INDIAN SCHOOL AL WADI AL KABIR
Class XII, Mathematics (2025-26)
WORKSHEET – Vectors AND Three-Dimensional Geometry

1.	If a line makes angles α, β, γ *with the positive direction of coordinate axes, then write* the value of $\sin^2\alpha + sin^2\beta + sin^2\gamma$.							
	A	1	B	0	C	2	D	-1
2.	What is the value of $\frac{projection\ of\ \vec{a}\ \text{on}\ \vec{b}}{projection\ of\ \vec{b}\ \text{on}\ \vec{a}}$ if $\vec{a} = 2\hat{\imath} - 3\hat{\jmath} - 6\hat{k}$ on $\vec{b} = 2\hat{\imath} - 2\hat{\jmath} + \hat{k}$							
	A	$\frac{3}{7}$	B	$\frac{7}{3}$	C	$\frac{4}{3}$	D	$\frac{4}{7}$
3.	Write the coordinates of the point which is the reflection of the point (α, β, γ) *in the XZ plane.*							
	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* $\hat{\imath} - 2\hat{\jmath} + \hat{k}$ 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* $\lvert\vec{a} \times \vec{b}\rvert = \vec{a}.\vec{b}$ 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* $\lvert\vec{a} \times \vec{b}\rvert = 12, \lvert\vec{a}\rvert = 8$ *and* $\lvert\vec{b}\rvert$=3 then the value of $\vec{a}.\vec{b}$							
	A	$12\sqrt{3}$	B	$8\sqrt{3}$		$18\sqrt{3}$		12
9.	If ABCD is a parallelogram and AC and BD are its diagonals. Then $\overrightarrow{AC} + \overrightarrow{BD} =$							
	A	$2\overrightarrow{DA}$	B	$2\overrightarrow{AB}$	C	$2\overrightarrow{BC}$	D	$2\overrightarrow{BD}$

10.	The value of $(\hat{i} \times \hat{j}) . \hat{j} + (\hat{j} \times \hat{i}) . \hat{k}$ is :							
	A	1	B	2	C	0	D	-1
11.	If $\vec{a} + \vec{b} = \hat{i}$ and $\vec{a} = 2\hat{i} - 2\hat{j} + 2\hat{k}$, then $\lvert \vec{b} \rvert$ equals :							
	A	$\sqrt{12}$	B	$\sqrt{14}$	C	3	D	$\sqrt{17}$
12.	If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then find the value of $\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a}$.							
	A	$-\frac{3}{2}$	B	$\frac{3}{2}$	C	$-\frac{2}{3}$	D	3
13.	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							
14.	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 $\vec{b} = \vec{c}$							
15.	Find all the vectors of magnitude $3\sqrt{3}$ which are collinear to vector $\hat{i} + \hat{j} + \hat{k}$. Ans: $\pm 3(\hat{\imath}+\hat{\jmath}+\hat{k})$							
16.	If $\vec{a}$, $\vec{b}$, $\vec{c}$ and $\vec{d}$ are four non-zero vectors such that $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = 4\vec{b} \times \vec{d}$, then show that $(\vec{a} - 2\vec{d})$ is parallel to $(2\vec{b} - \vec{c})$ where $\vec{a} \neq 2\vec{d}$, $\vec{c} \neq 2\vec{b}$.							
17.	Find λ when the projection of $\vec{a} = \lambda\hat{\imath}+\hat{\jmath}+4\hat{k}$ on $\vec{b} = 2\hat{\imath}+6\hat{\jmath}+3\hat{k}$ is 4 units. Ans: 5							
18.	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							
19.	Let $\vec{a} = \hat{\imath}+4\hat{\jmath}+2\hat{k}$, $\vec{b} = 3\hat{\imath}-2\hat{\jmath}+7\hat{k}$ and $\vec{c} = 2\hat{\imath}-\hat{\jmath}+4\hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{c}.\vec{d} = 15$. Ans: $\vec{d} = \left(\frac{5}{3}\right)(32\hat{\imath} - \hat{\jmath} - 14\hat{k})$.							
20.	Two adjacent sides of a parallelogram are $2\hat{\imath} - 4\hat{\jmath} - 5\hat{k}$ and $2\hat{\imath}+2\hat{\jmath}+3\hat{k}$. Find the two unit vectors parallel to its diagonals. Using diagonal vectors find the area of the parallelogram. Ans: $2\sqrt{101}$							
21.	Find the angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ if $\vec{a} = 2\hat{\imath}-\hat{\jmath}+3\hat{k}$ and $\vec{b} = 3\hat{\imath}+\hat{\jmath}-2\hat{k}$ and hence find a vector perpendicular to both $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$. Ans: $\frac{\pi}{2}$, $2\hat{\imath}-26\hat{\jmath}-10\hat{k}$							

Answers(MCQ)

1	**C**	**2**	**B**	**3**	**C**	**4**	**D**
5	**B**	**6**	**B**	**7**	**C**	**8**	**A**
9.	**C**	**10**	**D**	**11**	**C**	**12**	**A**

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