3z + 8 = 0$ (d) None of these

18. A variable plane at a constant distance p from origin meets the co-ordinates axes in A, B, C. Through these points planes are drawn parallel to co-ordinate planes. Then locus of the point of intersection is
(a) $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{p^2}$ (b) $x^2 + y^2 + z^2 = p^2$ (c) $x + y + z = p$ (d) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = p$

19. P is a fixed point (a, a, a) on a line through the origin equally inclined to the axes, then any plane through P perpendicular to OP, makes intercepts on the axes, the sum of whose reciprocals is equal to
(a) a (b) $\frac{3}{2a}$ (c) $\frac{3a}{2}$ (d) None of these

20. The equation of the plane through the intersection of the planes $x + 2y + 3z - 4 = 0$, $4x + 3y + 2z + 1 = 0$ and passing through the origin will be **[MP PET 1998]**
(a) $x + y + z = 0$ (b) $17x + 14y + 11z = 0$ (c) $7x + 4y + z = 0$ (d) $17x + 14y + z = 0$

21. The d.r's of normal to the plane through $(1, 0, 0)$, $(0, 1, 0)$ which makes an angle $\frac{\pi}{4}$ with plane $x + y = 3$, are **[AIEEE 2002]**
(a) $1, \sqrt{2}, 1$ (b) $1, 1, \sqrt{2}$ (c) $1, 1, 2$ (d) $\sqrt{2}, 1, 1$

22. Two systems of rectangular axes have the same origin. If a plane cuts them at distance a, b, c and a', b', c' from the origin, then
(a) $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} + \frac{1}{a'^2} + \frac{1}{b'^2} + \frac{1}{c'^2} = 0$ (b) $\frac{1}{a^2} + \frac{1}{b^2} - \frac{1}{c^2} + \frac{1}{a'^2} + \frac{1}{b'^2} - \frac{1}{c'^2} = 0$
(c) $\frac{1}{a^2} - \frac{1}{b^2} - \frac{1}{c^2} + \frac{1}{a'^2} - \frac{1}{b'^2} - \frac{1}{c'^2} = 0$ (d) $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} - \frac{1}{a'^2} - \frac{1}{b'^2} - \frac{1}{c'^2} = 0$ **[AIEEE 2003]**

23. If $4x + 4y - kz = 0$ is the equation of the plane through the origin that contains the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$, then $k =$
(a) 1 (b) 3 (c) 5 (d) 7 **[MP PET 1992]**

24. The distance of the point (1, –2, 3) from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$, is
(a) 1 (b) 6/7 (c) 7/6 (d) None of these **[AI CBSE 1984]**

25. The distance of the point of intersection of the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ and the plane $x + y + z = 17$ from the point (3, 4, 5) is given by
(a) 3 (b) 3/2 (c) $\sqrt{3}$ (d) None of these

26. The lines $\frac{x-a+d}{\alpha-\delta} = \frac{y-a}{\alpha} = \frac{z-a-d}{\alpha+\delta}$ and $\frac{x-b+c}{\beta-\gamma} = \frac{y-b}{\beta} = \frac{z-b-c}{\beta+\gamma}$ are coplanar and then equation to the plane in which they lie, is
(a) $x + y + z = 0$ (b) $x - y + z = 0$ (c) $x - 2y + z = 0$ (d) $x + y - 2z = 0$

27. The line $\frac{x-3}{2} = \frac{y-4}{3} = \frac{z-5}{4}$ lies in the plane $4x + 4y - kz - d = 0$. The values of k and d are
(a) 4, 8 (b) –5, – 3 (c) 5, 3 (d) – 4, – 8

28. The value of k such that $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ lies in the plane $2x - 4y + z = 7$, is **[IIT Screening 2003]**

(a) 7 (b) -7 (c) No real value (d) 4

The shortest distance from the plane $12x+4y+3z=327$ to the sphere $x^2+y^2+z^2+4x-2y-6z=155$ is **[AIEEE 2003]**

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

29. 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) 1 (b) 2 (c) 3 (d) 4 **[AIEEE 2003]**

30. The equation of motion of a rocket are: $x=2t, y=-4t, z=4t$ where the time 't' is given in seconds, and the co-ordinates of a moving point in kilometers. What is the path of the rocket? At what distance will be the rocket be from the starting point 0(0, 0, 0) in 10 seconds

(a) Straight line, 60 *km* (b) Straight line, 30 *km* (c) Parabola, 60 *km* (d) Ellipse, 60 *km*

31. The plane $lx+my=0$ is rotated an angle α about its line of intersection with the plane $z=0$, then the equation to the plane in its new position is

(a) $lx+my\pm z\sqrt{(l^2+m^2)}\tan\alpha=0$

(b) $lx-my\pm z\sqrt{(l^2+m^2)}\tan\alpha=0$

(c) $lx+my\pm z\sqrt{(l^2+m^2)}\cos\alpha=0$

(d) $lx-my\pm z\sqrt{(l^2+m^2)}\cos\alpha=0$

32. The distance between two points P and Q is d and the length of their projections of PQ on the co-ordinate planes are d_1, d_2, d_3. Then $d_1^2+d_2^2+d_3^2=kd^2$ where 'k' is

(a) 1 (b) 5
(c) 3 (d) 2

33. If P_1 and P_2 are the lengths of the perpendiculars from the points (2,3,4) and (1,1,4) respectively from the plane $3x-6y+2z+11=0$, then P_1 and P_2 are the roots of the equation

(a) $P^2-23P+7=0$ (b) $7P^2-23P+16=0$
(c) $P^2-17P+16=0$ (d) $P^2-16P+7=0$

34. The edge of a cube is of length 'a' then the shortest distance between the diagonal of a cube and an edge skew to it is

(a) $a\sqrt{2}$ (b) a
(c) $\sqrt{2}/a$ (d) $a/\sqrt{2}$

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Co-ordinate Geometry of Three Dimensions

1	d	2	c	3	a	4	c	5	b
6	b	7	a	8	a	9	a	10	d
11	b	12	b	13	b	14	b	15	a
16	b	17	a	18	a	19	d	20	b
21	b	22	d	23	c	24	a	25	a
26	c	27	c	28	a	29	c	30	c
31	a	32	a	33	d	34	b	35	d

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Vector Algebra

1. Three forces of magnitudes 1, 2, 3 dynes meet in a point and act along diagonals of three adjacent faces of a cube. The resultant force is **[MNR 1987]**

(a) 114 dyne (b) 6 dyne (c) 5 dyne (d) None of these

2. The vectors **b** and **c** are in the direction of north-east and north-west respectively and $|\mathbf{b}|=|\mathbf{c}|=4$. The magnitude and direction of the vector $\mathbf{d}=\mathbf{c}-\mathbf{b}$, are **[Roorkee 2000]**

(a) $4\sqrt{2}$, towards north (b) $4\sqrt{2}$, towards west (c) 4, towards east (d) 4, towards south

3. If **a, b** and **c** are unit vectors, then $|\mathbf{a}-\mathbf{b}|^2+|\mathbf{b}-\mathbf{c}|^2+|\mathbf{c}-\mathbf{a}|^2$ does not exceed **[IIT Screening 2001]**

(a) 4 (b) 9 (c) 8 (d) 6

4. The vectors $\overrightarrow{AB}=3\mathbf{i}+5\mathbf{j}+4\mathbf{k}$ and $\overrightarrow{AC}=5\mathbf{i}-5\mathbf{j}+2\mathbf{k}$ are the sides of a triangle ABC. The length of the median through A is **[UPSEAT 2004]**

(a) $\sqrt{13}$ *unit* (b) $2\sqrt{5}$ *unit* (c) 5 *unit* (d) 10 *unit*

5. Let the value of $\mathbf{p}=(x+4y)\mathbf{a}+(2x+y+1)\mathbf{b}$ and $\mathbf{q}=(y-2x+2)\mathbf{a}+(2x-3y-1)\mathbf{b}$, where **a** and **b** are non-collinear vectors. If $3\mathbf{p}=2\mathbf{q}$, then the value of x and y will be **[RPET 1984; MNR 1984]**

(a) $-1, 2$ (b) $2, -1$ (c) $1, 2$ (d) $2, 1$\

6. The points *D, E, F* divide *BC, CA* and *AB* of the triangle *ABC* in the ratio 1 : 4, 3 : 2 and 3 : 7 respectively and the point *K* divides *AB* in the ratio $1:3$, then $(\overrightarrow{AD}+\overrightarrow{BE}+\overrightarrow{CF}):\overrightarrow{CK}$ is equal to **[MNR 1987]**

(a) 1 : 1 (b) 2 : 5 (c) 5 : 2 (d) None of these

7. If two vertices of a triangle are $\mathbf{i}-\mathbf{j}$ and $\mathbf{j}+\mathbf{k}$, then the third vertex can be **[Roorkee 1995]**

(a) $\mathbf{i}+\mathbf{k}$ (b) $\mathbf{i}-2\mathbf{j}-\mathbf{k}$ (c) $\mathbf{i}-\mathbf{k}$ (d) $2\mathbf{i}-\mathbf{j}$

(e) All the above

8. If **a** of magnitude 50 is collinear with the vector $\mathbf{b}=6\,\mathbf{i}-8\,\mathbf{j}-\frac{15\,\mathbf{k}}{2}$, and makes an acute angle with the positive direction of *z*-axis, then the vector **a** is equal to

[Pb. CET 2004]

(a) $24\,\mathbf{i}-32\,\mathbf{j}+30\,\mathbf{k}$ (b) $-24\,\mathbf{i}+32\,\mathbf{j}+30\,\mathbf{k}$ (c) $16\,\mathbf{i}-16\,\mathbf{j}-15\,\mathbf{k}$ (d) $-12\,\mathbf{i}+16\,\mathbf{j}-30\,\mathbf{k}$

9. If three non-zero vectors are $\mathbf{a}=a_1\mathbf{i}+a_2\mathbf{j}+a_3\mathbf{k}$, $\mathbf{b}=b_1\mathbf{i}+b_2\mathbf{j}+b_3\mathbf{k}$ and $\mathbf{c}=c_1\mathbf{i}+c_2\mathbf{j}+c_3\mathbf{k}$. If **c** is the unit vector perpendicular to the vectors **a** and **b** and the angle between **a** and **b** is $\frac{\pi}{6}$, then $\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}^2$ is equal to

(a) 0 (b) $\frac{3\,(\Sigma a_1^2)(\Sigma b_1^2)(\Sigma c_1^2)}{4}$ (c) 1 (d) $\frac{(\Sigma a_1^2)(\Sigma b_1^2)}{4}$

10. Let the unit vectors **a** and **b** be perpendicular and the unit vector **c** be inclined at an angle θ to both **a** and **b**. If $\mathbf{c}=\alpha\,\mathbf{a}+\beta\,\mathbf{b}+\gamma(\mathbf{a}\times\mathbf{b})$, then **[Orissa JEE 2003]**

(a) $\alpha=\beta=\cos\theta,\ \gamma^2=\cos\,2\theta$ (b) $\alpha=\beta=\cos\theta,\ \gamma^2=-\cos\,2\theta$

(c) $\alpha=\cos\theta,\ \beta=\sin\theta,\ \gamma^2=\cos\,2\theta$ (d) None of these

11. The vector $\mathbf{a}+\mathbf{b}$ bisects the angle between the vectors **a** and **b,** if

(a) $|\mathbf{a}|=|\mathbf{b}|$ (b) $|\mathbf{a}|=|\mathbf{b}|$ or angle between **a** and **b** is zero

(c) $|\mathbf{a}|=m|\mathbf{b}|$ (d) None of these

12. The points O, A, B, C, D are such that $\overrightarrow{OA}=\mathbf{a}$, $\overrightarrow{OB}=\mathbf{b}$, $\overrightarrow{OC}=2\mathbf{a}+3\mathbf{b}$ and $\overrightarrow{OD}=\mathbf{a}-2\mathbf{b}$. If $|\mathbf{a}|=3|\mathbf{b}|$, then the angle between $\overrightarrow{BD}$ and $\overrightarrow{AC}$ is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{6}$ (d) None of these

13. If $\vec{A}=\mathbf{i}+2\mathbf{j}+3\mathbf{k}$, $\vec{B}=-\mathbf{i}+2\mathbf{j}+\mathbf{k}$ and $\vec{C}=3\mathbf{i}+\mathbf{j}$, then the value of *t* such that $\vec{A}+t\vec{B}$ is at right angle to vector $\vec{C}$, is

[RPET 2002]

(a) 2 (b) 4 (c) 5 (d) 6

14. Let $\mathbf{b}=4\mathbf{i}+3\mathbf{j}$ and **c** be two vectors perpendicular to each other in the *xy*-plane. All vectors in the same plane having projections 1 and 2 along **b** and **c** respectively, are given by **[IIT 1987]**

(a) $2\mathbf{i}-\mathbf{j},\ \frac{2}{5}\mathbf{i}+\frac{11}{5}\mathbf{j}$ (b) $2\mathbf{i}+\mathbf{j},\ -\frac{2}{5}\mathbf{i}+\frac{11}{5}\mathbf{j}$ (c) $2\mathbf{i}+\mathbf{j},-\frac{2}{5}\mathbf{i}-\frac{11}{5}\mathbf{j}$ (d) $2\mathbf{i}-\mathbf{j},\ -\frac{2}{5}\mathbf{i}+\frac{11}{5}\mathbf{j}$

15. Let $\mathbf{a}=2\mathbf{i}-\mathbf{j}+\mathbf{k}$, $\mathbf{b}=\mathbf{i}+2\mathbf{j}-\mathbf{k}$ and $\mathbf{c}=\mathbf{i}+\mathbf{j}-2\mathbf{k}$ be three vectors. A vector in the plane of **b** and **c** whose projection on **a** is of magnitude $\sqrt{2/3}$ is

[IIT 1993; Pb. CET 2004]

(a) $2\mathbf{i}+3\mathbf{j}-3\mathbf{k}$ (b) $2\mathbf{i}+3\mathbf{j}+3\mathbf{k}$ (c) $-2\mathbf{i}-\mathbf{j}+5\mathbf{k}$ (d) $2\mathbf{i}+\mathbf{j}+5\mathbf{k}$

16. A vector **a** has components 2*p* and 1 with respect to a rectangular cartesian system. The system is rotated through a certain angle about the origin in the anti-clockwise sense. If **a** has components *p*+1 and 1 with respect to the new system, then **[IIT 1984]**

(a) $p=0$ (b) $p=1$ or $-\frac{1}{3}$ (c) $p=-1$ or $\frac{1}{3}$ (d) $p=1$ or -1

17. If $\mathbf{u}=2\,\mathbf{i}+2\mathbf{j}-\mathbf{k}$ and $\mathbf{v}=6\,\mathbf{i}-3\,\mathbf{j}+2\,\mathbf{k}$, then a unit vector perpendicular to both **u** and **v** is **[MP PET 1987]**

(a) $\mathbf{i}-10\,\mathbf{j}-18\,\mathbf{k}$ (b) $\frac{1}{\sqrt{17}}\left(\frac{1}{5}\mathbf{i}-2\mathbf{j}-\frac{18}{5}\mathbf{k}\right)$ (c) $\frac{1}{\sqrt{473}}(7\mathbf{i}-10\,\mathbf{j}-18\,\mathbf{k})$ (d) None of these

18. If $\mathbf{a}=2\mathbf{i}+\mathbf{k}$, $\mathbf{b}=\mathbf{i}+\mathbf{j}+\mathbf{k}$ and $\mathbf{c}=4\mathbf{i}-3\mathbf{j}+7\mathbf{k}$. If $\mathbf{d}\times\mathbf{b}=\mathbf{c}\times\mathbf{b}$ and $\mathbf{d}\,.\,\mathbf{a}=0$, then **d** will be **[IIT 1990]**

(a) $\mathbf{i}+8\mathbf{j}+2\mathbf{k}$ (b) $\mathbf{i}-8\mathbf{j}+2\mathbf{k}$ (c) $-\mathbf{i}+8\mathbf{j}-\mathbf{k}$ (d) $-\mathbf{i}-8\mathbf{j}+2\mathbf{k}$

19. If $\mathbf{a}\times\mathbf{r}=\mathbf{b}+\lambda\mathbf{a}$ and $\mathbf{a}\ .\ \mathbf{r}=3$, where $\mathbf{a}=2\mathbf{i}+\mathbf{j}-\mathbf{k}$ and $\mathbf{b}=-\mathbf{i}-2\mathbf{j}+\mathbf{k}$, then **r** and λ are equal to

(a) $\mathbf{r}=\frac{7}{6}\mathbf{i}+\frac{2}{3}\mathbf{j},\ \lambda=\frac{6}{5}$ (b) $\mathbf{r}=\frac{7}{6}\mathbf{i}+\frac{2}{3}\mathbf{j},\ \lambda=\frac{5}{6}$ (c) $\mathbf{r}=\frac{6}{7}\mathbf{i}+\frac{2}{3}\mathbf{j},\ \lambda=\frac{6}{5}$ (d) None of these

20. Let the vectors **a**, **b**, **c** and **d** be such that $(\mathbf{a}\times\mathbf{b})\times(\mathbf{c}\times\mathbf{d})=0$. Let P_1 and P_2 be planes determined by pair of vectors **a**, **b** and **c**, **d** respectively. Then the angle between P_1 and P_2 is **[IIT Screening 2000; MP PET 2004]**

(a) 0^o (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

21. If $\mathbf{a}=\mathbf{i}+\mathbf{j}+\mathbf{k}$, $\mathbf{a}\,.\,\mathbf{b}=1$ and $\mathbf{a}\times\mathbf{b}=\mathbf{j}-\mathbf{k}$, then $\mathbf{b}=$ **[IIT Screening 2004]**

(a) $\mathbf{i}$ (b) $\mathbf{i}-\mathbf{j}+\mathbf{k}$ (c) $2\mathbf{j}-\mathbf{k}$ (d) $2\mathbf{i}$

22. The position vectors of the vertices of a quadrilateral *ABCD* are **a, b, c** and **d** respectively. Area of the quadrilateral formed by joining the middle points of its sides is **[Roorkee 2000]**

(a) $\frac{1}{4}|\mathbf{a}\times\mathbf{b}+\mathbf{b}\times\mathbf{d}+\mathbf{d}\times\mathbf{a}|$ (b) $\frac{1}{4}|\mathbf{b}\times\mathbf{c}+\mathbf{c}\times\mathbf{d}+\mathbf{a}\times\mathbf{d}+\mathbf{b}\times\mathbf{a}|$

(c) $\frac{1}{4}|\mathbf{a}\times\mathbf{b}+\mathbf{b}\times\mathbf{c}+\mathbf{c}\times\mathbf{d}+\mathbf{d}\times\mathbf{a}|$ (d) $\frac{1}{4}|\mathbf{b}\times\mathbf{c}+\mathbf{c}\times\mathbf{d}+\mathbf{d}\times\mathbf{b}|$

23. The moment about the point $M(-2,4,-6)$ of the force represented in magnitude and position by $\overrightarrow{AB}$ where the points *A* and *B* have the co-ordinates $(1,2,-3)$ and $(3,-4,2)$ respectively, is **[MP PET 2000]**

(a) $8\mathbf{i}-9\mathbf{j}-14\mathbf{k}$ (b) $2\mathbf{i}-6\mathbf{j}+5\mathbf{k}$ (c) $-3\mathbf{i}+2\mathbf{j}-3\mathbf{k}$ (d) $-5\mathbf{i}+8\mathbf{j}-8\mathbf{k}$

24. If the vectors $a\mathbf{i}+\mathbf{j}+\mathbf{k}$, $\mathbf{i}+b\mathbf{j}+\mathbf{k}$ and $\mathbf{i}+\mathbf{j}+c\mathbf{k}$ $(a\neq b\neq c\neq 1)$ are coplanar, then the value of $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=$

[BIT Ranchi 1988; RPET 1987;*IIT 1987; DCE 2001; MP PET 2004; ORISSA JEE 2005*]

(a) -1 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) 1

25. If $\alpha(\mathbf{a}\times\mathbf{b})+\beta(\mathbf{b}\times\mathbf{c})+\gamma(\mathbf{c}\times\mathbf{a})=\mathbf{0}$ and at least one of the numbers α, β and γ is non-zero, then the vectors **a, b** and **c** are

(a) Perpendicular (b) Parallel (c) Coplanar (d) None of these

26. The volume of the tetrahedron, whose vertices are given by the vectors $-\mathbf{i}+\mathbf{j}+\mathbf{k}$, $\mathbf{i}-\mathbf{j}+\mathbf{k}$ and $\mathbf{i}+\mathbf{j}-\mathbf{k}$ with reference to the fourth vertex as origin, is

(a) $\frac{5}{3}$ *cubic unit* (b) $\frac{2}{3}$ *cubic unit* (c) $\frac{3}{5}$ *cubic unit* (d) None of these

27. Let $\mathbf{a}=\mathbf{i}-\mathbf{j}$, $\mathbf{b}=\mathbf{j}-\mathbf{k}$, $\mathbf{c}=\mathbf{k}-\mathbf{i}$. If $\hat{\mathbf{d}}$ is a unit vector such that $\mathbf{a}\,.\,\hat{\mathbf{d}}=0=[\mathbf{b}\ \mathbf{c}\ \hat{\mathbf{d}}]$, then $\hat{\mathbf{d}}$ is equal to **[IIT 1995]**

(a) $\pm\frac{\mathbf{i}+\mathbf{j}-\mathbf{k}}{\sqrt{3}}$ (b) $\pm\frac{\mathbf{i}+\mathbf{j}+\mathbf{k}}{\sqrt{3}}$ (c) $\pm\frac{\mathbf{i}+\mathbf{j}-2\mathbf{k}}{\sqrt{6}}$ (d) $\pm\,\mathbf{k}$

28. The value of '*a*' so that the volume of parallelopiped formed by $\mathbf{i}+a\mathbf{j}+\mathbf{k}$, $\mathbf{j}+a\mathbf{k}$ and $a\mathbf{i}+\mathbf{k}$ becomes minimum is **[IIT Screening 2003]**

(a) -3 (b) 3 (c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{3}$

29. If **b** and **c** are any two non-collinear unit vectors and **a** is any vector, then $(\mathbf{a}\,.\,\mathbf{b})\mathbf{b}+(\mathbf{a}\,.\,\mathbf{c})\mathbf{c}+\frac{\mathbf{a}\,.\,(\mathbf{b}\times\mathbf{c})}{|\mathbf{b}\times\mathbf{c}|}(\mathbf{b}\times\mathbf{c})=$ **[IIT 1996]**

(a) **a** (b) **b** (c) **c** (d) **0**

30. If **a, b, c** are non-coplanar unit vectors such that $\mathbf{a}\times(\mathbf{b}\times\mathbf{c})=\frac{\mathbf{b}+\mathbf{c}}{\sqrt{2}}$, then the angle between **a** and **b** is **[IIT 1995]**

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{4}$ (d) π

31. $[(\mathbf{a}\times\mathbf{b})\times(\mathbf{b}\times\mathbf{c})(\mathbf{b}\times\mathbf{c})\times(\mathbf{c}\times\mathbf{a})(\mathbf{c}\times\mathbf{a})\times(\mathbf{a}\times\mathbf{b})]=$

(a) $[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]^2$ (b) $[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]^3$ (c) $[\mathbf{a}\ \mathbf{b}\ \mathbf{c}]^4$ (d) None of these

32. Unit vectors **a, b** and **c** are coplanar. A unit vector **d** is perpendicular to them. If $(\mathbf{a}\times\mathbf{b})\times(\mathbf{c}\times\mathbf{d})=\frac{1}{6}\mathbf{i}-\frac{1}{3}\mathbf{j}+\frac{1}{3}\mathbf{k}$ and the angle between **a** and **b** is 30^o, then **c** is **[Roorkee Qualifying 1998]**

(a) $\frac{(\mathbf{i}-2\mathbf{j}+2\mathbf{k})}{3}$ (b) $\frac{(2\mathbf{i}+\mathbf{j}-\mathbf{k})}{3}$ (c) $\frac{(-\mathbf{i}+2\mathbf{j}-2\mathbf{k})}{3}$ (d) $\frac{(-\mathbf{i}+2\mathbf{j}+\mathbf{k})}{3}$

33. The radius of the circular section of the sphere $|\mathbf{r}|=5$ by the plane $\mathbf{r}\,.\,(\mathbf{i}+\mathbf{j}+\mathbf{k})=3\sqrt{3}$ is **[DCE 1999]**

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

34. If $\mathbf{x}$ is parallel to $\mathbf{y}$ and $\mathbf{z}$ where $\mathbf{x}=2\mathbf{i}+\mathbf{j}+\alpha\mathbf{k}$, $\mathbf{y}=\alpha\mathbf{i}+\mathbf{k}$ and $\mathbf{z}=5\mathbf{i}-\mathbf{j}$, then α is equal to **[J & K 2005]**

(a) $\pm\sqrt{5}$ (b) $\pm\sqrt{6}$ (c) $\pm\sqrt{7}$ (d) None of these

35. The vector **c** directed along the internal bisector of the angle between the vectors $\mathbf{a} = 7\mathbf{i} - 4\mathbf{j} - 4\mathbf{k}$ and $\mathbf{b} = -2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ with $|\mathbf{c}| = 5\sqrt{6}$, is

(a) $\frac{5}{3}(\mathbf{i} - 7\mathbf{j} + 2\mathbf{k})$ (b) $\frac{5}{3}(5\mathbf{i} + 5\mathbf{j} + 2\mathbf{k})$ (c) $\frac{5}{3}(\mathbf{i} + 7\mathbf{j} + 2\mathbf{k})$ (d) $\frac{5}{3}(-5\mathbf{i} + 5\mathbf{j} + 2\mathbf{k})$

36. The distance of the point $B(\mathbf{i} + 2\mathbf{j} + 3\mathbf{k})$ from the line which is passing through $A(4\mathbf{i} + 2\mathbf{j} + 2\mathbf{k})$ and which is parallel to the vector $\vec{C} = 2\mathbf{i} + 3\mathbf{j} + 6\mathbf{k}$ is **[Roorkee 1993]**

(a) 10 (b) $\sqrt{10}$ (c) 100 (d) None of these

37. Let **a, b, c** are three non-coplanar vectors such that

$\mathbf{r}_1 = \mathbf{a} - \mathbf{b} + \mathbf{c}$, $\mathbf{r}_2 = \mathbf{b} + \mathbf{c} - \mathbf{a}$, $\mathbf{r}_3 = \mathbf{c} + \mathbf{a} + \mathbf{b}$,

$\mathbf{r} = 2\mathbf{a} - 3\mathbf{b} + 4\mathbf{c}$. If $\mathbf{r} = \lambda_1 \mathbf{r}_1 + \lambda_2 \mathbf{r}_2 + \lambda_3 \mathbf{r}_3$, then

(a) $\lambda_1 = 7$ (b) $\lambda_1 + \lambda_3 = 3$ (c) $\lambda_1 + \lambda_2 + \lambda_3 = 4$ (d) $\lambda_3 + \lambda_2 = 2$

38. Let $\mathbf{a} = 2\mathbf{i} + \mathbf{j} + \mathbf{k}$, $\mathbf{b} = \mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and a unit vector **c** be coplanar. If **c** is perpendicular to **a**, then **c** = **[IIT 1999; Pb. CET 2003; DCE 2005]**

(a) $\frac{1}{\sqrt{2}}(-\mathbf{j} + \mathbf{k})$ (b) $\frac{1}{\sqrt{3}}(-\mathbf{i} - \mathbf{j} - \mathbf{k})$ (c) $\frac{1}{\sqrt{5}}(\mathbf{i} - 2\mathbf{j})$ (d) $\frac{1}{\sqrt{3}}(\mathbf{i} - \mathbf{j} - \mathbf{k})$

39. Let **p, q, r** be three mutually perpendicular vectors of the same magnitude. If a vector **x** satisfies equation $\mathbf{p} \times \{(\mathbf{x} - \mathbf{q}) \times \mathbf{p}\} + \mathbf{q} \times \{(\mathbf{x} - \mathbf{r}) \times \mathbf{q}\} + \mathbf{r} \times \{(\mathbf{x} - \mathbf{p}) \times \mathbf{r}\} = 0$, then **x** is given by **[IIT 1997 Cancelled]**

(a) $\frac{1}{2}(\mathbf{p} + \mathbf{q} - 2\mathbf{r})$ (b) $\frac{1}{2}(\mathbf{p} + \mathbf{q} + \mathbf{r})$ (c) $\frac{1}{3}(\mathbf{p} + \mathbf{q} + \mathbf{r})$ (d) $\frac{1}{3}(2\mathbf{p} + \mathbf{q} - \mathbf{r})$

40. The point of intersection of $\mathbf{r} \times \mathbf{a} = \mathbf{b} \times \mathbf{a}$ and $\mathbf{r} \times \mathbf{b} = \mathbf{a} \times \mathbf{b}$, where $\mathbf{a} = \mathbf{i} + \mathbf{j}$ and $\mathbf{b} = 2\mathbf{i} - \mathbf{k}$ is **[Orissa JEE 2004]**

(a) $3\mathbf{i} + \mathbf{j} - \mathbf{k}$ (b) $3\mathbf{i} - \mathbf{k}$ (c) $3\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ (d) None of these

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Vector Algebra

1	c	2	b	3	b	4	c	5	b
6	b	7	e	8	b	9	d	10	b
11	b	12	d	13	c	14	d	15	a,c
16	b	17	b	18	d	19	b	20	a
21	a	22	c	23	a	24	d	25	c
26	b	27	c	28	c	29	a	30	c
31	c	32	a,c	33	d	34	c	35	a
36	b	37	b,c	38	a	39	b	40	a

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