

1

$$\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$$

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$ $\begin{pmatrix} 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

$$\begin{pmatrix} 3 \\ 8 \end{pmatrix}$$

(1)

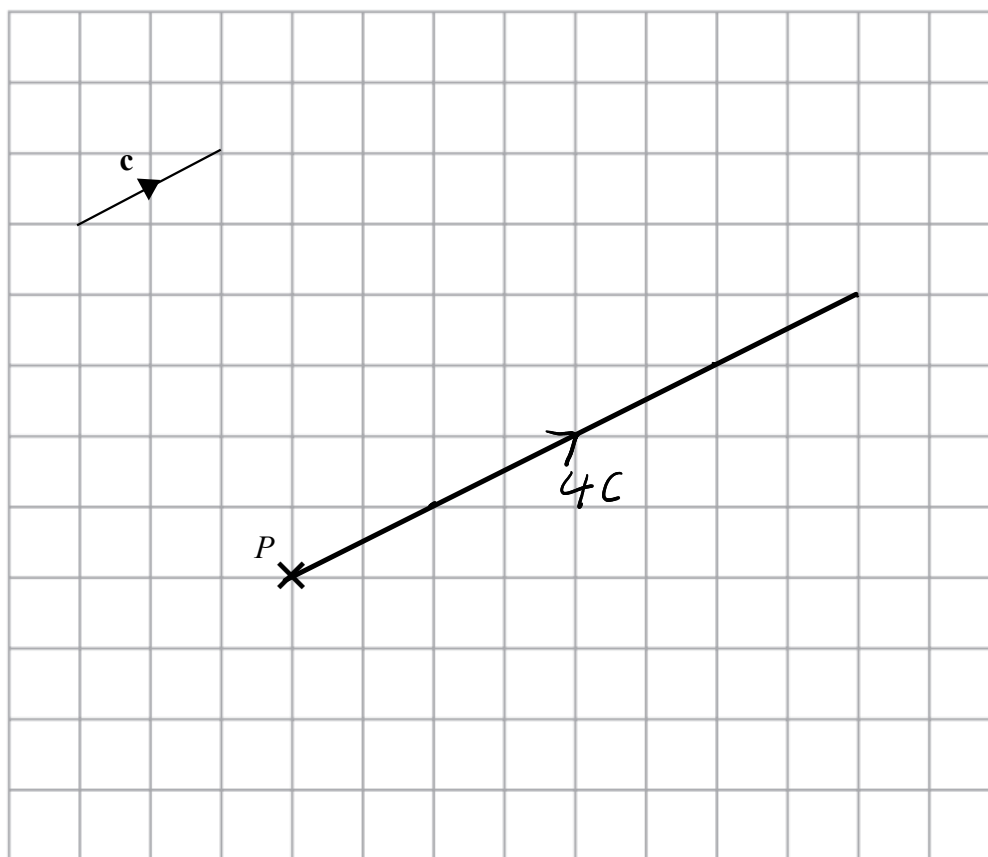
(ii) $2\mathbf{a} + 3\mathbf{b}$ $2 \begin{pmatrix} 2 \\ 3 \end{pmatrix} + 3 \begin{pmatrix} 1 \\ 5 \end{pmatrix}$
 $\begin{pmatrix} 4 \\ 6 \end{pmatrix} + \begin{pmatrix} 3 \\ 15 \end{pmatrix}$

$$\begin{pmatrix} 7 \\ 21 \end{pmatrix}$$

(2)

The vector $\mathbf{c}$ is drawn on the grid.

(b) From the point P , draw the vector $4\mathbf{c}$



(1)

(Total for question 1 is 4 marks)

2

$$a = \begin{pmatrix} 4 \\ 1 \end{pmatrix} \text{ and } b = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Write down as a column vector

(i) $a + b$

$$\begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 7 \\ 3 \end{pmatrix}$$

(1)

(ii) $2a - b$

$$2 \begin{pmatrix} 4 \\ 1 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

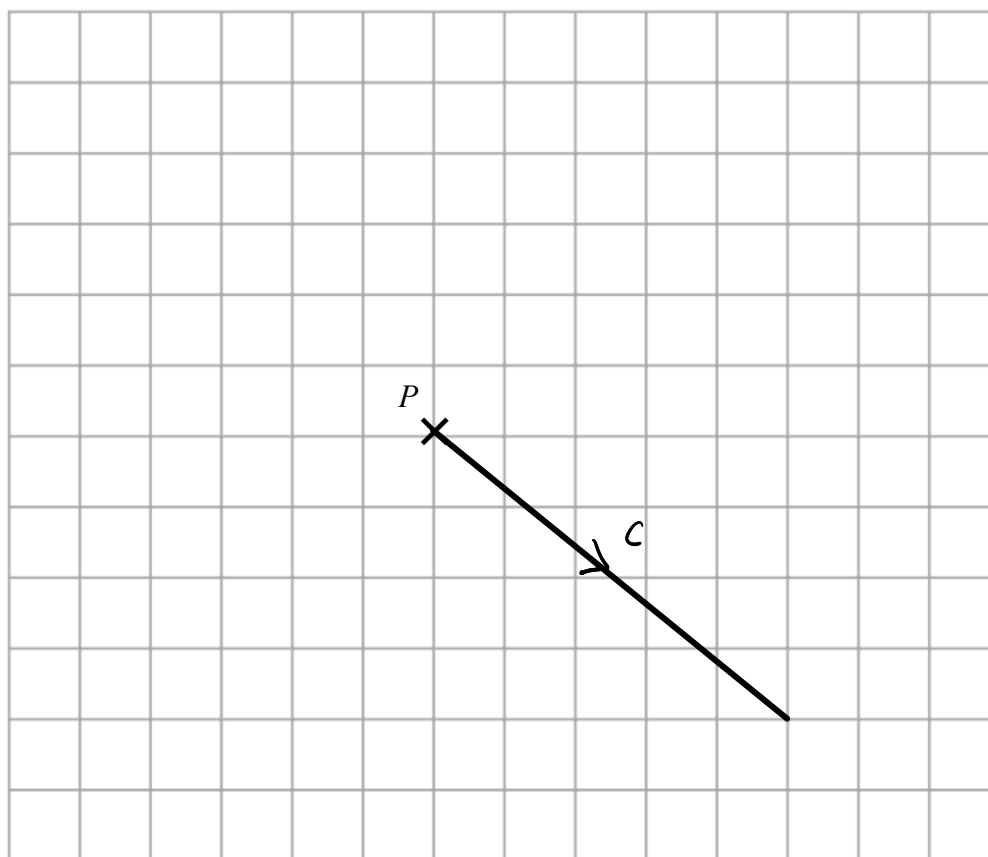
$$\begin{pmatrix} 8 \\ 2 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 5 \\ 0 \end{pmatrix}$$

(2)

$$c = \begin{pmatrix} 5 \\ -4 \end{pmatrix} \text{ right } 5 \\ \text{down } 4$$

(b) From the point P , draw the vector c



(1)

(Total for question 2 is 4 marks)

3

$$a = \begin{pmatrix} -2 \\ 3 \end{pmatrix} \text{ and } b = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

(a) Write down as a column vector

(i) $a + b$ $\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 5 \\ -1 \end{pmatrix}$

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(1)

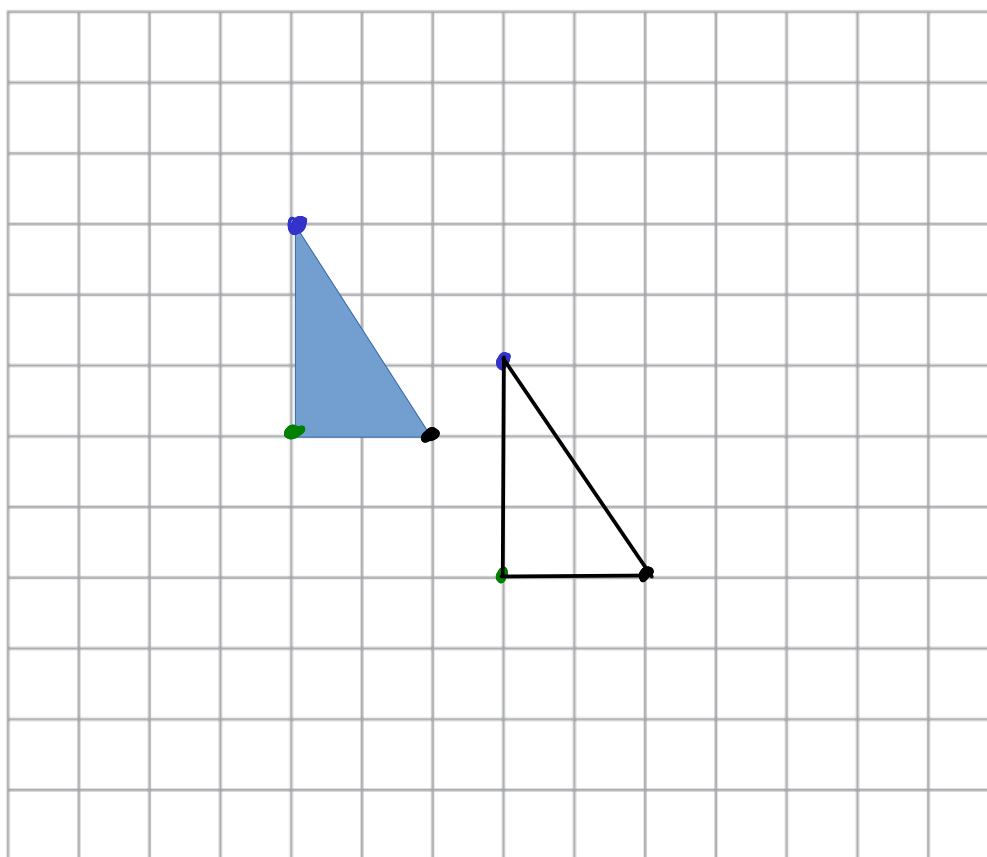
(ii) $2a - b$

$$\begin{pmatrix} -4 \\ 6 \end{pmatrix} - \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

$$\begin{pmatrix} -9 \\ 7 \end{pmatrix}$$

(2)

(b) Translate the triangle by the vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ 3 right
2 down



(1)

(Total for question 3 is 4 marks)

4 A is the point $(3, 2)$ and B is the point $(4, -1)$.

(a) Write down as a column vector $\overrightarrow{AB}$

1 right
3 down

$$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$$

(1)

C is the point $(5, -2)$ and D is the point $(2, 1)$.

(b) Write down as a column vector $\overrightarrow{CD}$

3 left
3 up

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

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

(1)

(Total for question 4 is 2 marks)

5 A is the point $(5, -1)$ and B is the point $(4, -3)$.

(a) Write down as a column vector $\overrightarrow{AB}$

1 left
2 down

$$\begin{pmatrix} -1 \\ -2 \end{pmatrix}$$

(1)

C is the point $(1, 6)$ and D is the point $(-3, 9)$.

(b) Write down as a column vector $\overrightarrow{CD}$

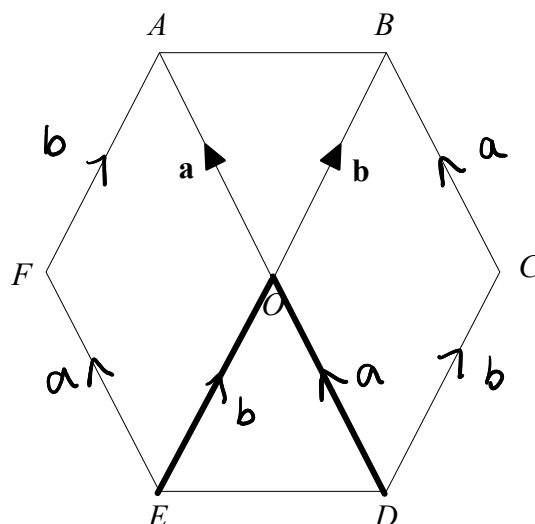
4 left
3 up

$$\begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

(1)

(Total for question 5 is 2 marks)

6 $ABCDEF$ is a regular hexagon with centre O .



$$\vec{OA} = \mathbf{a}$$

$$\vec{OB} = \mathbf{b}$$

(a) Find, in terms of $\mathbf{a}$, the vector $\vec{AD}$

$$\underline{-2\mathbf{a}} \quad (1)$$

(b) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\vec{AB}$

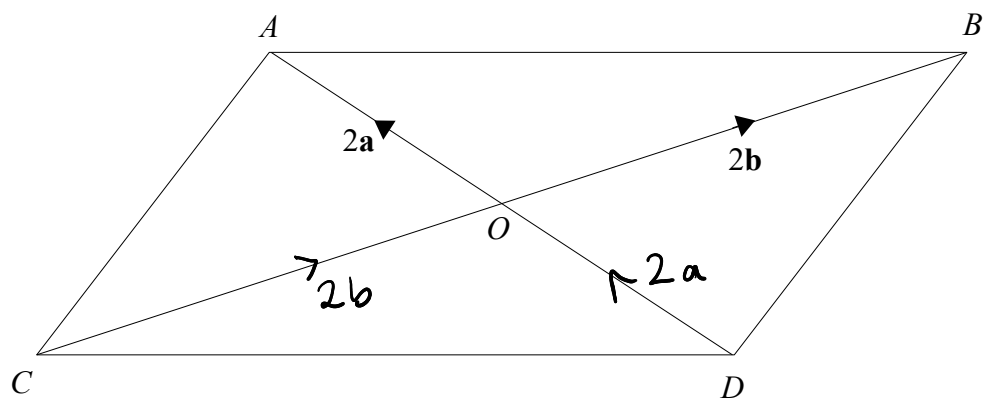
$$\underline{-\mathbf{a} + \mathbf{b}} \quad (1)$$

(c) Find, in terms of $\mathbf{b}$, the vector $\vec{AF}$

$$\underline{-\mathbf{b}} \quad (1)$$

(Total for question 6 is 3 marks)

- 7 The diagram shows a parallelogram.



$$\vec{OA} = 2\mathbf{a}$$

$$\vec{OB} = 2\mathbf{b}$$

- (a) Find, in terms of $\mathbf{a}$, the vector $\vec{DA}$

$$4\mathbf{a}$$

(1)

- (b) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\vec{AB}$

$$-2\mathbf{a} + 2\mathbf{b}$$

(1)

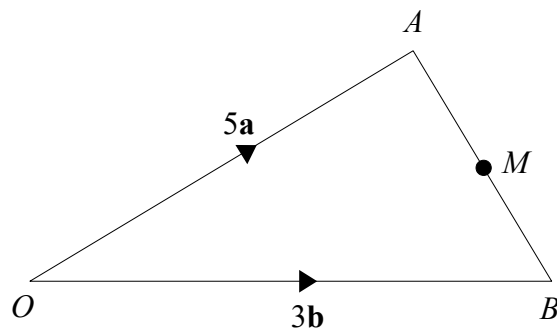
- (c) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\vec{AC}$

$$-2\mathbf{a} - 2\mathbf{b}$$

(1)

(Total for question 7 is 3 marks)

8



$$\vec{OA} = 5\mathbf{a}$$

$$\vec{OB} = 3\mathbf{b}$$

M is the midpoint of AB

(a) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\vec{AB}$

$$\underline{-5\mathbf{a} + 3\mathbf{b}}$$

(1)

(b) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\vec{AM}$

$$\frac{1}{2}(-5\mathbf{a} + 3\mathbf{b})$$

$$\text{or } -2.5\mathbf{a} + 1.5\mathbf{b}$$

$$\underline{-\frac{5}{2}\mathbf{a} + \frac{3}{2}\mathbf{b}}$$

(1)

(c) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\vec{OM}$

$$\vec{OA} + \vec{AM}$$

$$5\mathbf{a} - \frac{5}{2}\mathbf{a} + \frac{3}{2}\mathbf{b}$$

$$\frac{5}{2}\mathbf{a} + \frac{3}{2}\mathbf{b}$$

$$\text{or } \underline{2.5\mathbf{a} + 1.5\mathbf{b}}$$

(1)

(Total for question 8 is 3 marks)

9

$$\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -1 \\ 5 \end{pmatrix}$$

Work out $3\mathbf{a} + \mathbf{b}$ as a column vector.

$$\begin{pmatrix} 9 \\ 6 \end{pmatrix} + \begin{pmatrix} -1 \\ 5 \end{pmatrix} = \begin{pmatrix} 8 \\ 11 \end{pmatrix}$$

$$\begin{pmatrix} 8 \\ \dots\dots\dots \\ 11 \end{pmatrix}$$

(Total for Question 9 is 2 marks)