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

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1. \( a = \begin{pmatrix} \frac{2}{3} \end{pmatrix} \) and \( b = \begin{pmatrix} \frac{1}{5} \end{pmatrix} \)

(a) Write down as a column vector

(i) \( a + b \)

(ii) \( 2a + 3b \)

The vector \( c \) is drawn on the grid.

(b) From the point \( P \), draw the vector \( 4c \)

(Total for question 1 is 4 marks)
(1)

(2)

(a) Write down as a column vector

(i) \(a + b\)

\(2a - b\)

\(c = \begin{pmatrix} 5 \\ -4 \end{pmatrix}\)

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

(Total for question 2 is 4 marks)
3 \hspace{1cm} \mathbf{a} = \begin{pmatrix} -2 \\ 3 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}

(a) Write down as a column vector

(i) \( \mathbf{a} + \mathbf{b} \)

(ii) \( 2\mathbf{a} - \mathbf{b} \)

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

(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 \( \overrightarrow{AB} \)

\[
\begin{pmatrix}
3 \\
2 \\
\end{pmatrix}
\]

(1)

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

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

\[
\begin{pmatrix}
3 \\
-3 \\
\end{pmatrix}
\]

(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 \( \overrightarrow{AB} \)

\[
\begin{pmatrix}
1 \\
-2 \\
\end{pmatrix}
\]

(1)

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

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

\[
\begin{pmatrix}
-4 \\
5 \\
\end{pmatrix}
\]

(1)

(Total for question 5 is 2 marks)
6  \(ABCDEF\) is a regular hexagon with centre \(O\).

\[
\overrightarrow{OA} = a \\
\overrightarrow{OB} = b
\]

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

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

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

(Total for question 6 is 3 marks)
The diagram shows a parallelogram.

\[ \overrightarrow{OA} = 2a \]
\[ \overrightarrow{OB} = 2b \]

(a) Find, in terms of a, the vector \( \overrightarrow{DA} \)

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

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

(Total for question 7 is 3 marks)
\[ \overrightarrow{OA} = 5a \]
\[ \overrightarrow{OB} = 3b \]

M is the midpoint of AB

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

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

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

(Total for question 8 is 3 marks)