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A LEVEL MATHS

# (73) Vector Geometry

## WORKING AT D/E

(1) Given that

$(p-1)\mathbf{i} + (q+2)\mathbf{j} + r\mathbf{k} = -8\mathbf{i} + 22\mathbf{j}$

find the values of p, q and r

(2) $\overrightarrow{OA} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$, $\overrightarrow{OB} = \begin{pmatrix} 5 \\ 2 \\ 0 \end{pmatrix}$, $\overrightarrow{OC} = \begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}$ and $\overrightarrow{OD} = \begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$.

(a) Find the vectors:

(i) $\overrightarrow{AB}$ (ii) $\overrightarrow{BC}$ (iii) $\overrightarrow{DC}$ (iv) $\overrightarrow{AD}$

(b) Find (i) $|\overrightarrow{AB}|$ (ii) $|\overrightarrow{BC}|$ (iii) $|\overrightarrow{DC}|$ (iv) $|\overrightarrow{AD}|$

(c) Hence, explain why $ABCD$ is a parallelogram.

## WORKING AT B/C

(1) $ABCD$ is a trapezium.

$\overrightarrow{OA} = 2\mathbf{i} - \mathbf{j} + 4\mathbf{k}$

$\overrightarrow{OB} = -3\mathbf{i} + 2\mathbf{j} - \mathbf{k}$

$\overrightarrow{OC} = -\mathbf{i} + 7\mathbf{k}$

$\overrightarrow{OD} = p\mathbf{i} + q\mathbf{j} + r\mathbf{k}$

Given that $\overrightarrow{AD} = 2\overrightarrow{BC}$

(a) Find the values of p, q and r

(b) Hence, find the exact lengths of the parallel sides in the trapezium.

## WORKING AT A*/A

(1) $\overrightarrow{OA} = \begin{pmatrix} -1 \\ 2 \\ 4 \end{pmatrix}$, $\overrightarrow{OB} = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$, $\overrightarrow{OC} = \begin{pmatrix} 6 \\ 7 \\ 8 \end{pmatrix}$

Explain why $0 < \cos(ABC) < 1$