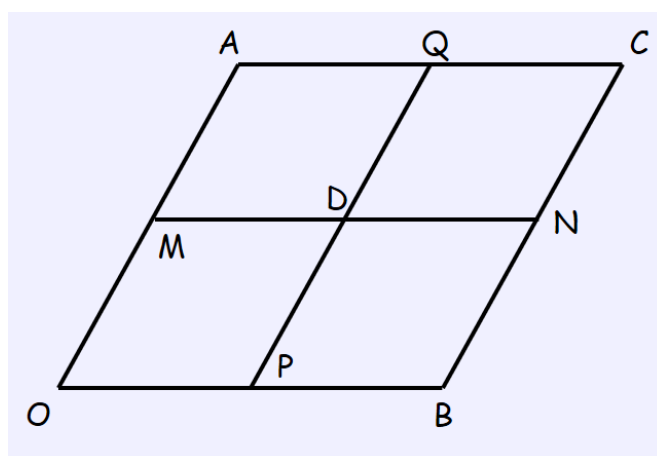


11A Vectors Introduction



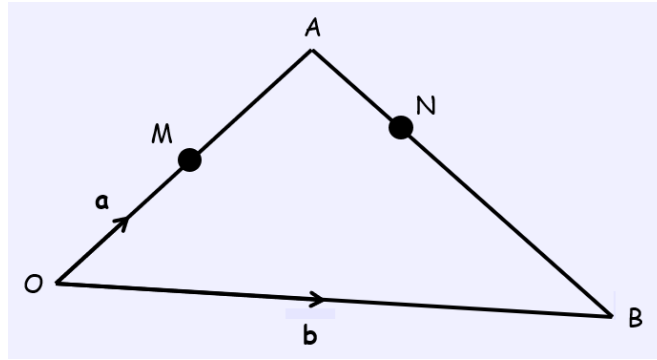
1. OACB is a parallelogram. The points P, Q, M and N are the midpoints of the sides.

$$\vec{OA} = \mathbf{a}$$

$$\vec{OB} = \mathbf{b}$$

Express the following in terms of \mathbf{a} and \mathbf{b} .

- a) \vec{OC} b) \vec{AB} c) \vec{QC} d) \vec{CN} e) \vec{QN}



2. In triangle OAB, M is the midpoint of OA and N divides AB in the ratio 1:2.

$$\vec{OM} = \mathbf{a}$$

$$\vec{OB} = \mathbf{b}$$

Express \vec{ON} in terms of \mathbf{a} and \mathbf{b}

11B i and j

1. When vectors are written in terms of the unit vectors **i** and **j** you can add them together by adding the terms in **i** and **j** separately. Subtraction works in a similar way.

Given that:

$$\mathbf{a} = 5\mathbf{i} + 2\mathbf{j}$$

$$\mathbf{b} = 3\mathbf{i} - 4\mathbf{j}$$

Find $2\mathbf{a} - \mathbf{b}$ in terms of **i** and **j**

3. Vector \mathbf{a} has magnitude 10 and makes an angle of 30° with \mathbf{j} . Find \mathbf{a} in column vector format.

11D Position Vectors

1. The points A and B in the diagram have coordinates $(1,5)$ and $(7,4)$ respectively. Find, in terms of \mathbf{i} and \mathbf{j} :
 - a) The position vector of A

 - b) The position vector of B

- c) The vector \overrightarrow{AB}

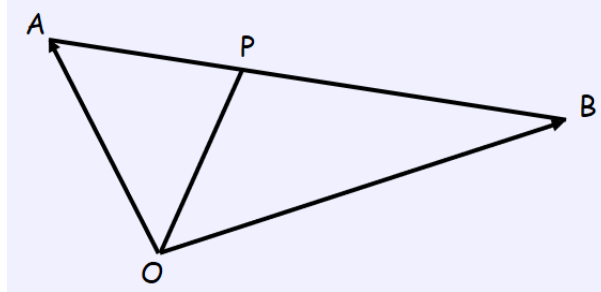
2. $\overrightarrow{OA} = 5i - 2j$ and $\overrightarrow{AB} = 3i + 4j$ Find:

a) The position vector of B

b) The exact value of $|\overrightarrow{OB}|$ in simplified surd form

11E Geometric Problems

1. In the diagram the points A and B have position vectors \mathbf{a} and \mathbf{b} respectively. The point P divides line AB in the ratio 1:2. Find the position vector of P



2. In triangle ABC , $\overrightarrow{AB} = 3\mathbf{i} - 2\mathbf{j}$ and $\overrightarrow{AC} = \mathbf{i} - 5\mathbf{j}$. Find the size of $\angle BAC$ in degrees.

3. OABC is a parallelogram. P is the point where OB and AC intersect.

The vectors \mathbf{a} and \mathbf{c} represent OA and OC respectively.

Prove that the diagonals bisect each other.

11F Context Problems notes

1. A girl walks 2km due east from a fixed point O to A, and then 3km due south from A to B.

Find:

a) The total distance travelled

b) The position vector of B relative to O

c) $|\overrightarrow{OB}|$

d) The bearing of B from O

2. In an orienteering exercise, a cadet leaves the starting point O and walks 15km on a bearing of 120 to reach A, the first checkpoint. From A he walks 9km on a bearing of 240 to the second checkpoint, at B. From B, he returns directly to O. Find:
- a) The position vector of A relative to O

b) $|\overrightarrow{OB}|$

- c) The bearing of B from O

- d) The position vector of B relative to O