FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

G25: Vectors

Add, subtract and scale vectors; column vectors and vector diagrams

20 marks · 25 minutes · Non-calculator

1) $\mathbf{a} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$. Write as a column vector

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

.....

(1)

(b) $\mathbf{a} - \mathbf{b}$

.....

(1)

(c) $3\mathbf{a}$

.....

(1)

(d) $2\mathbf{a} + 3\mathbf{b}$

.....

(1)

[Question 1: 4 marks]

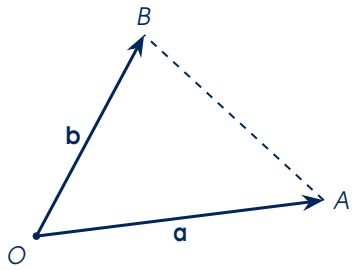
2) Find the magnitude of $\begin{pmatrix} 5 \\ -12 \end{pmatrix}$.

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[Question 2: 1 marks]

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3) $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.



Write in terms of **a** and **b**

(a) $\overrightarrow{AB}$

.....

(1)

(b) $\overrightarrow{BA}$

.....

(1)

[Question 3: 2 marks]

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4) Using the diagram in question 3, M is the midpoint of AB. Find $\overrightarrow{OM}$ in terms of **a** and **b**. Simplify your answer.

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[Question 4: 2 marks]

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5) $OABC$ is a parallelogram with $\overrightarrow{OA}$ = **a** and $\overrightarrow{OC}$ = **c**. Write in terms of **a** and **c**

(a) $\overrightarrow{OB}$

.....

(1)

(b) $\overrightarrow{AC}$

.....

(1)

[Question 5: 2 marks]

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6) Is $\begin{pmatrix} 6 \\ -9 \end{pmatrix}$ parallel to $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$? Give a reason.

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[Question 6: 2 marks]

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7) $\begin{pmatrix} k \\ 6 \end{pmatrix}$ is parallel to $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$. Find k.

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[Question 7: 2 marks]

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8) Find the values of x and y such that $x\begin{pmatrix}1\\2\end{pmatrix} + y\begin{pmatrix}3\\-1\end{pmatrix} = \begin{pmatrix}5\\3\end{pmatrix}$

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[Question 8: 3 marks]

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9) Using the diagram in question 3, P lies on AB with $AP : PB = 1 : 2$. Find $\overrightarrow{OP}$ in terms of **a** and **b**. Simplify your answer.

.....

[Question 9: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	(a) $\begin{pmatrix}1\\3\end{pmatrix}$ (b) $\begin{pmatrix}5\\-5\end{pmatrix}$ (c) $\begin{pmatrix}9\\-3\end{pmatrix}$ (d) $\begin{pmatrix}0\\10\end{pmatrix}$	B1 each.
2	13	B1.
3	(a) $\mathbf{b}-\mathbf{a}$ (b) $\mathbf{a}-\mathbf{b}$	B1 each.
4	$\frac{1}{2}(\mathbf{a}+\mathbf{b})$	$\mathbf{a}+\frac{1}{2}(\mathbf{b}-\mathbf{a})$ (M1); A1.
5	(a) $\mathbf{a}+\mathbf{c}$ (b) $\mathbf{c}-\mathbf{a}$	B1 each.
6	Yes	It is $3\times\begin{pmatrix}2\\-3\end{pmatrix}$ (M1); yes (A1).
7	4	Scale factor 2 (M1); A1.
8	$x=2$, $y=1$	$x+3y=5$ and $2x-y=3$ (M1); solve (M1); A1.
9	$\frac{2}{3}\mathbf{a}+\frac{1}{3}\mathbf{b}$	$\mathbf{a}+\frac{1}{3}(\mathbf{b}-\mathbf{a})$ (M1); A1.