



NAME: \_\_\_\_\_  
CLASS: \_\_\_\_\_

DATE: \_\_\_\_\_  
SCORE: \_\_\_\_\_/40

**Question 1**

**[4 marks]**

Given that  $\mathbf{a} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ , find

- (a)  $3\mathbf{a} + 2\mathbf{b}$
- (b)  $|3\mathbf{a} + 2\mathbf{b}|$
- (c) the unit vector of  $3\mathbf{a} + 2\mathbf{b}$

**Question 2**

**[4 marks]**

Given that  $A(2,6)$ ,  $B(4,4)$  and  $C(-4, -2)$ ,

- (a)  $|\overrightarrow{AB}|$
- (b)  $|\overrightarrow{BC}|$
- (c)  $|\overrightarrow{AC}|$
- (d) state the special name given to triangle  $ABC$ .

**Question 3**

**[4 marks]**

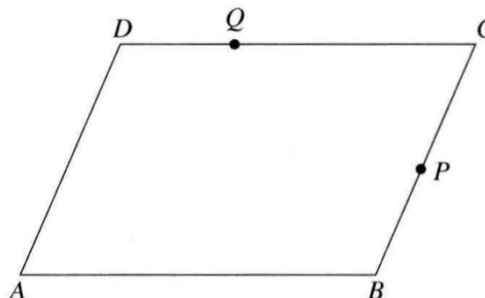
In the diagram,  $ABCD$  is a parallelogram and  $P$  is the midpoint of  $BC$ .

$Q$  is the point on  $CD$  such that  $QC = 3DQ$ .

If  $\overrightarrow{AB} = \mathbf{a}$  and  $\overrightarrow{AD} = \mathbf{b}$ , express:

(a)  $\overrightarrow{AP}$

(b)  $\overrightarrow{PQ}$



**Question 4****[3 marks]**

Given that vectors  $\mathbf{a} = \begin{pmatrix} 3 \\ m \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} n \\ 11 \end{pmatrix}$  and  $\mathbf{c} = \begin{pmatrix} 23 \\ 9 \end{pmatrix}$ .

Given also that  $\mathbf{a} + 2\mathbf{b} = \mathbf{c}$ , find the values of  $m$  and  $n$ .

**Question 5****[2 marks]**

It is given that  $\overrightarrow{AB} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$  and  $\overrightarrow{CD} = \begin{pmatrix} 20 \\ 6x \end{pmatrix}$ .

If  $\overrightarrow{AB}$  is parallel to  $\overrightarrow{CD}$ , find the value of  $x$ .

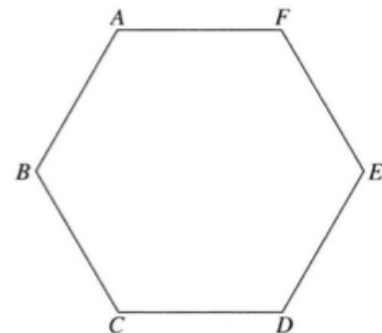
**Question 6****[4 marks]**

$ABCDEF$  is a regular hexagon.

Given that  $\overrightarrow{OA} = \mathbf{a}$ ,  $\overrightarrow{OB} = \mathbf{b}$  and  $\overrightarrow{OC} = \mathbf{c}$ , express the following in terms of  $\mathbf{a}$ ,  $\mathbf{b}$  and/or  $\mathbf{c}$ :

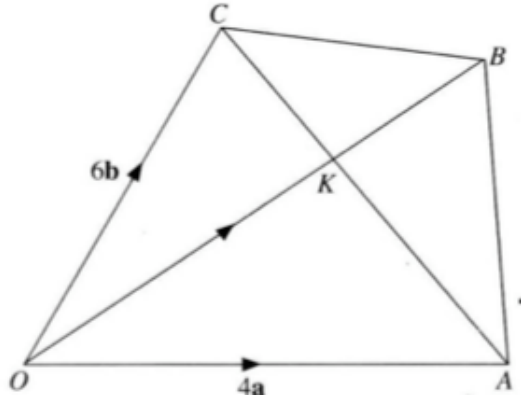
(a)  $\overrightarrow{AF}$

(b)  $\overrightarrow{OE}$



**Question 7****[10 marks]**

In the diagram,  $\overrightarrow{OA} = 4\mathbf{a}$ ,  $\overrightarrow{OC} = 6\mathbf{b}$  and  $K$  is a point on  $AC$  such that  $KC = \frac{2}{5}AC$ .  
The point  $K$  lies on  $OB$  such that  $OK = 2KB$ .



(a) Express, as simple as possible, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ ,

(i)  $\overrightarrow{AC}$

(ii)  $\overrightarrow{OK}$

(iii)  $\overrightarrow{OB}$

(iv)  $\overrightarrow{BC}$

(b) Calculate the value of

(i)  $\frac{\text{area of } \triangle CBK}{\text{area of } \triangle ABK}$

(ii)  $\frac{\text{area of } \triangle ABK}{\text{area of } \triangle OCK}$ .

**Question 8****[6 marks]**

In the diagram,  $M$  is the midpoint of  $CD$ .

$BP:PM = 2:1$ .

$\vec{AB} = \mathbf{x}$ ,  $\vec{AC} = \mathbf{y}$  and  $\vec{AD} = \mathbf{z}$ .

Express the following vectors in terms of  $\mathbf{x}$ ,  $\mathbf{y}$  and  $\mathbf{z}$ .

(a)  $\vec{DC}$

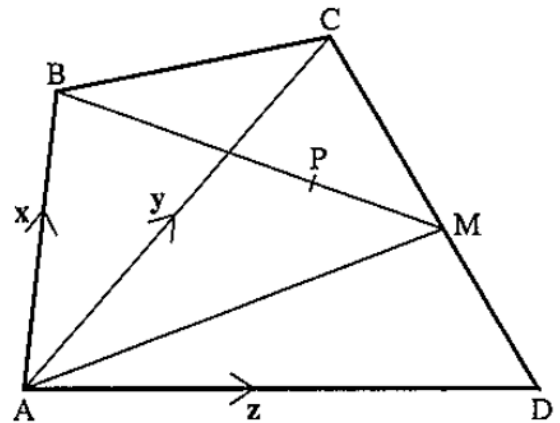
(b)  $\vec{DM}$

(c)  $\vec{AM}$

(d)  $\vec{BM}$

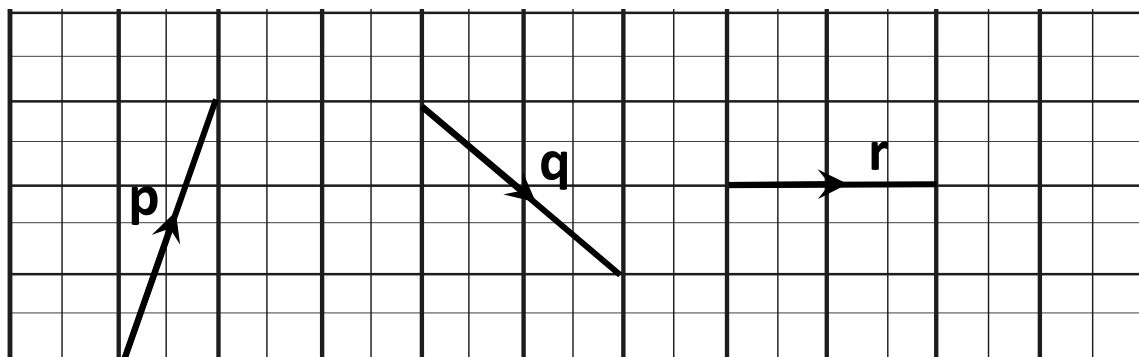
(e)  $\vec{BP}$

(f)  $\vec{AP}$



**Question 9****[8 marks]**

Given the following vectors **p**, **q** and **r**, draw the following vectors on a separate grid\*.



- (a)  $q - p$
- (b)  $p + 2r$
- (c)  $3r - 2q$
- (d)  $q + r + p$

\*A grid is attached on the next page.

