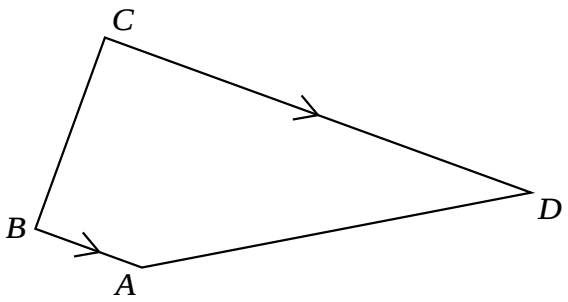
7



The diagram shows a trapezium $ABCD$ in which BA is parallel to CD. The position vectors of A, B and C relative to an origin O are given by

$$\overrightarrow{OA} = \begin{pmatrix} 3 \\ 4 \\ 0 \end{pmatrix}, \quad \overrightarrow{OB} = \begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix} \quad \text{and} \quad \overrightarrow{OC} = \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix}.$$

(i) Use a scalar product to show that AB is perpendicular to BC. [3]

(ii) Given that the length of CD is 12 units, find the position vector of D. [4]