INDIAN SCHOOL AL WADI AL KABIR

Class XII, Mathematics (2024-25)

WORKSHEET – Vectors AND Three-Dimensional Geometry

MCQ (1Mark)

1. If a line makes angles α, β, γ *with the positive direction of coordinate axes, then write* the value of $cos2\alpha + cos2\beta + \cos 2\gamma$.

	A	1	B	0	C	2	D	-1

2. Find the angle between the lines 2x= 3y = -z and 6x = -y = -4z. Ans:

	A	$\frac{\pi}{2}$	B	0	C	π	D	$\frac{\pi}{4}$

3. Write the coordinates of the point which is the reflection of the point (α, β, γ) *in the XZ plane.*
Ans: $(\alpha, -\beta, \gamma)$

	A	$(\alpha, -\beta, -\gamma)$	B	$(-\alpha, \beta, \gamma)$	C	$(\alpha, -\beta, \gamma)$	D	(α, β, γ)

4. vectors $\hat{\imath} + \hat{\jmath} + \hat{k}$ *and* $\hat{\imath} - 2\hat{j} + \hat{k}$ are:

	A	parallel	B	perpendicular	C	Unit vectors	D	null vectors

5. If $\vec{a}$, $\vec{b}$ and $(\vec{a} - \sqrt{2}\,\vec{b})$ are unit vectors, then the angle between $\vec{a}$ *and* $\vec{b}$:

	A	$\frac{2\pi}{3}$	B	$\frac{\pi}{4}$	C	$\frac{\pi}{2}$	D	$\frac{\pi}{6}$

6. *If* $|\vec{a} \times \vec{b}| = \vec{a}.\vec{b}$ then the angle between $\vec{a}$ and $\vec{b}$:

	A	$\frac{2\pi}{3}$	B	$\frac{\pi}{4}$	C	$\frac{\pi}{2}$	D	$\frac{\pi}{6}$

7. The two vectors $\hat{\jmath} + \hat{k}$ *and* $3\,\hat{\imath} - \hat{\jmath} + 4\hat{k}$ represents the two sides AB and AC respectively of a triangle ABC. The length of the median through A:

	A	$\frac{\sqrt{48}}{2}$	B	$\frac{\sqrt{18}}{2}$	C	$\frac{\sqrt{34}}{2}$	D	$\frac{\sqrt{27}}{2}$

8. *If* $|\vec{a} \times \vec{b}| = 12, |\vec{a}| = 8$ *and* $|\vec{b}|$=3 then the value of $\vec{a}.\vec{b}$

	A	$12\sqrt{3}$	B	$8\sqrt{3}$		$18\sqrt{3}$		12

9. The scalar product of the vectors $\hat{\imath} + \hat{\jmath} + \hat{k}$ with a unit vector along the sum of the vectors $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is equal to 1. Find the value of λ. Ans: 1

10.	If $\vec{a}\neq 0$, $\vec{a}.\vec{b}=\vec{a}.\vec{c}$ and $\vec{a}\times\vec{b}=\vec{a}\times\vec{c}$, then show that $\vec{b}=\vec{c}$
11.	Find λ when the projection of $\vec{a}=\lambda\hat{i}+\hat{j}+4\hat{k}$ on $\vec{b}=2\hat{i}+6\hat{j}+3\hat{k}$ is 4 units. Ans: 5
12.	Show that the four points A(4, 5, 1), B(0, -1, -1), C(3, 9, 4) and D(-4, 4, 4) are coplanar.
13.	The x coordinate of a point Q on the line joining the points P (2, 2, 1) and R(5, 1, -2) is 4. Find its z coordinate. Ans. -1
14.	Let $\vec{a}=\hat{i}+4\hat{j}+2\hat{k}$, $\vec{b}=3\hat{i}-2\hat{j}+7\hat{k}$ and $\vec{c}=2\hat{i}-\hat{j}+4\hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{c}.\vec{d}=15$. Ans: $\vec{d}=\left(\frac{5}{3}\right)\left(32\hat{i}-\hat{j}-14\hat{k}\right)$.
15.	Two adjacent sides of a parallelogram are $2\hat{i}-4\hat{j}-5\hat{k}$ and $2\hat{i}+2\hat{j}+3\hat{k}$. Find the two unit vectors parallel to its diagonals. Using diagonal vectors find the area of the parallelogram. Ans: $2\sqrt{101}$
16.	Find the angle between the vectors $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ if $\vec{a}=2\hat{i}-\hat{j}+3\hat{k}$ and $\vec{b}=3\hat{i}+\hat{j}-2\hat{k}$ and hence find a vector perpendicular to both $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$. Ans: $\frac{\pi}{2}$, $2\hat{i}-26\hat{j}-10\hat{k}$
17.	Find the shortest distance between the lines: $\vec{r}=(\hat{i}+2\hat{j}+\hat{k})+\lambda(\hat{i}-\hat{j}+\hat{k})$ and $\vec{r}=(2\hat{i}-\hat{j}-\hat{k})+\mu(2\hat{i}+\hat{j}+2\hat{k})$ Shortest distance $=\left\lvert\frac{-9}{3\sqrt{2}}\right\rvert=\frac{3\sqrt{2}}{2}$
18.	Find the shortest distance between the following lines : $\vec{r}=(\hat{i}+2\hat{j}+3\hat{k})+\lambda(2\hat{i}+3\hat{j}+4\hat{k})$ $\vec{r}=(2\hat{i}+4\hat{j}+5\hat{k})+\mu(4\hat{i}+6\hat{j}+8\hat{k})$ $\frac{\sqrt{145}}{29}$
19.	Find the vector and cartesian equations of a line through the point (1, –1, 1) and perpendicular to the lines joining the points (4, 3, 2), (1, –1, 0) and (1, 2, –1), (2, 1, 1). Ans: $\frac{x-1}{10}=\frac{y+1}{-4}=\frac{z-1}{-7}$, $\vec{r}=\left(\hat{i}-\hat{j}+\hat{k}\right)+\lambda\left(10\hat{i}-4\hat{j}-7\hat{k}\right)$
20.	Find the value of k if the following lines are perpendicular: $\frac{x+3}{k-5}=\frac{y-1}{1}=\frac{5-z}{-2k-1}$; $\frac{x+2}{-1}=\frac{2-y}{-k}=\frac{z}{5}$.. Ans: k= -1
21.	Find the image of the point (1, 6, 3) in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$. Ans: (1, 0, 7)

Answers(MCQ)

1	D	2	A	3	C	4	D
5	B	6	B	7	C	8	A

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