FOUNDATION & HIGHER

HIGHER EXTENDS

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

G25: Vectors

Solve problems and construct arguments using vectors

20 marks · 25 minutes · Non-calculator

1) $\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b**. *P* lies on *AB* with *AP* : *PB* = 1 : 3. Find $\overrightarrow{OP}$ in terms of **a** and **b**.

.....

[Question 1: 3 marks]

2) $OABC$ is a parallelogram with $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$. M is the midpoint of AB. Find $\overrightarrow{CM}$ in terms of $\mathbf{a}$ and $\mathbf{c}$.

.....

[Question 2: 3 marks]

---

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

.....

[Question 3: 2 marks]

---

4) $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = 3\mathbf{b} - 2\mathbf{a}$. Show that A, B and C lie on a straight line.

[Question 4: 3 marks]

---

5) $\mathbf{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 5 \\ -12 \end{pmatrix}$. Find the exact magnitude of $\mathbf{a} + \mathbf{b}$.

.....

[Question 5: 3 marks]

---

6) In triangle OAB, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$. M and N are the midpoints of OA and OB. Show that MN is parallel to AB and half its length.

[Question 6: 3 marks]

7) Find x and y such that $x \begin{pmatrix} 2 \\ 1 \end{pmatrix} + y \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} 7 \\ 11 \end{pmatrix}$

.....

[Question 7: 3 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	$\frac{3}{4}\mathbf{a} + \frac{1}{4}\mathbf{b}$	$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ (P1); $\mathbf{a} + \frac{1}{4}(\mathbf{b} - \mathbf{a})$ (P1); A1.
2	$\mathbf{a} - \frac{1}{2}\mathbf{c}$	$\overrightarrow{OM} = \mathbf{a} + \frac{1}{2}\mathbf{c}$ (P1, P1); A1.
3	4	Scale factor 2 (P1); A1.
4	Shown	$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ (P1); $\overrightarrow{AC} = 3\mathbf{b} - 3\mathbf{a} = 3\overrightarrow{AB}$ (P1); common point A (C1).
5	$8\sqrt{2}$	$\begin{pmatrix} 8 \\ \\ -8 \end{pmatrix}$ (P1); $\sqrt{128}$ (P1); A1.
6	Shown	$\overrightarrow{MN} = \frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{a}$ (P1); $= \frac{1}{2}\overrightarrow{AB}$ (P1); C1.
7	$x = 2, y = 3$	$2x + y = 7, x + 3y = 11$ (P1); solve (P1); A1.