



# MATHS

## BOOKS - BHARATI BHAWAN MATHS (HINGLISH)

### Application of Vectors

#### Example

1. Prove that the line segments joining the midpoints of the adjacent sides of a

quadrilateral form a parallelogram.



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2. In the parallelogram ABCD, the internal bisectors of the consecutive angles B and C intersect at P. Use vector method to find  $\angle BPC$



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3. A non zero vector  $\vec{a}$  is parallel to the line of intersection of the plane determined by the vectors  $\text{ver } i, \vec{i} + \vec{j}$  and the plane determined by the vectors  $\vec{i} - \text{ver } j, \vec{i} + \vec{k}$  find the angle between  $\vec{a}$  and the vector  $\vec{i} - 2\vec{j} + 2\vec{k}$ .



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**Exercise**

1. Prove by vector method that the diagonals of a parallelogram bisect each other.



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2. If the diagonals of a parallelogram are equal, show that it is a rectangle.



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3. Using vector method, prove that the angle in a semi circle is a right angle.



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4. किसी  $\triangle ABC$  में D भुजा BC का मध्य बिंदु है। सिद्ध कीजिए की

$$AB^2 + CA^2 = 2(AD^2 + DC^2)$$



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5. By vector method prove that the straight line joining the midpoints of two non-parallel sides of a trapezium is parallel to the parallel sides and half of their sum.



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6. Prove that in a tetrahedron if two pairs of opposite edges are perpendicular, then the third pair is also perpendicular.



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7. Prove vectorially that

$$\sin 2A = 2 \sin A \cdot \cos A.$$



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8. In a  $\triangle OAB$ , E is the mid-point of BO and D is a point on AB such that  $AD : DB = 2:1$ . If OD and AE intersect at P, determine the ratio OP:PD using vector method.



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9. Show that the perpendicular distance of a point  $A(\vec{a})$  from the line  $\vec{r} = \vec{b} + t\vec{c}$  is

$$\frac{\left| \left( \vec{b} - \vec{a} \right) \times \vec{c} \right|}{\left| \vec{c} \right|}$$



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10. Find the vector equation of the plane passing through the points.

$$\vec{i} - 2\vec{j} + 5\vec{k}, \quad -5\vec{j} - \vec{k} \quad \text{and}$$

$$-3\vec{j} + 5\vec{k}.$$







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11. The position vector of the points A, B and C are respectively  $\vec{i} + \vec{j}$ ,  $\vec{j} + \vec{k}$  and  $\lambda \vec{k} + \vec{i}$ . If the volume of the tetrahedron OABC is 6, find  $\lambda$  where O is the origin.



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12. A force  $\vec{F} = 3\vec{i} + 2\vec{j} - 4\vec{k}$  is acting at the point  $(1, -1, 2)$ . Find the vector moment of  $\vec{F}$  about the point  $(2, -1, 3)$ .



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**13.** Show, by vector methods, that the angular bisectors of a triangle are concurrent and find an expression for the position vector of the point of concurrency in terms of the position vectors of the vertices.



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