

Model Question Paper 1

VECTOR ALGEBRA 1

11th Standard

Maths

Reg.No. :

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Answer all the Questions

Time : 02:00:00 Hrs

Total Marks : 60

9 x 1 = 9

Part A

- 1) The position vector of A is $2\vec{i} + 3\vec{j} + 4\vec{k}$, $\vec{AB} = 5\vec{i} + 7\vec{j} + 6\vec{k}$, then position vector of B is
 (a) $7\vec{i} + 10\vec{j} + 10\vec{k}$ (b) $7\vec{i} + 10\vec{j} - 10\vec{k}$ (c) $7\vec{i} - 10\vec{j} + 10\vec{k}$ (d) $-7\vec{i} - 10\vec{j} - 10\vec{k}$
- 2) If $\vec{a}$ is a non-zero vector and k is a scalar such that $\left| \frac{\vec{a}}{ka} \right| = 1$, then k is equal to
 (a) $|\vec{a}|$ (b) 1 (c) $\frac{1}{|\vec{a}|}$ (d) $\pm \frac{1}{|\vec{a}|}$
- 3) Let $\vec{a}, \vec{b}$ be the vectors $\vec{AB}, \vec{BC}$ determined by two adjacent sides of regular hexagon ABCDEF. The vector represented by $\vec{EF}$ is
 (a) $\vec{a} - \vec{b}$ (b) $\vec{a} + \vec{b}$ (c) $2\vec{a}$ (d) $-\vec{b}$
- 4) If $\vec{AB} = k, \vec{AC}$ where k is a scalar, then
 (a) $\vec{AB}, \vec{AC}$ have the same magnitude
 (b) A,B,C are collinear (c) A,B,C are coplanar (d) A,B,C are coincident
- 5) The position vectors of A and B are $\vec{a}$ and $\vec{b}$. P divides AB in the ratio 3:1. Q is the mid of AP. The position vector of Q is
 (a) $\frac{5\vec{a} + 3\vec{b}}{8}$ (b) $\frac{3\vec{a} + 5\vec{b}}{2}$ (c) $\frac{5\vec{a} + 3\vec{b}}{4}$ (d) $\frac{3\vec{a} + \vec{b}}{4}$
- 6) If G is the centroid of a triangle ABC and O is any other point, then $\vec{OA} + \vec{OB} + \vec{OC}$ is equal to
 (a) $\vec{O}$ (b) $\vec{OG}$ (c) $3\vec{OG}$ (d) $4\vec{OG}$
- 7) If G is the centroid of a triangle ABC, then $\vec{GA} + \vec{GB} + \vec{GC}$ is equal to
 (a) $3(\vec{a} + \vec{b} + \vec{c})$ (b) $\vec{OG}$ (c) $\vec{O}$ (d) $\frac{\vec{a} + \vec{b} + \vec{c}}{3}$
- 8) If G is the centroid of a triangle ABC and G' is the centroid of triangle A'B'C', then $\vec{AA'} + \vec{BB'} + \vec{CC'}$ =
 (a) $\vec{GG'}$ (b) $3\vec{GG'}$ (c) $2\vec{GG'}$ (d) $4\vec{GG'}$
- 9) If the initial point of vector $-2\vec{i} - 3\vec{j}$ is (-1,5,8), then the terminal point is
 (a) $3\vec{i} + 2\vec{j} + 8\vec{k}$ (b) $-3\vec{i} + 2\vec{j} + 8\vec{k}$ (c) $-3\vec{i} - 2\vec{j} - 8\vec{k}$ (d) $3\vec{i} + 2\vec{j} - 8\vec{k}$

Part B

8 x 2 = 16

- 10) If $\vec{a}$ and $\vec{b}$ represent two adjacent sides $\vec{AB}$ and $\vec{BC}$ respectively of a parallelogram ABCD. Find the diagonals $\vec{AC}$ and $\vec{BD}$.
- 11) If $\vec{PQ} + \vec{OR} = \vec{QO} + \vec{OR}$, show that the points P, Q, R are collinear.
- 12) Show that the points with position vectors $\vec{a} - 2\vec{b} + 3\vec{c}, -2\vec{a} + 3\vec{b} + 2\vec{c}, -8\vec{a} + 13\vec{b}$ are collinear.
- 13) Show that the points A, B, C with position vectors $-2\vec{a} + 3\vec{b} + 5\vec{c}, \vec{a} + 2\vec{b} + 3\vec{c}, 7\vec{a} - \vec{c}$ respectively, are collinear.
- 14) If D is the mid-point of the side BC of a triangle ABC, prove that $\vec{AB} + \vec{AC} = 2\vec{AD}$
- 15) If G is the centroid of a triangle ABC, prove that $\vec{GA} + \vec{GB} + \vec{GC} = \vec{O}$
- 16) If ABC and A' B' C' are two triangles and G, G' be their corresponding centroids, prove that $\vec{AA'} + \vec{BB'} + \vec{CC'} = 3\vec{GG'}$
- 17) Prove by vector method that the internal bisectors of the angles of a triangle are concurrent.

Part C

5 x 3 = 15

- 18) Find the sum of the vectors $4\vec{i} + 5\vec{j} + \vec{k}, -2\vec{i} + 4\vec{j} - \vec{k}$ and $3\vec{i} - 4\vec{j} + 5\vec{k}$. Find also the magnitude of the sum
- 19) If $\vec{a} = 3\vec{i} - \vec{j} - 4\vec{k}, \vec{b} = -2\vec{i} + 4\vec{j} - 3\vec{k}$ and $\vec{c} = \vec{i} + 2\vec{j} - \vec{k}$ find $|2\vec{a} - \vec{b} + 3\vec{c}|$
- 20) The position vectors of the vertices A, B, C of a triangle ABC are respectively $2\vec{i} + 3\vec{j} + 4\vec{k}, -\vec{i} + 2\vec{j} - \vec{k}$ and $3\vec{i} + 5\vec{j} + 6\vec{k}$. Find the vectors determined by the sides and calculate the length of the sides.

21) Show that the points whose position vectors given by

$$\vec{r}_1 = -2\vec{i} + 3\vec{j} + 5\vec{k}, \vec{r}_2 = \vec{i} + 2\vec{j} + 3\vec{k}, \vec{r}_3 = 7\vec{i} - \vec{k}$$

$$\vec{r}_1 = \vec{i} - 2\vec{j} + 3\vec{k}, \vec{r}_2 = 2\vec{i} + 3\vec{j} - 4\vec{k}, \vec{r}_3 = -7\vec{j} + 10\vec{k} \text{ are collinear}$$

22) The vertices of a triangle have position vectors $4\vec{i} + 5\vec{j} + 6\vec{k}$, $5\vec{i} + 6\vec{j} + 4\vec{k}$, $6\vec{i} + 4\vec{j} + 5\vec{k}$. Prove that the triangle is equilateral.

Part D

4 x 5 = 20

23) Prove that the sum of the vectors directed from the vertices to the mid-points of opposite sides of a triangle is zero.

24) Prove by vector method that the line segment joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides and equal to half of their difference.

25) If $\vec{a}$ and $\vec{b}$ are the vectors determined by two adjacent sides of a regular hexagon, find the vectors determined by the other sides taken in order.

26) The position vectors of the points A, B, C and D are $\vec{a}$, $\vec{b}$, $2\vec{a} + 3\vec{b}$, $\vec{a} - 2\vec{b}$ respectively. Find $\vec{DB}$ and $\vec{AC}$.

