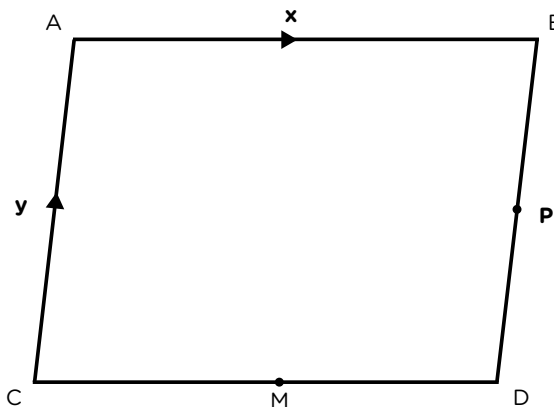


Vectors and geometric proofs

GCSE Mathematics

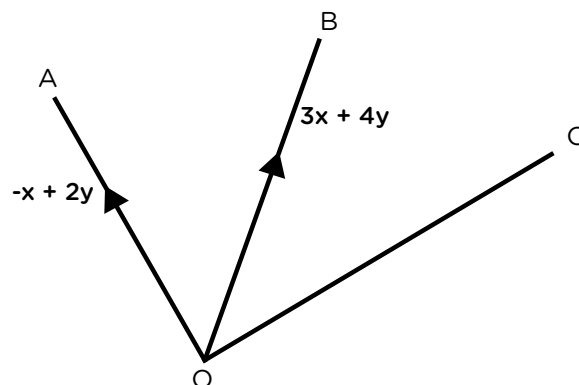
HG25

1. In the parallelogram ABCD $\overrightarrow{AB} = \mathbf{x}$ and $\overrightarrow{AC} = \mathbf{y}$.



M is the midpoint of CD and P is the midpoint of BD.
Find in terms of \mathbf{x} and \mathbf{y} :

- \overrightarrow{CD}
 - \overrightarrow{BD}
 - \overrightarrow{CB}
 - \overrightarrow{MP}
 - What can you conclude about CB and MP?
2. In the diagram $\overrightarrow{OA} = -\mathbf{x} + 2\mathbf{y}$ and $\overrightarrow{OB} = 3\mathbf{x} + 4\mathbf{y}$.

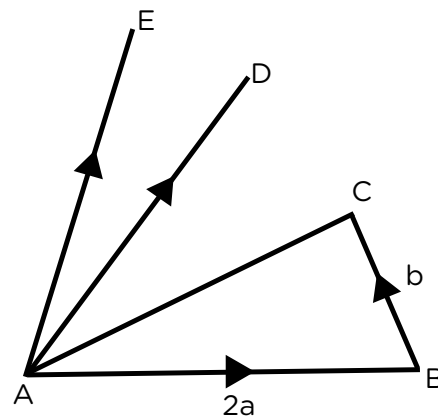


- Find \overrightarrow{AB} in terms of \mathbf{x} and \mathbf{y}
- Knowing that $\overrightarrow{BC} = 3\mathbf{x} - \mathbf{y}$ find \overrightarrow{OC} in terms of \mathbf{x} and \mathbf{y} .

(c) What does this tell us about the quadrilateral OABC?
Explain your answer.

3. In the following diagram

$$\overrightarrow{AB} = 2\mathbf{a} \quad \overrightarrow{BC} = \mathbf{b}$$



(a) Find \overrightarrow{AC} in terms of \mathbf{a} and \mathbf{b} .

(b) Knowing that the point M is the midpoint of AD and $\overrightarrow{AM} = \mathbf{a} + \mathbf{b}$, find \overrightarrow{CD} in terms of \mathbf{a} and \mathbf{b} .

(c) Knowing that the point N is the midpoint of AE and $\overrightarrow{AN} = \mathbf{a} + \frac{3}{2}\mathbf{b}$, find \overrightarrow{DE} in terms of \mathbf{a} and \mathbf{b} .

(d) What conclusion can we draw about the points B, C, D and E?