5-Aug-24

Objective: **Complete iGCSE questions on vector calculations.**

8/5/2024

8/5/2024

8/5/2024

12	$\mathbf{p} = \mathbf{a} + \mathbf{b}$ oe $\mathbf{q} = 2\mathbf{a} + \mathbf{b}$ oe $\mathbf{r} = -2\mathbf{a} + \mathbf{b}$ oe	**3**	**B1** for each

8/5/2024

8/5/2024

8/5/2024

Question	Answer	Mark	Part Marks
8 (a)	$6\mathbf{p} - \mathbf{q}$	**2**	**B1** for $\overrightarrow{XD} = -\mathbf{q}$ or **M1** for $\overrightarrow{AD} = \overrightarrow{A}$
(b)	$3\mathbf{p} + \mathbf{q}$ oe	**2**	**M1** for $\overrightarrow{AC} = 9\mathbf{p}$ or $\overrightarrow{XC} = 3\mathbf{p}$ or c
(c)	$3\mathbf{p} - 2\mathbf{q}$ oe	**3**	**M1** for $\overrightarrow{BD}$ = *their* (a) **M1** for $\overrightarrow{CB} = \overrightarrow{CD} + \overrightarrow{DB}$ oe

8/5/2024

10 $p = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$

Find $|p|$, giving your answer in the form $3\sqrt{a}$.

.....

8/5/2024

10	$3\sqrt{5}$	**2**	**M1** for $\sqrt{6^2+3^2}$ or better or **M1** for $a = 5$

8/5/2024

8/5/2024

(b) O is the point (0, 0).

$\overrightarrow{OA} = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$ and $\overrightarrow{OB} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$.

Find the co-ordinates of N.

(..... , ...

8/5/2024

8/5/2024

8/5/2024

Question	Answer	Marks	Partial Marks
4(a)(i)	$\begin{pmatrix}-1.5\\1\end{pmatrix}$ oe	1	
4(a)(ii)	$\begin{pmatrix}10\\-1\end{pmatrix}$	2	**B1** for each
4(a)(iii)	$\sqrt{13}$ final answer	2	**M1** for $(-3)^2 + 2^2$ oe soi by 3.61 or 3.605 $\sqrt{13}$ in working implies M1
4(b)	Correct B clearly indicated	2	**B1** for vector $\begin{pmatrix}1\\5\end{pmatrix}$ drawn not from A or $\begin{pmatrix}$ or correctly following through, from A, th incorrect vector seen. or either $\begin{pmatrix}-3\\2\end{pmatrix}$ or $\begin{pmatrix}4\\3\end{pmatrix}$ correctly drawn **on** starts from A.

8/5/2024

8/5/2024

7(a)	(9, 4)	2	**B1** for each co-ordinate
7(b)	$3\sqrt{5}$	3	**M1** for $([-]6)^2 + 3^2$ **A1** for $\sqrt{45}$

8/5/2024

10(a)	$\begin{pmatrix}6\\3\end{pmatrix}$	**1**	
10(b)	6.71 or 6.708… or $\sqrt{45}$ oe	**2**	**M1** for $(7-1)^2+(5-2)^2$ oe

8/5/2024

10(c)	$k-5=\sqrt{(their\mathbf{(b)})^2-3^2}$	**M2**	**M1** for $(k-5)^2+(10-7)^2=(their\mathbf{(b)}$ Reverse process scores 0.
	$k-5=6$	**A1**	

8/5/2024

8/5/2024

8/5/2024

7(a)	Vector $\begin{pmatrix}4\\2\end{pmatrix}$ drawn Vector $\begin{pmatrix}2\\5\end{pmatrix}$ drawn Vector $\begin{pmatrix}-4\\0\end{pmatrix}$ drawn	**3**	**B1** for each with arrows If 0 scored **SC1** for all three witho or all incorrect arrows
7(b)	[**p** =] –3**b** oe [**q** =] 3**a** + 3**b** oe [**r** =] 2**b** – **a** oe	**3**	**B1** for each

8/5/2024

10(a)	$\begin{pmatrix} 0 \\ 32 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} 0 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 32 \end{pmatrix}$
10(b)	10	**2**	**M1** for $6^2 + 8^2$ soi by 100

8/5/2024

3 A is the point (1, 5) and B is the point (6, 2).

Find the column vector $\overrightarrow{AB}$.

8/5/2024

3	$\begin{pmatrix} 5 \\ -3 \end{pmatrix}$	**2**	**B1** for each If 0 scored, **SC1** for $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$

8/5/2024

2 $\mathbf{p} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$

(a) Find $\mathbf{p} + \mathbf{q}$.

(b) A is the point (2, 7).
The point A is translated to the point B by the vector $\mathbf{p} + \mathbf{q}$.

Find the coordinates of B.

(....., ...

2(a)	$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$	**1**	
2(b)	(6, 4)	**2**	**FT** *their*(a) **B1** for each coordinate

8/5/2024

8 **(a)** Work out $\begin{pmatrix}12\\-5\end{pmatrix}-5\begin{pmatrix}4\\-1\end{pmatrix}$.

(b) Work out the magnitude of $\begin{pmatrix}3\\-4\end{pmatrix}$.

.....

8(a)	$\begin{pmatrix}-8\\0\end{pmatrix}$	**2**	**B1** for each
8(b)	5	**2**	**M1** for $3^2+(-4)^2$ oe

10 $\mathbf{a}=\begin{pmatrix}6\\8\end{pmatrix}$ $\mathbf{b}=\begin{pmatrix}2\\-8\end{pmatrix}$

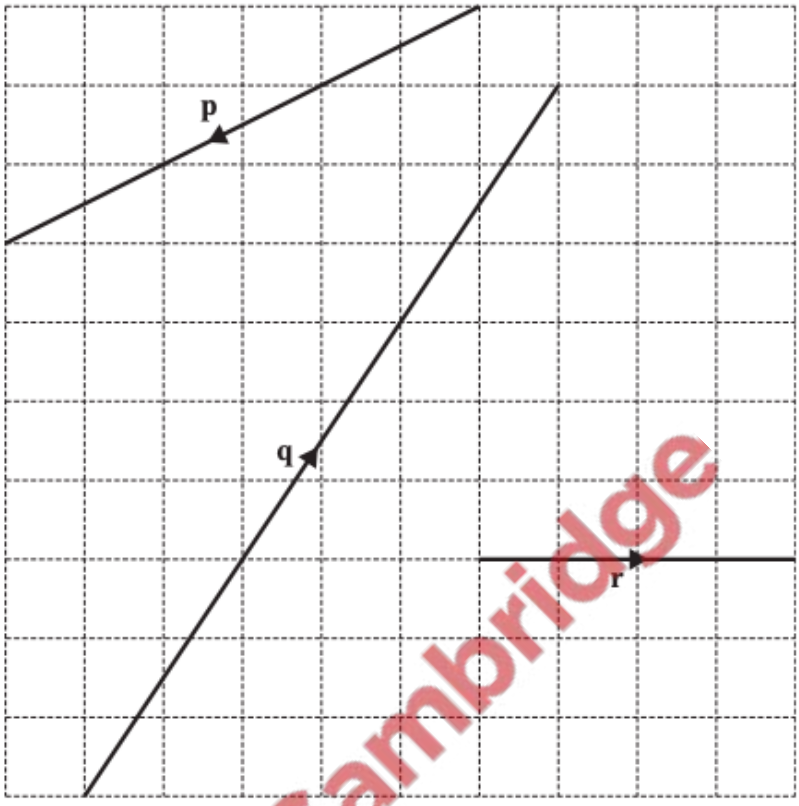
(a) Find $\mathbf{a}-3\mathbf{b}$.

(b) Work out $|\mathbf{a}|$.

.....

(b) Vectors **p**, **q**, and **r** are drawn on this grid.

Write each of the vectors in terms of **a** and/or **b**.

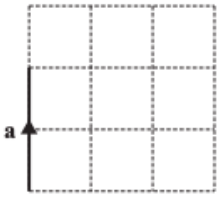


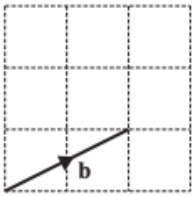
p = ...

q = ...

r = ... [3]

7 The vectors **a** and **b** are shown on the grids.



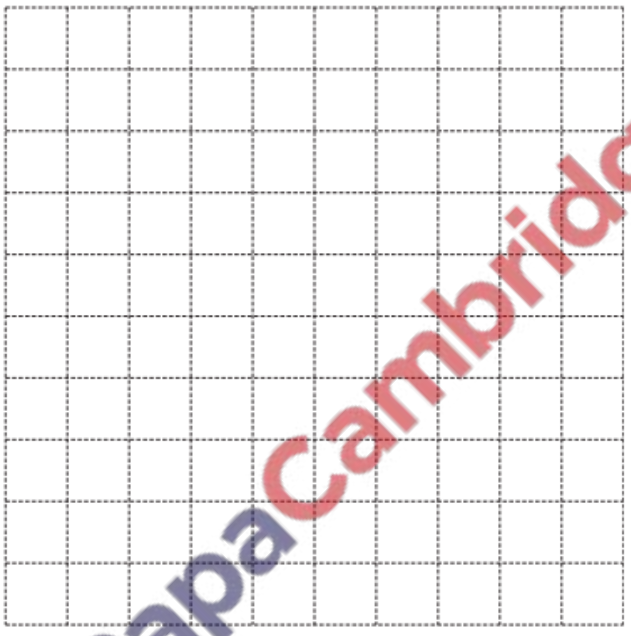


(a) On the grid below, draw and label the following three vectors.

$2\mathbf{b}$

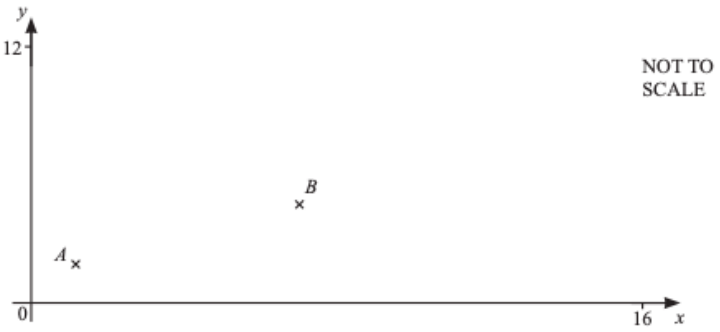
$2\mathbf{a}+\mathbf{b}$

$\mathbf{a}-2\mathbf{b}$



[3]

10 The points A (1, 2) and B (7, 5) are shown on the diagram below.



(a) Write $\overrightarrow{AB}$ as a column vector.

( ) [1]

(b) Calculate the length of the line AB.

..... [2]

(c) The point C has co-ordinates $(10, k)$.
$AB = BC$ and $k > 0$.

Show that $k = 11$.

[3]

7 Q is the point (3, 7) and $\overrightarrow{PQ} = \begin{pmatrix} -6 \\ 3 \end{pmatrix}$.

(a) Find the co-ordinates of P.

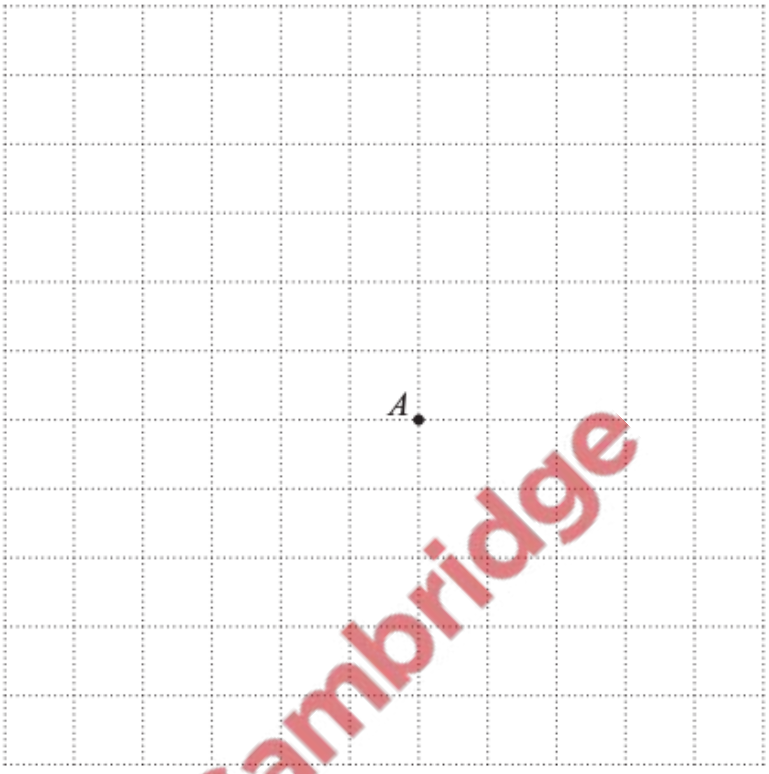
(..... , ...

(b) Find $\left|\overrightarrow{PQ}\right|$.
Give your answer in its simplest surd form.

.....

(b) $\overrightarrow{AB} = \mathbf{p} + \mathbf{q}$

Mark and label point B on the grid.



4 $\mathbf{p} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$

(a) Find

(i) the column vector $\frac{1}{2}\mathbf{p}$,

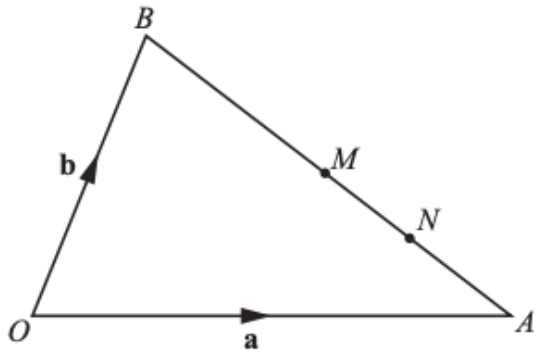
(ii) the column vector $\mathbf{q} - 2\mathbf{p}$,

(iii) $|\mathbf{p}|$, leaving your answer in surd form.

.....

11(a)(i)	$-\mathbf{a}+\mathbf{b}$ oe	**1**	
11(a)(ii)	$-\frac{1}{4}\mathbf{a}+\frac{1}{4}\mathbf{b}$ oe	**1**	**FT** *their* (i)
11(a)(iii)	$\frac{3}{4}\mathbf{a}+\frac{1}{4}\mathbf{b}$ oe	**2**	**B1** for correct unsimplified answer o route
11(b)	(6.5, 1.5)	**3**	**FT** *their* (a)(iii) **B2** for $\begin{pmatrix}6.5\\1.5\end{pmatrix}$ or **M1** for $\frac{3}{4}\times\begin{pmatrix}8\\0\end{pmatrix}+\frac{1}{4}\times\begin{pmatrix}2\\6\end{pmatrix}$ OR **B2** for (5, 3) at M or $[\overrightarrow{OM}=]\begin{pmatrix}5\\3\end{pmatrix}$ or **B1** for $(k, 3)$ or $(5, k)$ at M or $[\overrightarrow{OM}=]\begin{pmatrix}k\\3\end{pmatrix}$ or $\begin{pmatrix}5\\k\end{pmatrix}$

11



NOT TO SCALE

In the diagram, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
M is the midpoint of AB and N is the midpoint of AM.

(a) Find each of these vectors in terms of **a** and **b**.
Give each vector in its simplest form.

(i) $\overrightarrow{AB}$

$\overrightarrow{AB}$ = ...

(ii) $\overrightarrow{AN}$

$\overrightarrow{AN}$ = ...

(iii) $\overrightarrow{ON}$

$\overrightarrow{ON}$ = ...

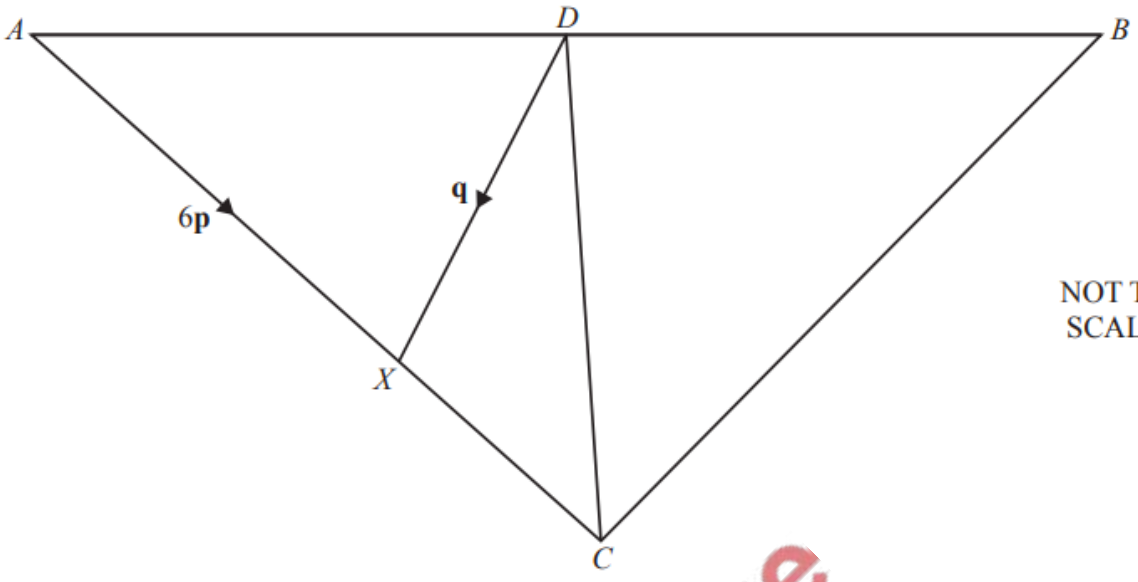
(b) $\overrightarrow{DC}$,

.....

(c) $\overrightarrow{CB}$.

.....

8



NOT TO SCALE

ABC is a triangle.

$AX = \frac{2}{3}AC$ and $AD = \frac{1}{2}AB$.

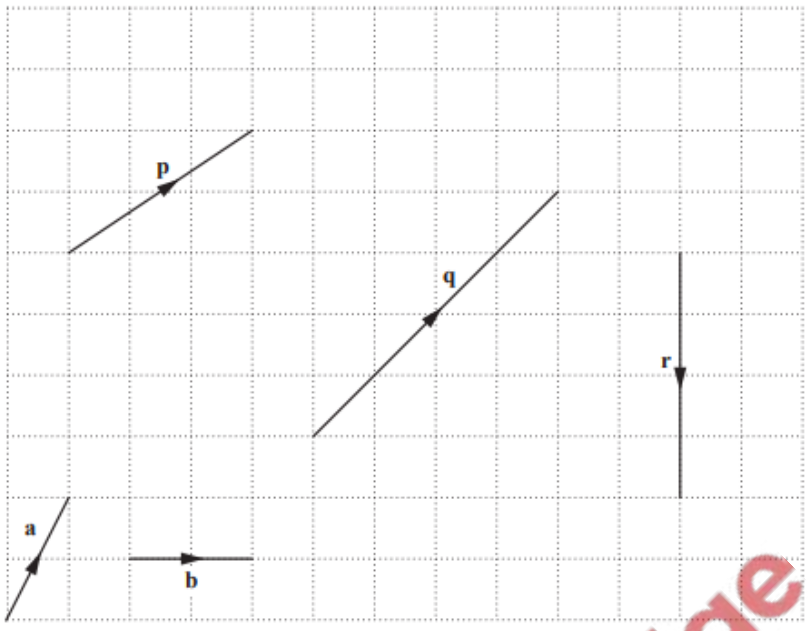
$\overrightarrow{AX} = 6\mathbf{p}$ and $\overrightarrow{DX} = \mathbf{q}$.

Find an expression, in terms of $\mathbf{p}$ and $\mathbf{q}$, for

(a) $\overrightarrow{AD}$,

.....

12



Write the vectors **p**, **q** and **r** in terms of **a** and **b**.

p = ...

q = ...

r = ... [3]