Vectors – Foundation

Example

$$\boldsymbol{a} = \begin{pmatrix} -7 \\ 3 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 6 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 9 \\ -2 \end{pmatrix}$$

Find the value of $3\boldsymbol{a} + 2\boldsymbol{b} - \boldsymbol{c}$

$$3\begin{pmatrix} -7 \\ 3 \end{pmatrix} + 2\begin{pmatrix} 6 \\ -4 \end{pmatrix} - \begin{pmatrix} 9 \\ -2 \end{pmatrix} = \begin{pmatrix} -21 \\ 9 \end{pmatrix} + \begin{pmatrix} 12 \\ -8 \end{pmatrix} - \begin{pmatrix} 9 \\ -2 \end{pmatrix}$$

$$= \begin{pmatrix} -18 \\ 3 \end{pmatrix}$$

Q1

$$\boldsymbol{a} = \begin{pmatrix} -7 \\ 3 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 6 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 9 \\ -2 \end{pmatrix}$$

Find the value of $5\boldsymbol{a} - 4\boldsymbol{b} + 2\boldsymbol{c}$

Q2

$$\boldsymbol{a} = \begin{pmatrix} 6 \\ 7 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} -5 \\ -12 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 11 \\ -7 \end{pmatrix}$$

Find the value of $7\boldsymbol{a} - 5\boldsymbol{b} + 6\boldsymbol{c}$

Q3

$$\boldsymbol{a} = \begin{pmatrix} -9 \\ 6 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 18 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 11 \\ 5 \end{pmatrix}$$

Find the value of $11\boldsymbol{a} - 12\boldsymbol{b} + \boldsymbol{c}$

Q4

$$\boldsymbol{a} = \begin{pmatrix} 12 \\ 11 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 5 \\ 7 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} -8 \\ -5 \end{pmatrix}$$

Find the value of $14\boldsymbol{a} - 2\boldsymbol{b} + 9\boldsymbol{c}$

Q5

$$\boldsymbol{a} = \begin{pmatrix} -5 \\ 7 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 8 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 52 \\ 23 \end{pmatrix}$$

Find the value of $4\boldsymbol{a} - 6\boldsymbol{b} - 4\boldsymbol{c}$

Q6

$$\boldsymbol{a} = \begin{pmatrix} -7 \\ 3 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 6 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 9 \\ -2 \end{pmatrix}$$

Find the value of $9\boldsymbol{a} - 2\boldsymbol{b} + 6\boldsymbol{c}$

Q7

$$\boldsymbol{a} = \begin{pmatrix} 6 \\ 7 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} -5 \\ -12 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 11 \\ -7 \end{pmatrix}$$

Find the value of $11\boldsymbol{a} - 12\boldsymbol{b} + 13\boldsymbol{c}$

Q8

$$\boldsymbol{a} = \begin{pmatrix} -9 \\ 6 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 18 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 11 \\ 5 \end{pmatrix}$$

Find the value of $\boldsymbol{a} - 5\boldsymbol{b} + 4\boldsymbol{c}$

Q9

$$\boldsymbol{a} = \begin{pmatrix} 12 \\ 11 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 5 \\ 7 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} -8 \\ -5 \end{pmatrix}$$

Find the value of $8\boldsymbol{a} + 5\boldsymbol{b} - \boldsymbol{c}$

Q10

$$\boldsymbol{a} = \begin{pmatrix} -5 \\ 7 \end{pmatrix} \quad \boldsymbol{b} = \begin{pmatrix} 8 \\ -4 \end{pmatrix} \quad \boldsymbol{c} = \begin{pmatrix} 52 \\ 23 \end{pmatrix}$$

Find the value of $5\boldsymbol{a} - 15\boldsymbol{b} - \boldsymbol{c}$

Vectors – Higher

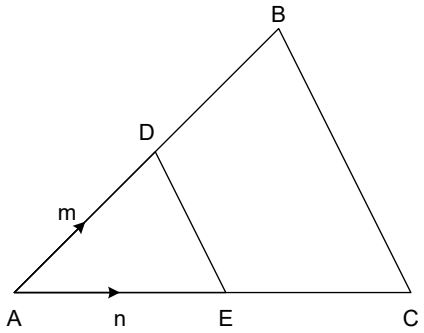
Q1 ABC is a triangle.

D is the midpoint of AB. E is the midpoint of AC.

$\overrightarrow{AD} = \boldsymbol{m}$

$\overrightarrow{AE} = \boldsymbol{n}$

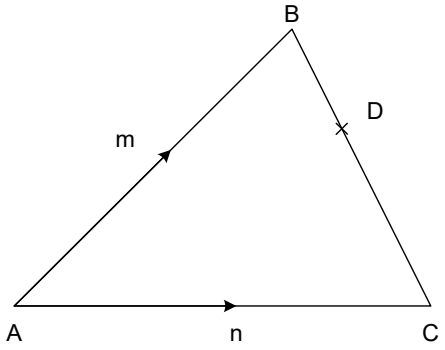
Show that DE is parallel to BC.



Q2 ABC is a triangle.

$\overrightarrow{AB} = \boldsymbol{m}$

$\overrightarrow{AC} = \boldsymbol{n}$

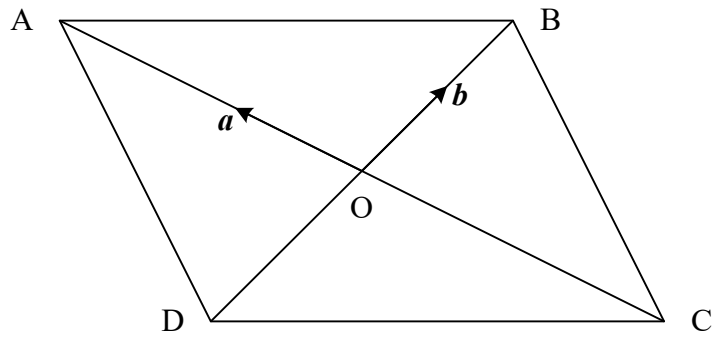


(i) Find $\overrightarrow{CB}$ in terms of ***m*** and ***n***.

Point D is on BC such that BD:DC is 3:5.

(ii) Find $\overrightarrow{AD}$ in terms of ***m*** and ***n***. Give your answer in its simplest form.

Q3 ABCD is a parallelogram.



The diagonals of the parallelogram intersect at O.

$\overrightarrow{OA} = \boldsymbol{a}$ *and* $\overrightarrow{OB} = \boldsymbol{b}$

(i) Write an expression in terms of **a** and **b** for:

a. $\overrightarrow{BA}$

b. $\overrightarrow{BC}$

c. $\overrightarrow{CA}$

(ii) P is a point such that $\overrightarrow{OP} = -2\boldsymbol{a} - \boldsymbol{b}$

a. Find an expression in terms of **a** and **b** for $\overrightarrow{AP}$

b. B, C and P lie on the same straight line. Explain why.

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Vectors and Matrices – Further Maths

Q1 $\boldsymbol{A} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$ $\boldsymbol{B} = \begin{bmatrix} 1 & 2 \\ -2 & -3 \end{bmatrix}$

Find

(i) $\boldsymbol{AB}$
(ii) $\boldsymbol{BA}$
(iii) $\boldsymbol{A^2}$
(iv) $\boldsymbol{B^2}$

Q2 $\boldsymbol{A} = \begin{bmatrix} 3 & 2 & -4 \\ 0 & 5 & 3 \end{bmatrix}$ $\boldsymbol{B} = \begin{bmatrix} 7 & 9 \\ 2 & 0 \\ 5 & 1 \end{bmatrix}$

Find

(i) $\boldsymbol{AB}$
(ii) $\boldsymbol{BA}$
(iii) $\boldsymbol{A^2}$