

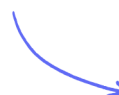
Exam Questions

Vectors

Introduction to Column Vectors / Representing Vectors as Diagrams / Finding Vector Paths

Easy (5 questions)	/10
Medium (6 questions)	/17
Hard (6 questions)	/15
Total Marks	/42

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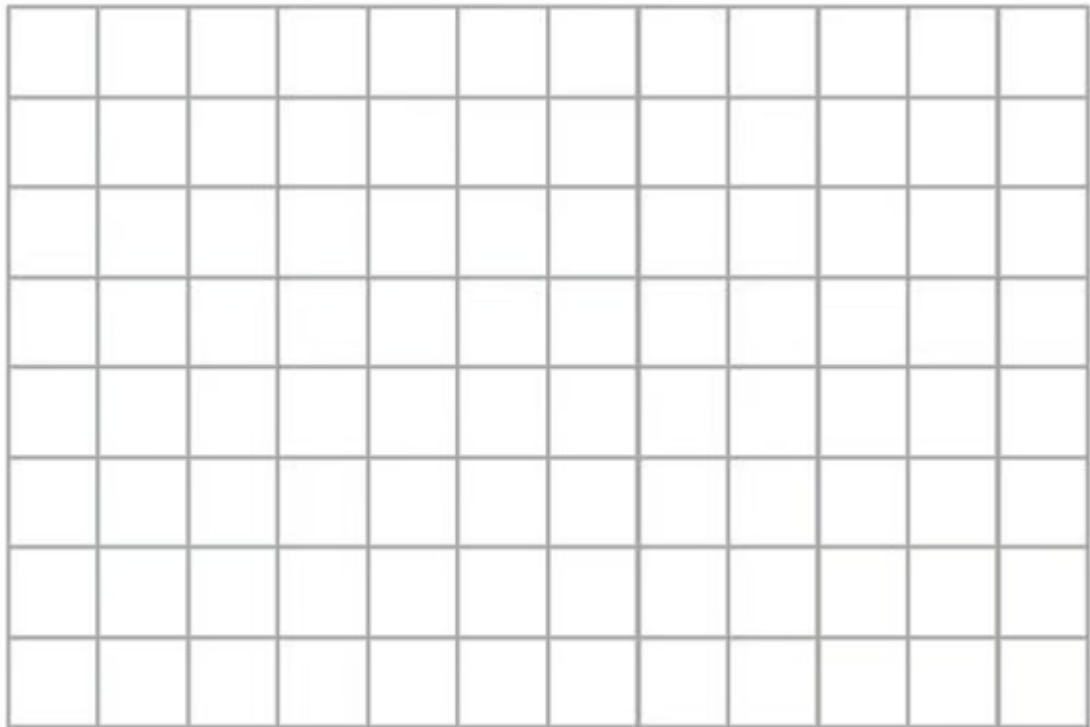


Easy Questions

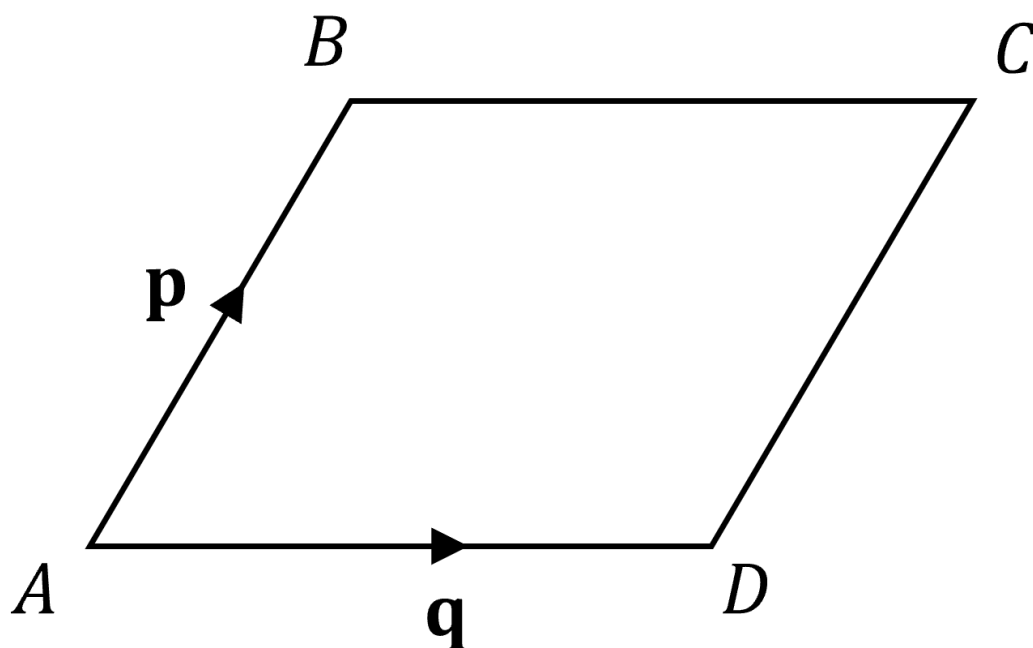
- 1 Here are two column vectors.

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

On the grid below, draw and label the vector $\mathbf{a} + \mathbf{b}$.



(2 marks)



$ABCD$ is a parallelogram.

$\overrightarrow{AB} = \mathbf{p}$ and $\overrightarrow{AD} = \mathbf{q}$.

(i) Find the vector $\overrightarrow{AC}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

[1]

(ii) Find the vector $\overrightarrow{BD}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

[1]

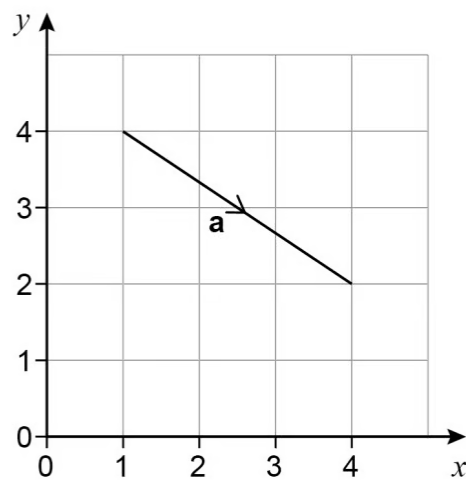
(2 marks)

3 $\mathbf{a} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$

Work out $\mathbf{a} + 2\mathbf{b}$ as a column vector.

(2 marks)

4 Here is vector $\mathbf{a}$.

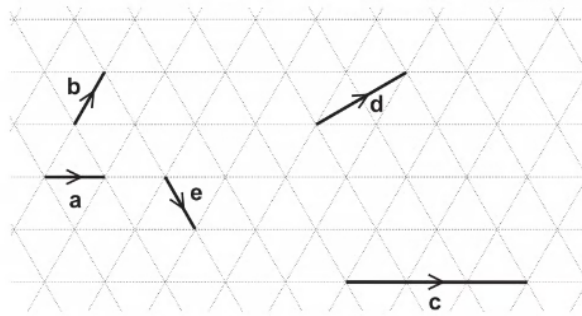


Choose the column vector that represents $\mathbf{a}$.

- A. $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$
- B. $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$
- C. $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$
- D. $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$

(1 mark)

5 Vectors **a**, **b**, **c**, **d** and **e** are drawn on an isometric grid.



Write each of the vectors **c**, **d** and **e** in terms of **a** and/or **b**.

c =

d =

e =

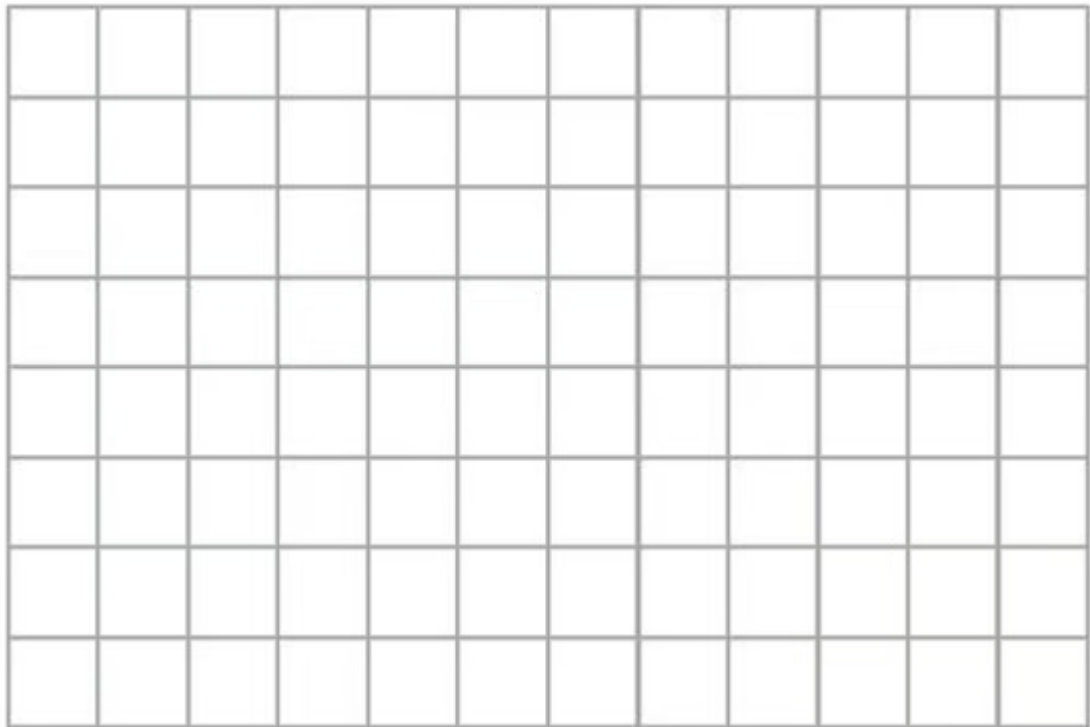
(3 marks)

Medium Questions

1 Here are two column vectors.

$$\mathbf{a} = \begin{pmatrix} 4 \\ 1 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

On the grid below, draw and label the vector $\mathbf{a} + 2\mathbf{b}$.



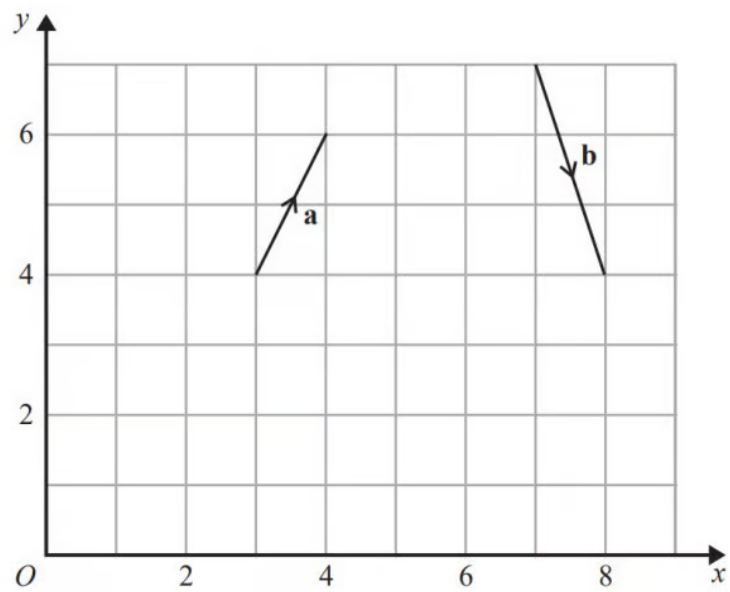
(3 marks)

2 $\mathbf{a} = \begin{pmatrix} -5 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

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

(2 marks)

3 (a) The vector **a** and the vector **b** are shown on the grid.



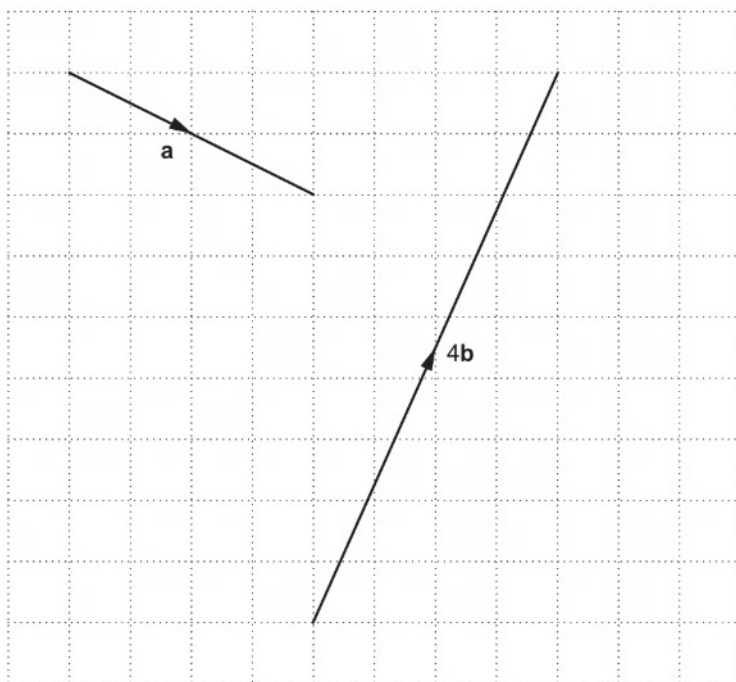
On the grid, draw and label vector $-2\mathbf{a}$

(1 mark)

(b) Work out $\mathbf{a} + 2\mathbf{b}$ as a column vector.

(2 marks)

4 (a) Vectors $\mathbf{a}$ and $4\mathbf{b}$ are drawn on the grid.



Write vector $\mathbf{a}$ as a column vector.

(2 marks)

(b) Find vector $\mathbf{b}$ as a column vector.

(2 marks)

5 (a) Vector $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, vector $\mathbf{b} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

On each grid below, draw a vector to represent

(i) $2\mathbf{a}$,



(ii) $\mathbf{a} + \mathbf{b}$.



(2 marks)

(b) Emma says that if she draws vector $\mathbf{a}$ and vector $\mathbf{b}$ they will be the same.

Explain why this is incorrect.

(1 mark)

6 $\mathbf{a} = \begin{pmatrix} 4 \\ 7 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} p \\ 5 \end{pmatrix}$

$\mathbf{a}$ and $\mathbf{b}$ are column vectors.

$$2\mathbf{a} - \mathbf{b} = \begin{pmatrix} 7 \\ 9 \end{pmatrix}$$

Find the value of p .

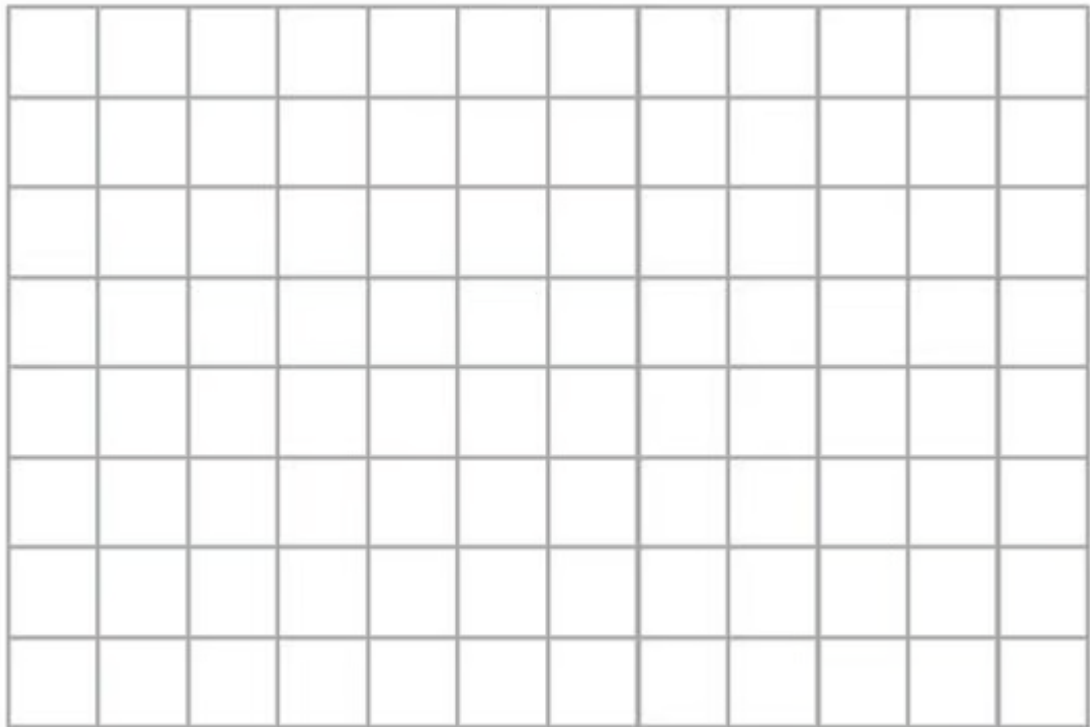
(2 marks)

Hard Questions

- 1 Here are two column vectors.

$$\mathbf{a} = \begin{pmatrix} 3 \\ -1 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 1 \\ 0.5 \end{pmatrix}$$

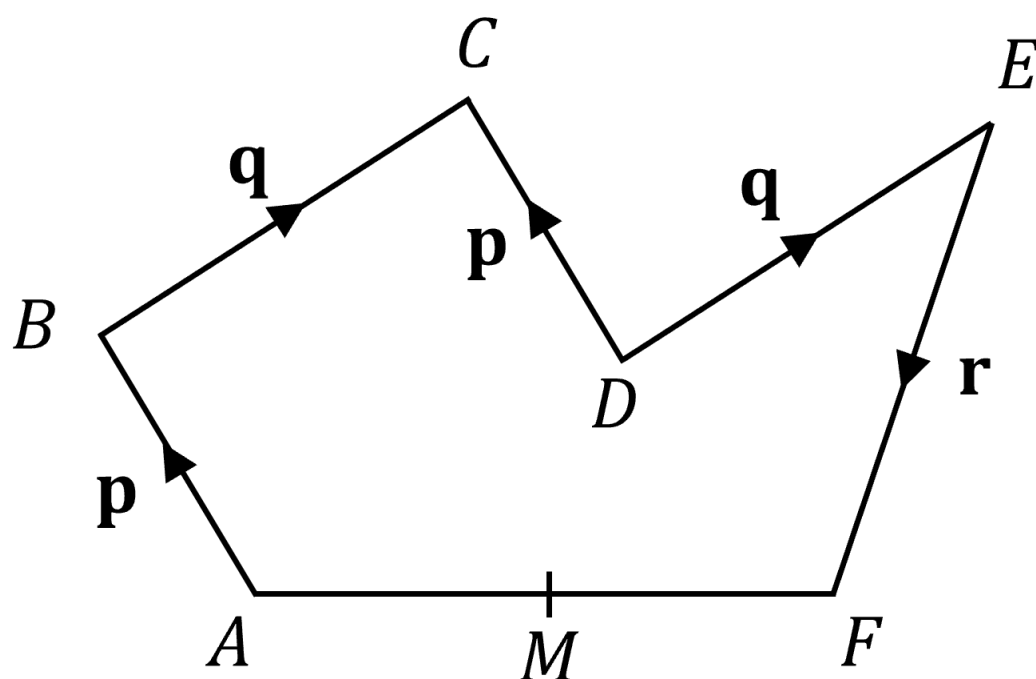
On the grid below, draw and label the vector $2\mathbf{a} - 4\mathbf{b}$.



(3 marks)

- 2 The shape in the diagram shows the vectors $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$.

M is the midpoint of the line AF .



Find $\overrightarrow{AM}$ in terms of $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$.

(3 marks)

3 $\mathbf{a} = \begin{pmatrix} -6 \\ 4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$

Work out $-2\mathbf{a} - 4\mathbf{b}$ as a column vector.

(2 marks)

4 $\mathbf{a} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 1 \\ -5 \end{pmatrix}$

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

A. $\begin{pmatrix} -6 \\ 17 \end{pmatrix}$

B. $\begin{pmatrix} -6 \\ -13 \end{pmatrix}$

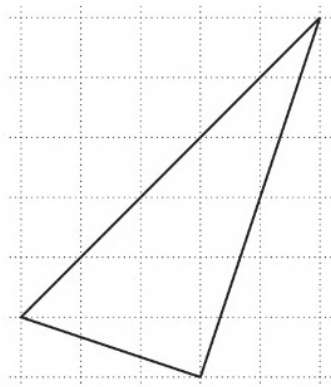
C. $\begin{pmatrix} 0 \\ 17 \end{pmatrix}$

D. $\begin{pmatrix} 0 \\ -13 \end{pmatrix}$

(1 mark)

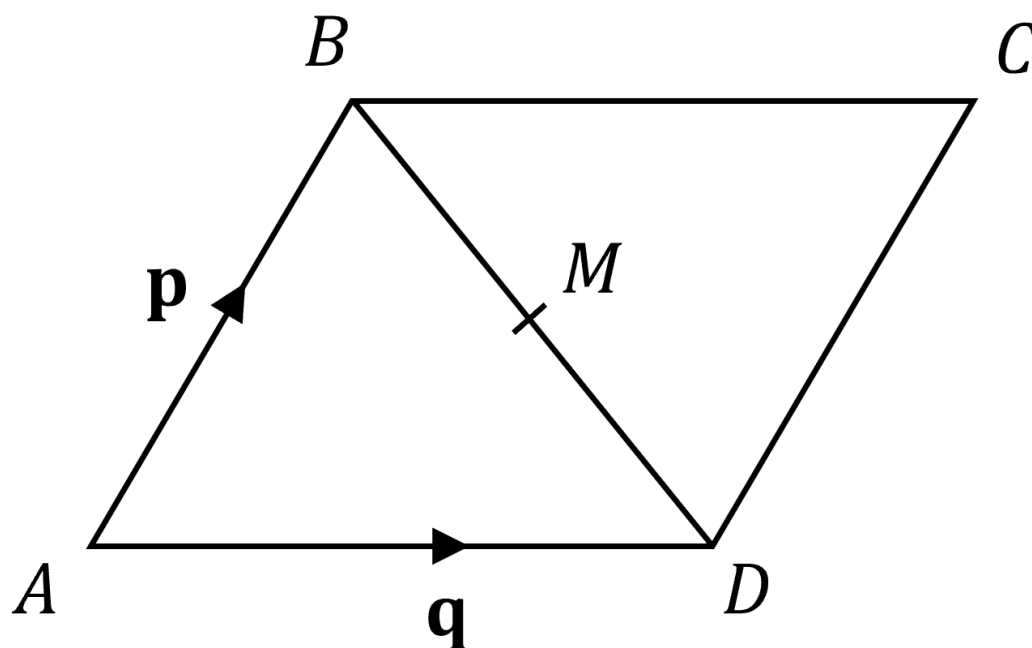
5 Vector $\mathbf{a} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and vector $\mathbf{b} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

Gavin starts to draw a diagram to show that $\mathbf{a} + 2\mathbf{b} = \begin{pmatrix} 5 \\ 5 \end{pmatrix}$



Complete Gavin's diagram.

(3 marks)



$ABCD$ is a parallelogram.

$\vec{AB} = \mathbf{p}$ and $\vec{AD} = \mathbf{q}$.

M is the midpoint of the line BD .

Find the vector $\vec{AM}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

(3 marks)