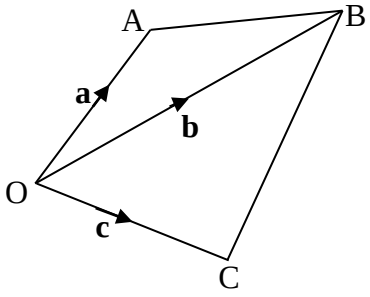
Section 1: Introduction to vectors

Exercise level 2

1. Find the unit vectors in the direction of

   (i) $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ (ii) $\mathbf{b} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$ (iii) $\mathbf{c} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$

2. In the diagram below, N is the midpoint of OB and M the midpoint of AC.



   (i) Express $\overrightarrow{AB}$ and $\overrightarrow{AC}$ in terms of **a**, **b** and **c**.
   (ii) Express $\overrightarrow{AM}$ in terms of **a** and **c**.
   (iii) Find the position vector of M.
   (iv) Write $\overrightarrow{NM}$ in terms of **a**, **b** and **c**.
   (v) If N and M coincide, write down an equation connecting **a**, **b** and **c**.

3. The position vectors of A, B and C in the parallelogram ABCD are **a**, **b**, and **c** respectively. Find the position vector of D.

4. Points A(2, 3), B(5, 7) and C(12, 8) are the vertices of a triangle. The midpoint of AB is L and the midpoint of BC is M.
   (i) Find the position vectors of L and M.
   (ii) Find $\overrightarrow{AC}$ and $\overrightarrow{LM}$
   (iii) Find the lengths of AC and LM.
   (iv) What do you notice about these two lines?