

GCSE QUESTIONS

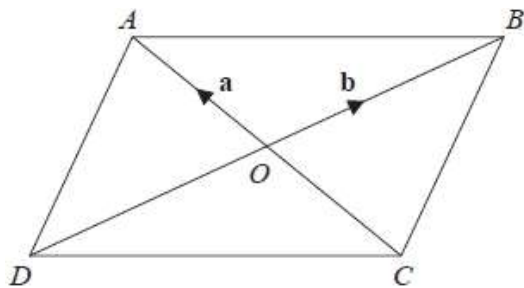
Q1. NON-CALCULATOR

$$\mathbf{a} = \begin{pmatrix} 3 \\ -7 \end{pmatrix}, \quad \mathbf{b} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$

Work out $\mathbf{b} - 2\mathbf{a}$ as a column vector.

.....
(Total for question = 2 marks)

Q2. NON-CALCULATOR



$ABCD$ is a parallelogram.
The diagonals of the parallelogram intersect at O .

$$\vec{OA} = \mathbf{a} \text{ and } \vec{OB} = \mathbf{b}$$

(a) Find, in terms of \mathbf{b} , the vector \vec{DB} .

.....
(1)

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

.....
(1)

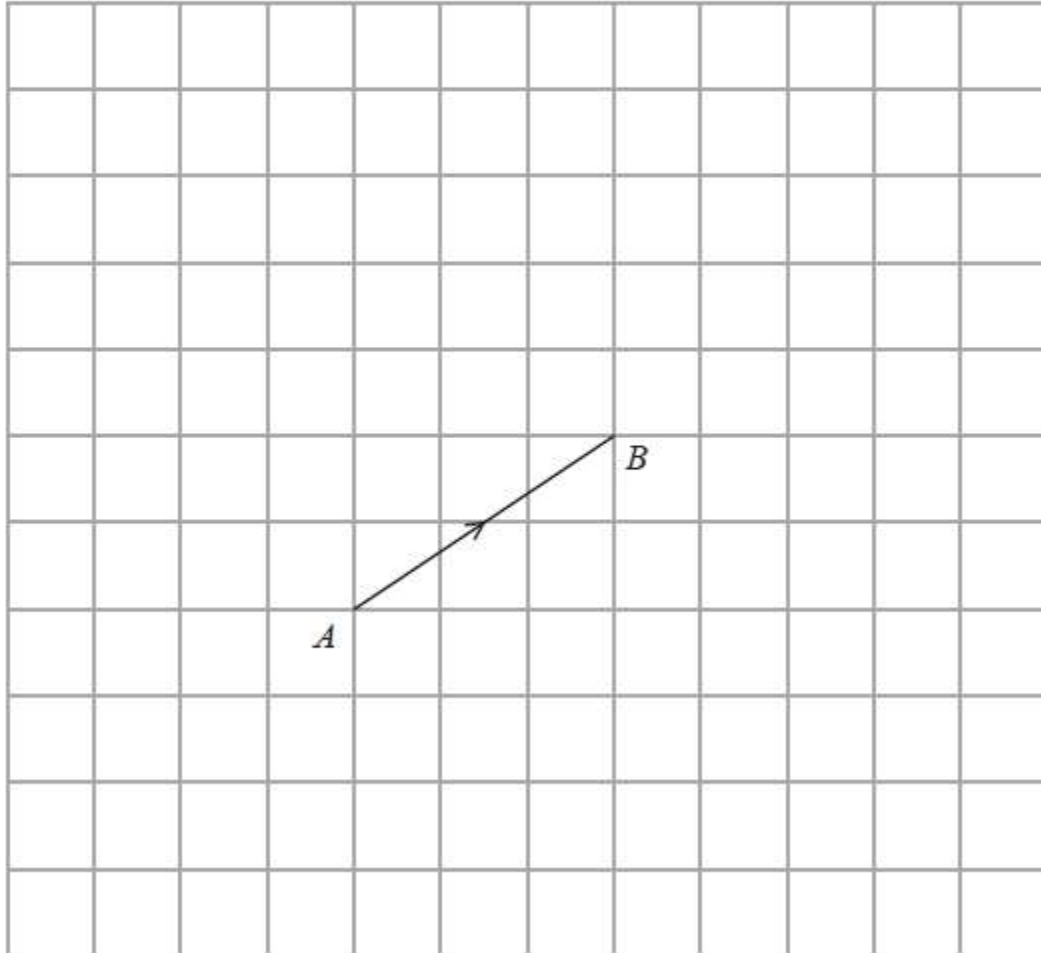
(c) Find, in terms of \mathbf{a} and \mathbf{b} , the vector \vec{AD} .

.....
(1)
(Total for question = 3 marks)

Q3. NON-CALCULATOR

$$\vec{AB} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \text{ and } \vec{BC} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$

\vec{AB} is shown on the grid.



(a) On the grid, draw \vec{BC} .

(1)

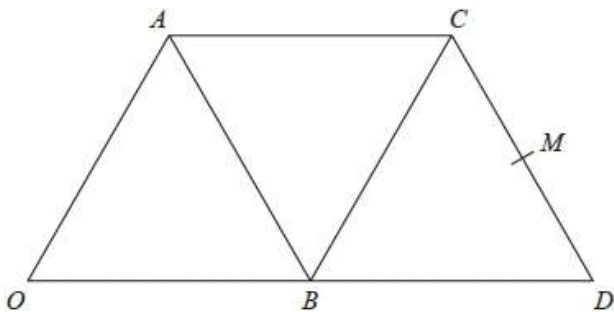
$$\vec{AD} = \vec{AB} - \vec{BC}$$

(b) On the grid, mark with a cross (X) the position of D .
Label this point D .

(2)

(Total for question = 3 marks)

Q4. NON-CALCULATOR



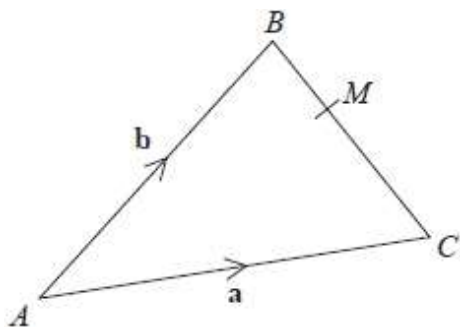
OACD is a trapezium and OACB is a parallelogram.
 B is the midpoint of OD.
 M is the midpoint of CD.

$$\vec{OA} = \mathbf{a} \text{ and } \vec{OB} = \mathbf{b}$$

Given that $\vec{BM} = k \times \vec{OC}$ where k is a scalar,
 use a vector method to find the value of k .

.....
 (Total for question = 3 marks)

Q5. NON-CALCULATOR



M is the point such that $BM : MC$ is $1 : 2$
 Here is Charlie's method to find \vec{BM} in terms of \mathbf{a} and \mathbf{b} .

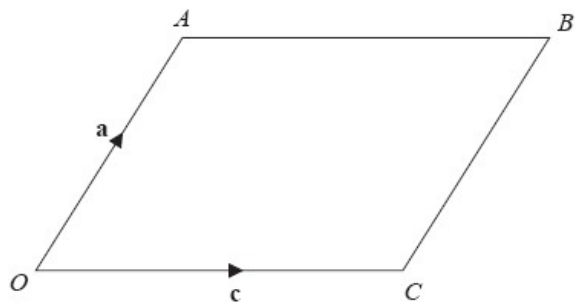
$$\begin{aligned} \vec{BC} &= \vec{BA} + \vec{AC} \\ &= -\mathbf{b} + \mathbf{a} \\ &= \mathbf{a} - \mathbf{b} \\ \vec{BM} &= \frac{1}{2} \vec{BC} \\ &= \frac{1}{2} (\mathbf{a} - \mathbf{b}) \end{aligned}$$

(a) Evaluate Charlie's method.

.....

 (1)
 (Total for question = 1 mark)

Q6. NON-CALCULATOR



OABC is a parallelogram.

$$\vec{OA} = \mathbf{a} \text{ and } \vec{OC} = \mathbf{c}$$

X is the midpoint of the line AC.

OCD is a straight line so that $OC : CD = k : 1$

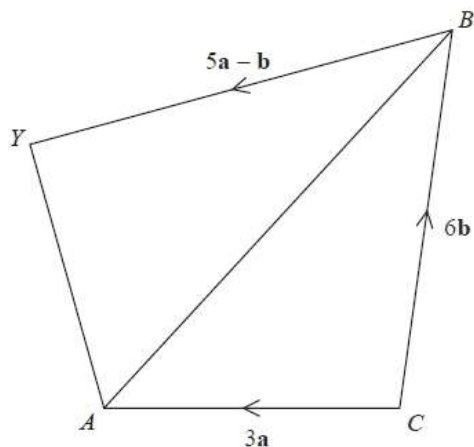
Given that $\vec{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$

find the value of k .

$k = \dots\dots\dots$

(Total for question = 4 marks)

Q7. NON-CALCULATOR



CAYB is a quadrilateral.

$$\vec{CA} = 3\mathbf{a}$$

$$\vec{CB} = 6\mathbf{b}$$

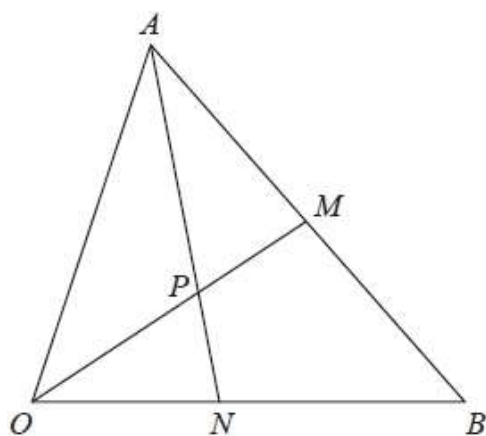
$$\vec{BY} = 5\mathbf{a} - \mathbf{b}$$

X is the point on AB such that $AX : XB = 1 : 2$

Prove that $\vec{CX} = \frac{2}{5}\vec{CY}$

Q8. NON-CALCULATOR

(Total for question is 5 marks)



OAB is a triangle.
 OPM and APN are straight lines.
 M is the midpoint of AB .

$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

$$OP : PM = 3 : 2$$

Work out the ratio $ON : NB$

.....
 (Total for question = 5 marks)

Q9. CALCULATOR ALLOWED

$$\mathbf{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Write down as a column vector

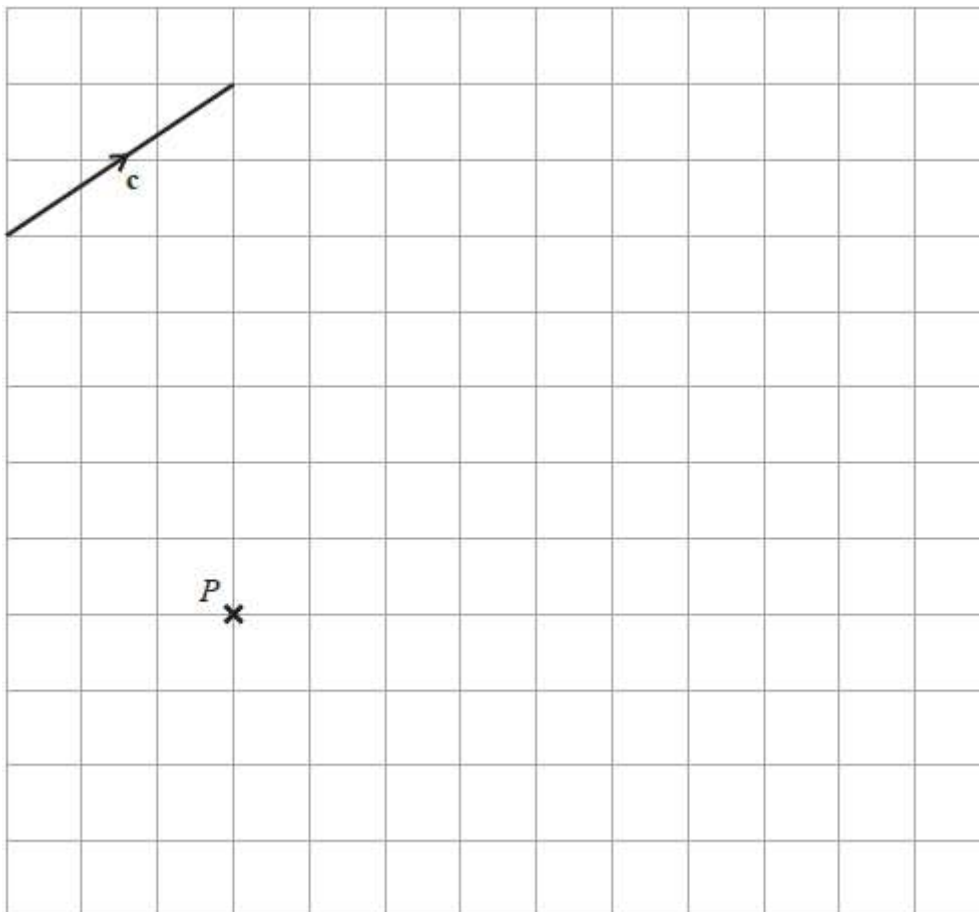
(i) $\mathbf{a} + \mathbf{b}$

.....
(1)

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

.....
(2)

The vector \mathbf{c} is drawn on the grid.

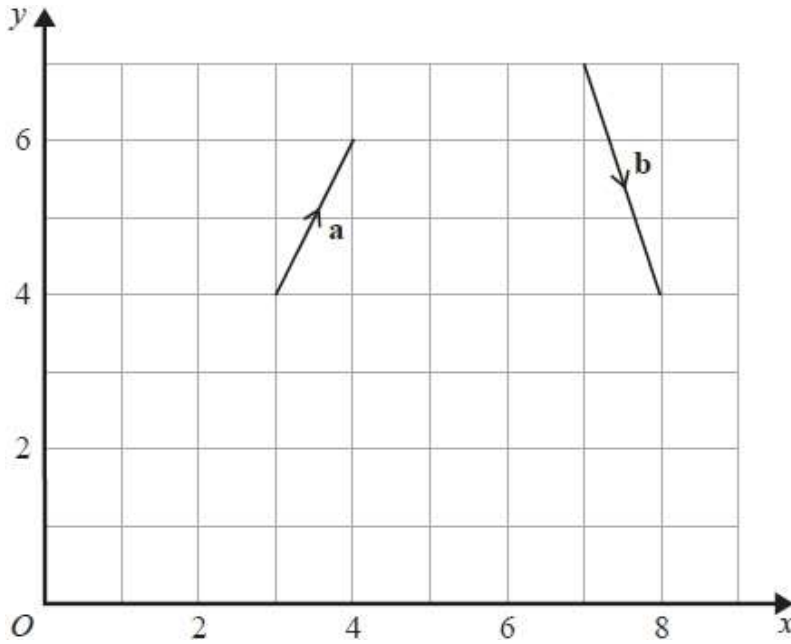


(b) From the point P , draw the vector $3\mathbf{c}$

(1)
(Total for question = 4 marks)

Q10. CALCULATOR ALLOWED

The vector **a** and the vector **b** are shown on the grid.



(a) On the grid, draw and label vector $-2\mathbf{a}$

(1)

(b) Work out $\mathbf{a} + 2\mathbf{b}$ as a column vector.

$$\begin{pmatrix} \\ \text{---} \\ \end{pmatrix}$$

(2)

(Total for question = 3 marks)

Q11. CALCULATOR ALLOWED

Here are two column vectors.

$$\mathbf{a} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$$

On the grid below, draw and label the vector $\mathbf{a} - 2\mathbf{b}$



(Total for question = 3 marks)

Q12. CALCULATOR ALLOWED

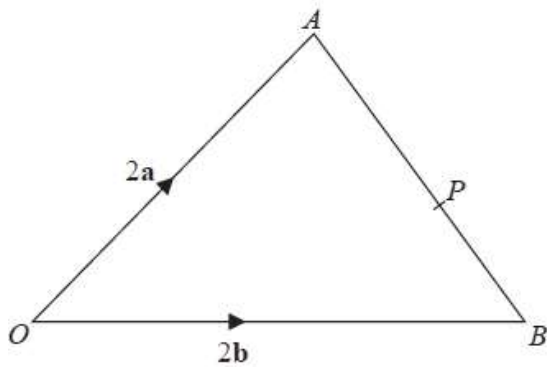
$$\mathbf{a} = \begin{pmatrix} 4 \\ 5 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

Work out $\mathbf{a} - 2\mathbf{b}$ as a column vector.

$$\begin{pmatrix} \\ \text{---} \\ \end{pmatrix}$$

(Total for question = 2 marks)

Q13. CALCULATOR ALLOWED



OAB is a triangle.

P is the point on AB such that $AP : PB = 5:3$

$$\vec{OA} = 2\mathbf{a}$$

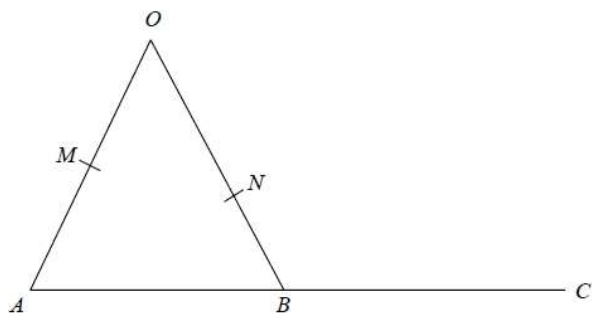
$$\vec{OB} = 2\mathbf{b}$$

$$\vec{OP} = k(3\mathbf{a} + 5\mathbf{b}) \text{ where } k \text{ is a scalar quantity.}$$

Find the value of k .

.....
(Total for question = 4 marks)

Q14. CALCULATOR ALLOWED



OMA , ONB and ABC are straight lines.

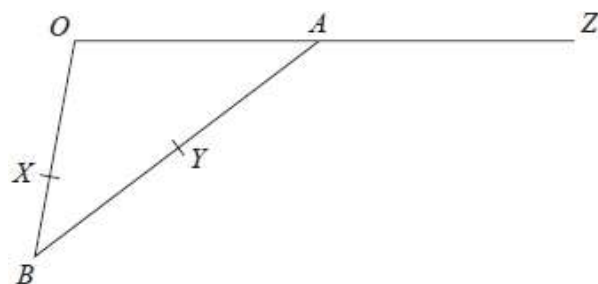
M is the midpoint of OA .

B is the midpoint of AC .

$\vec{OA} = 6\mathbf{a}$ $\vec{OB} = 6\mathbf{b}$ $\vec{ON} = k\mathbf{b}$ where k is a scalar quantity.

Given that MNC is a straight line, find the value of k .

Q15. CALCULATOR ALLOWED



OAB is a triangle.

A is the midpoint of OZ

Y is the midpoint of AB

X is a point on OB

$\vec{OA} = \mathbf{a}$ $\vec{OX} = 2\mathbf{b}$ $\vec{XB} = \mathbf{b}$

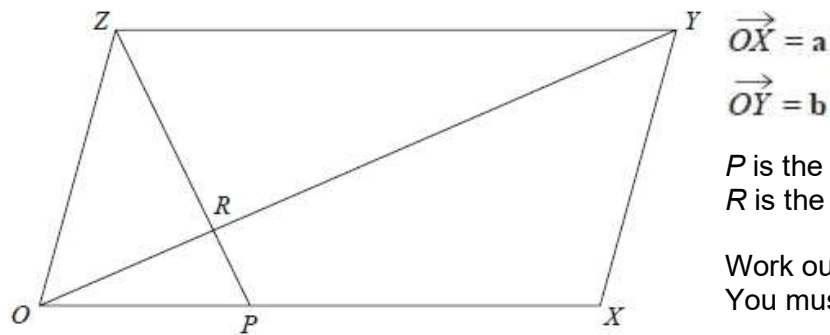
Prove that XYZ is a straight line.

(Total for question = 5 marks)

Q16. CALCULATOR ALLOWED

(Total for question = 5 marks)

OXYZ is a parallelogram.



$$\vec{OX} = \mathbf{a}$$

$$\vec{OY} = \mathbf{b}$$

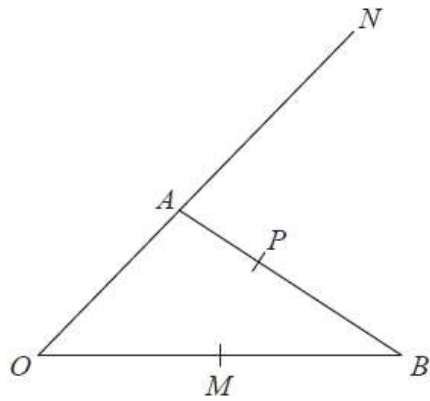
P is the point on OX such that $OP : PX = 1 : 2$

R is the point on OY such that $OR : RY = 1 : 3$

Work out, in its simplest form, the ratio $ZP : ZR$
You must show all your working.

.....
(Total for question = 5 marks)

Q17. CALCULATOR ALLOWED



OAN , OMB and APB are straight lines.

$AN = 2OA$.

M is the midpoint of OB .

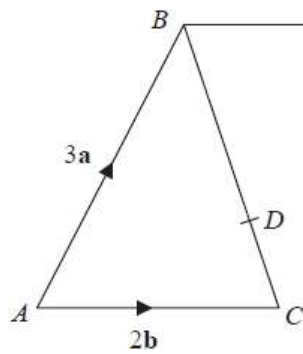
$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

$$\vec{AP} = k\vec{AB} \text{ where } k \text{ is a scalar quantity.}$$

Given that MPN is a straight line, find the value of k .

.....
(Total for question = 5 marks)

Q18. CALCULATOR ALLOWED



The diagram shows triangle ABC .

$$\vec{AB} = 3\mathbf{a}$$

$$\vec{AC} = 2\mathbf{b}$$

$$\vec{BE} = 3\vec{AC}$$

D is the point on BC such that $BD : DC = 3 : 1$

Prove that ADE is a straight line.

(Total for question = 4 marks)