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

Work out $\mathbf{a} - 3\mathbf{b}$

Circle your answer.

$\begin{bmatrix} -3 \\ 2 \end{bmatrix} - 3\begin{bmatrix} 1 \\ -5 \end{bmatrix}$

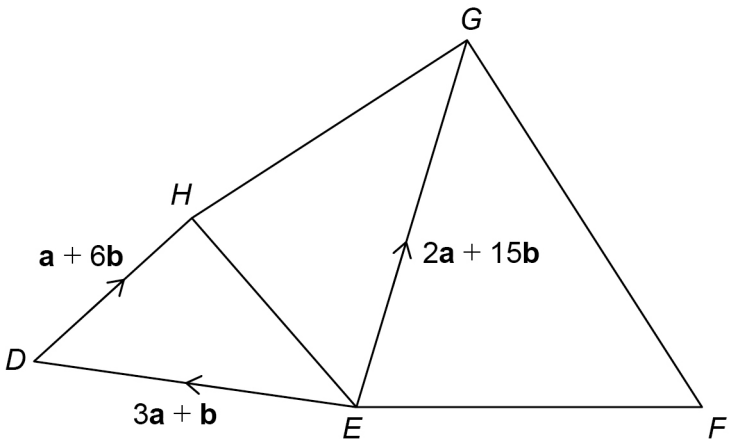
$\therefore \begin{bmatrix} -3 \\ 2 \end{bmatrix} - \begin{bmatrix} 3 \\ -15 \end{bmatrix}$

[1 mark]

$\begin{pmatrix} -6 \\ 17 \end{pmatrix}$ (1) $\quad \begin{pmatrix} -6 \\ -13 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 17 \end{pmatrix} \quad \begin{pmatrix} 0 \\ -13 \end{pmatrix}$

2 Five points are connected by vectors.

Not drawn accurately



$\overrightarrow{FG} = 2\overrightarrow{EH}$

Work out $\overrightarrow{FE}$ in terms of **a** and **b**.

[4 marks]

$\overrightarrow{EH} = \overrightarrow{ED} + \overrightarrow{DH}$

$= 3\underline{a} + \underline{b} + \underline{a} + 6\underline{b}$

$= 4\underline{a} + 7\underline{b}$ (1)

$\overrightarrow{FG} = 2(4\underline{a} + 7\underline{b}) = 8\underline{a} + 14\underline{b}$ (1)

$\overrightarrow{FG} = \overrightarrow{FE} + \overrightarrow{EG}$

$\overrightarrow{FE} = \overrightarrow{FG} - \overrightarrow{EG}$

$= 8\underline{a} + 14\underline{b} - 2\underline{a} - 15\underline{b}$ (1)

$= 6\underline{a} - \underline{b}$ (1)

Answer $6\underline{a} - \underline{b}$

3 Work out $\begin{pmatrix} -4 \\ 8 \end{pmatrix} - \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ $= \begin{bmatrix} -7 \\ 10 \end{bmatrix}$

Circle your answer.

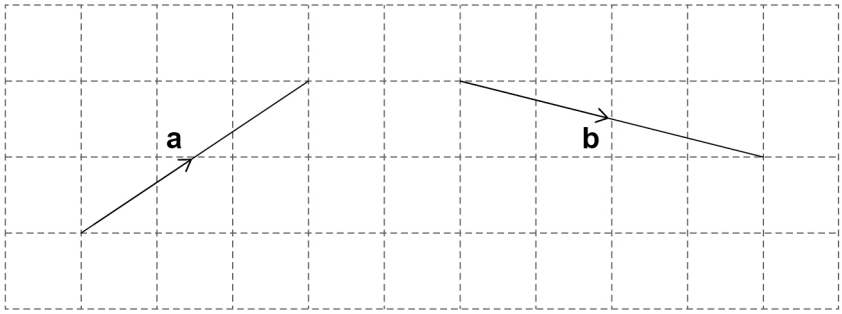
[1 mark]

$\begin{pmatrix} -7 \\ 10 \end{pmatrix}$ $\begin{pmatrix} -7 \\ 6 \end{pmatrix}$ $\begin{pmatrix} -1 \\ 10 \end{pmatrix}$ $\begin{pmatrix} -1 \\ 6 \end{pmatrix}$

1

4 The diagram shows the vectors **a** and **b**.

As a column vector $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$



4 (a) What is **b** as a column vector?

[2 marks]

Answer $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$ (1)

4 (b) Work out 4**a** as a column vector.

[1 mark]

$4 \times 3 = 12$
$4 \times 2 = 8$

Answer $\begin{pmatrix} 12 \\ 8 \end{pmatrix}$ (1)

4 (c) $\mathbf{a} + \mathbf{c} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$

Work out **c** as a column vector.

Circle your answer.

$\begin{bmatrix} 3 \\ 2 \end{bmatrix} + c = \begin{bmatrix} 3 \\ 0 \end{bmatrix}$

$c = \begin{bmatrix} 3-3 \\ 0-2 \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}$

[1 mark]

$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ $\begin{pmatrix} -2 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ (1)