

Name: _____

GCSE (1 – 9)

Vectors

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1

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

(a) Write down as a column vector

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

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

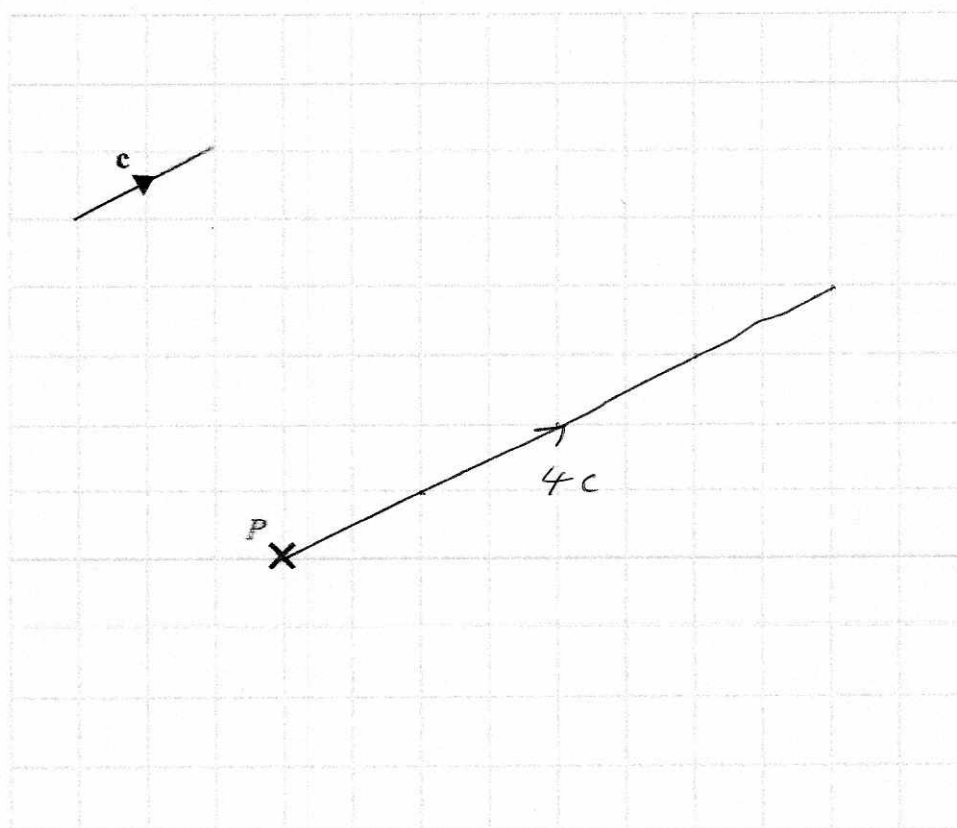
(1)

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

$$\begin{pmatrix} 4 \\ 6 \end{pmatrix} + \begin{pmatrix} 3 \\ 15 \end{pmatrix}$$

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

(2)

The vector c is drawn on the grid.(b) From the point P , draw the vector $4c$ 

(1)

(Total for question 1 is 4 marks)

2

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

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$ $\begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

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

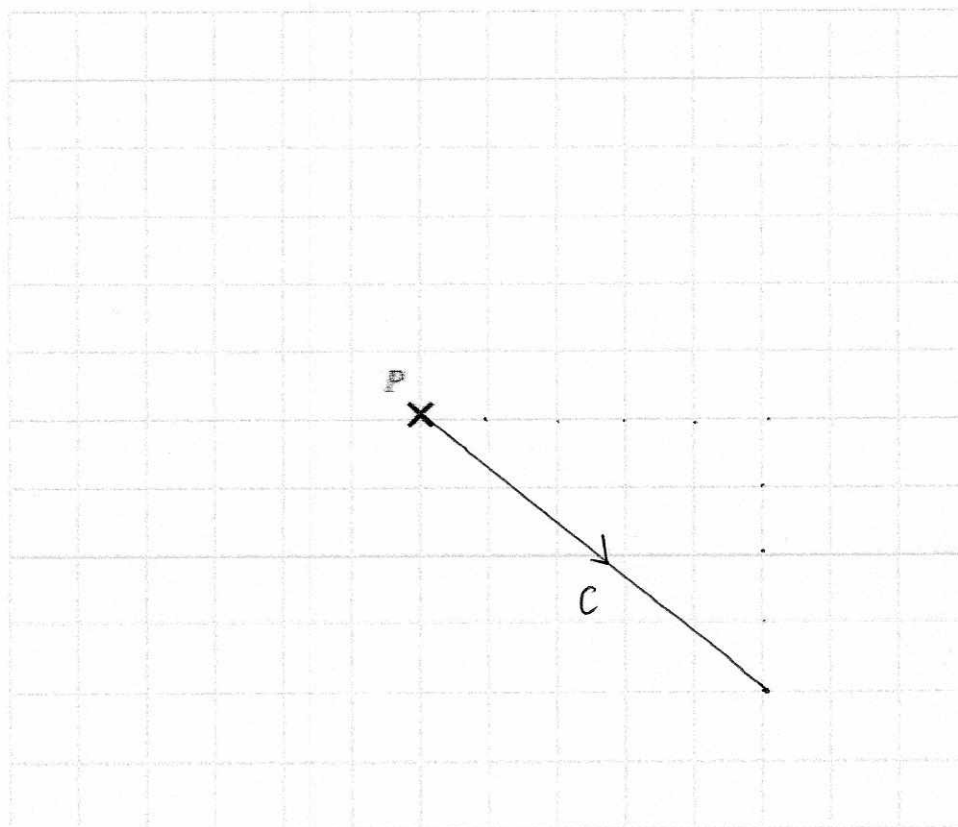
(1)

(ii) $2\mathbf{a} - \mathbf{b}$ $2\begin{pmatrix} 4 \\ 1 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix}$
 $\begin{pmatrix} 8 \\ 2 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

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

(2)

$$\mathbf{c} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$$

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

(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)

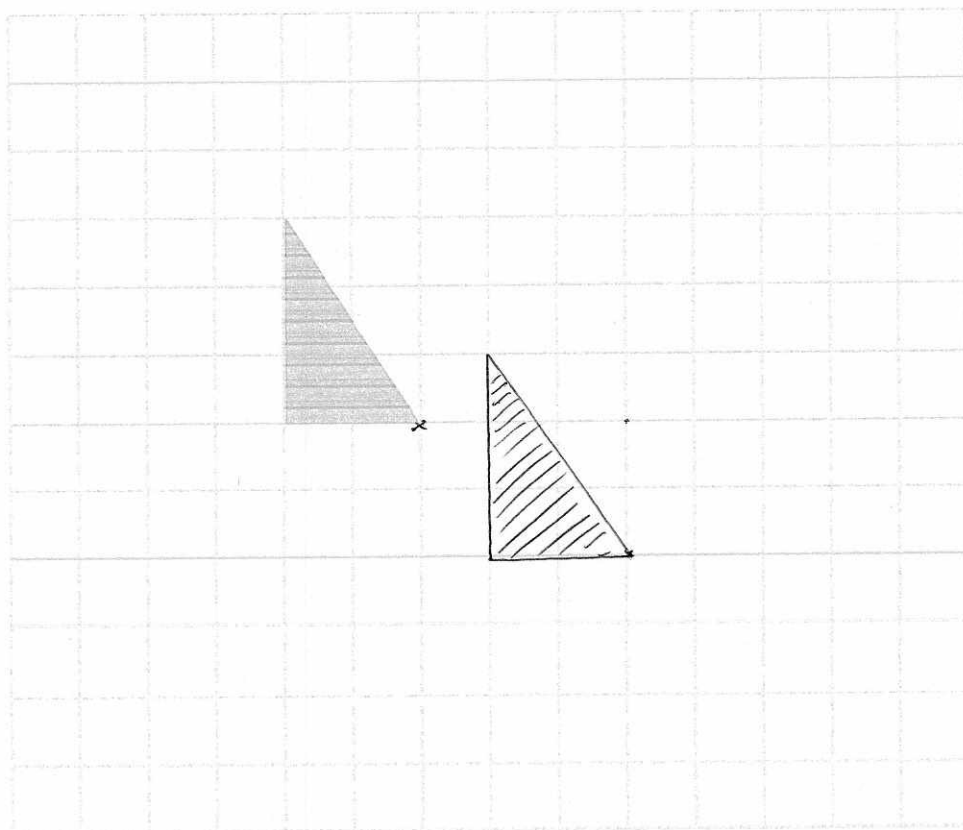
(ii) $2a - b$

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

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

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

(2)

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

(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 $\overrightarrow{AB}$

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

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

(1)

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

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

$$\begin{pmatrix} 2 \\ 1 \end{pmatrix} - \begin{pmatrix} 5 \\ -2 \end{pmatrix}$$

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

(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 $\overrightarrow{AB}$

$$\begin{pmatrix} 4 \\ -3 \end{pmatrix} - \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

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

(1)

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

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

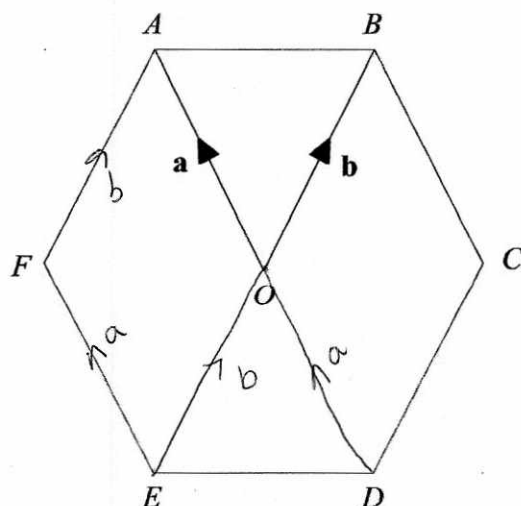
$$\begin{pmatrix} -3 \\ 9 \end{pmatrix} - \begin{pmatrix} 1 \\ 6 \end{pmatrix}$$

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

(1)

(Total for question 5 is 2 marks)

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



$$\vec{OA} = a$$

$$\vec{OB} = b$$

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

$$\frac{-2a}{\dots\dots\dots}$$

(1)

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

$$\frac{-a + b}{\dots\dots\dots}$$

(1)

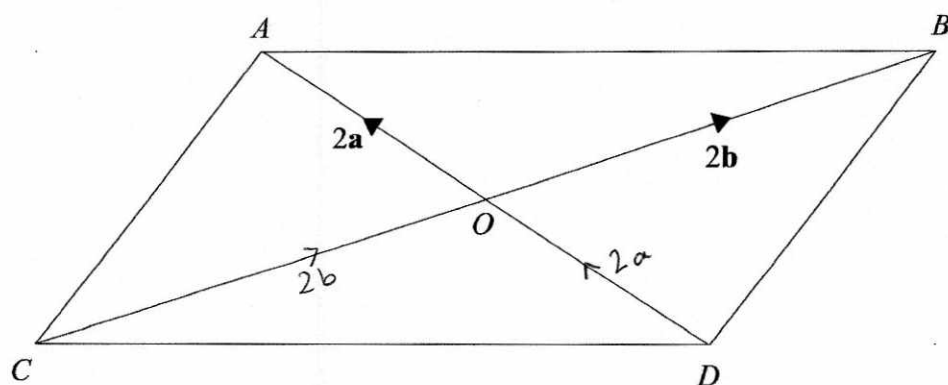
(c) Find, in terms of a and b , the vector $\vec{AF}$

$$\frac{-b}{\dots\dots\dots}$$

(1)

(Total for question 6 is 3 marks)

- 7 The diagram shows a parallelogram.



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

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

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

$$\begin{array}{r} 4a \\ \hline \end{array} \quad (1)$$

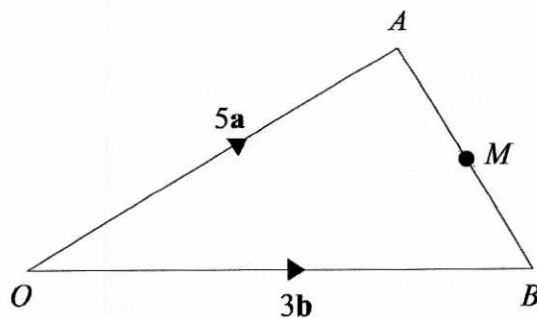
- (b) Find, in terms of a and b , the vector $\vec{AB}$

$$\begin{array}{r} -2a + 2b \\ \hline \end{array} \quad (1)$$

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

$$\begin{array}{r} -2a - 2b \\ \hline \end{array} \quad (1)$$

(Total for question 7 is 3 marks)



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

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

M is the midpoint of AB

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

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

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

half of $\vec{AB}$

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

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

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

or $5a - 2.5a + 1.5b$

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

(Total for question 8 is 3 marks)