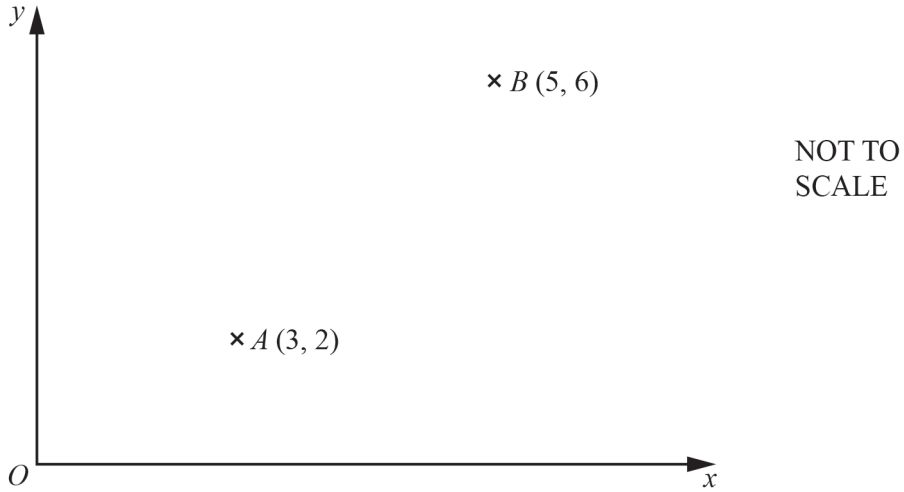


Topical Worksheets for Cambridge IGCSE™  
Mathematics (0580)

**Vectors**

1<sup>st</sup> edition, for examination until 2025

1



(a) Find the column vector  $\vec{AB}$ .

$\vec{AB} = \begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

(b) Find  $|\vec{AB}|$ .

$|\vec{AB}| = \dots\dots\dots$  [2]

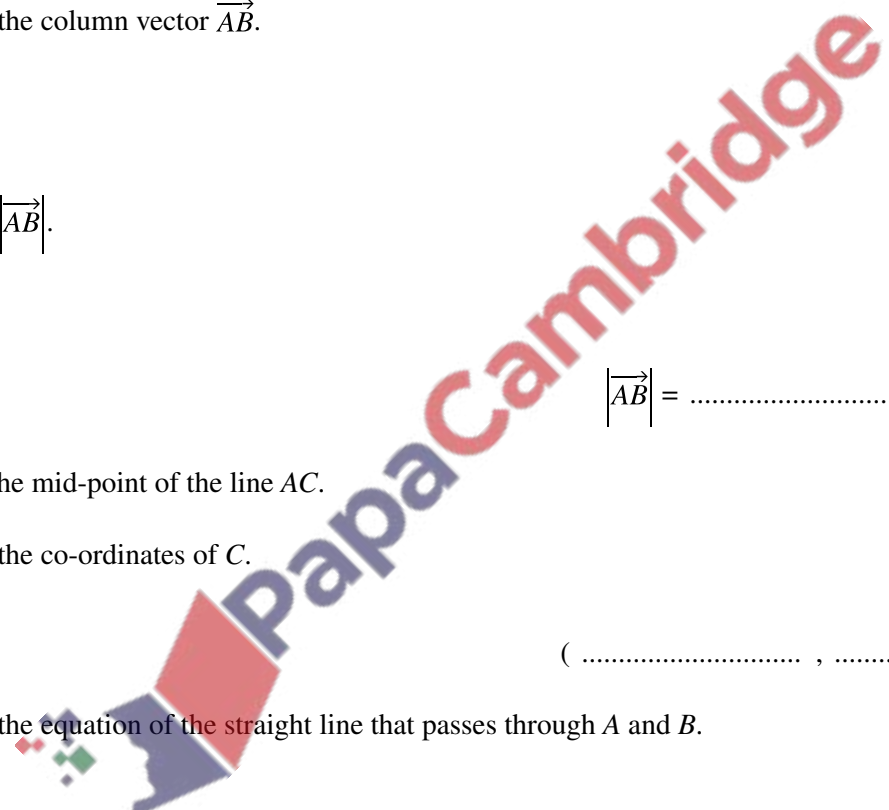
(c) B is the mid-point of the line AC.

Find the co-ordinates of C.

(  $\dots\dots\dots$  ,  $\dots\dots\dots$  ) [2]

(d) Find the equation of the straight line that passes through A and B.

$\dots\dots\dots$  [3]



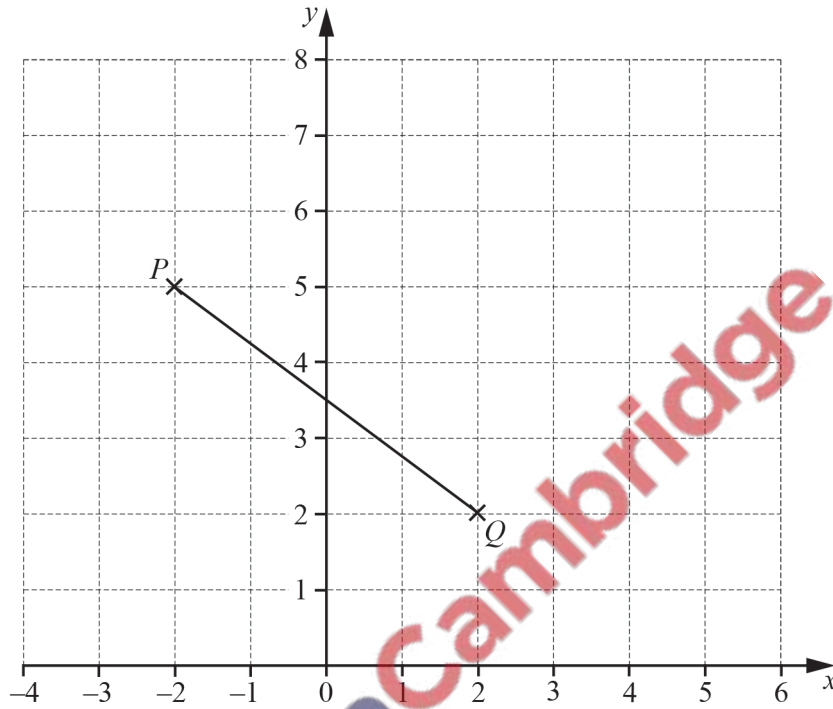
- (e) The straight line that passes through  $A$  and  $B$  cuts the  $y$ -axis at  $D$ .

Write down the co-ordinates of  $D$ .

( ..... , ..... ) [1]

[Total: 9]

2



- (a) Write down the co-ordinates of point  $P$ .

( ..... , ..... ) [1]

- (b) Write down the column vector  $\vec{PQ}$ .

$\vec{PQ} = \begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

- (c)  $\vec{QR} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

On the grid, plot point  $R$ .

[1]

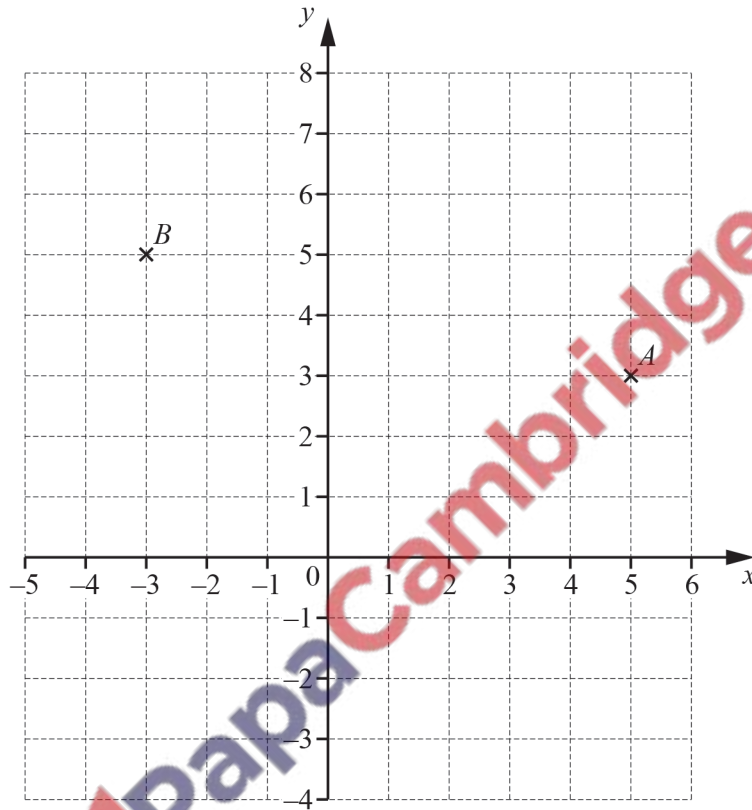
(d)  $PQRS$  is a parallelogram.

On the grid, complete the parallelogram  $PQRS$ .  
Write down the co-ordinates of point  $S$ .

( ..... , ..... ) [2]

[Total: 5]

3



(a) Write down the co-ordinates of point  $A$ .

( ..... , ..... ) [1]

(b) Plot the point  $C$  at  $(4, -3)$ .

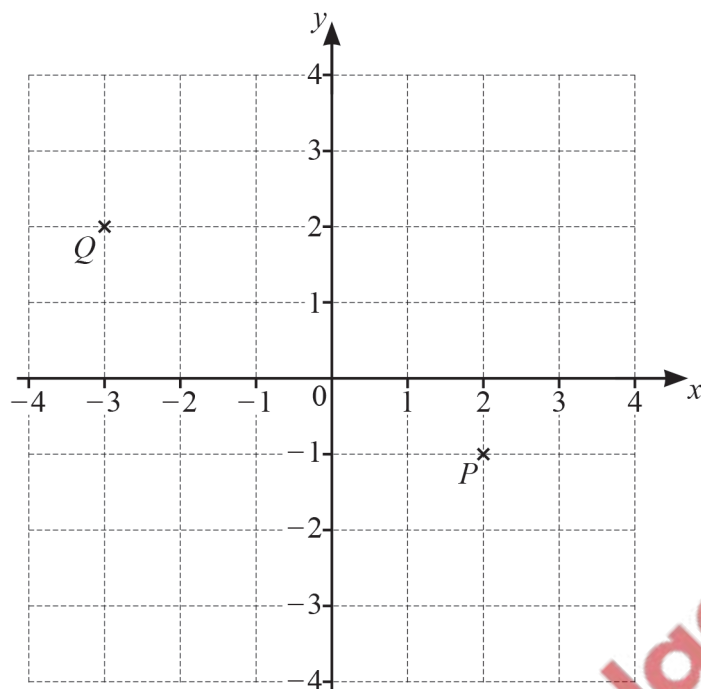
[1]

(c) Find the vector  $\vec{AB}$ .

$\vec{AB} = \left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right)$  [1]

[Total: 3]

4



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

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

(b) Write  $3\overrightarrow{PQ}$  as a single vector.

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

[Total: 2]

5 Work out.

(a)  $\begin{pmatrix} 4 \\ -2 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

(b)  $6 \begin{pmatrix} 3 \\ 0 \end{pmatrix}$

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

[Total: 2]

$$6 \quad \mathbf{p} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \quad \mathbf{q} = \begin{pmatrix} 1 \\ 6 \end{pmatrix}$$

Work out  $2\mathbf{p} + 3\mathbf{q}$ .

$$\left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right) \quad [2]$$

[Total: 2]

$$7 \quad \mathbf{e} = \begin{pmatrix} -5 \\ 4 \end{pmatrix} \quad \mathbf{f} = \begin{pmatrix} 0 \\ 6 \end{pmatrix}$$

Write as a single vector

(a)  $3\mathbf{e}$ ,

$$\left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right) \quad [1]$$

(b)  $\mathbf{f} - \mathbf{e}$ .

$$\left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right) \quad [1]$$

[Total: 2]

8 Work out.

$$(a) \quad \begin{pmatrix} -2 \\ 5 \end{pmatrix} - \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

$$\left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right) \quad [1]$$

(b)  $7 \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

[Total: 2]

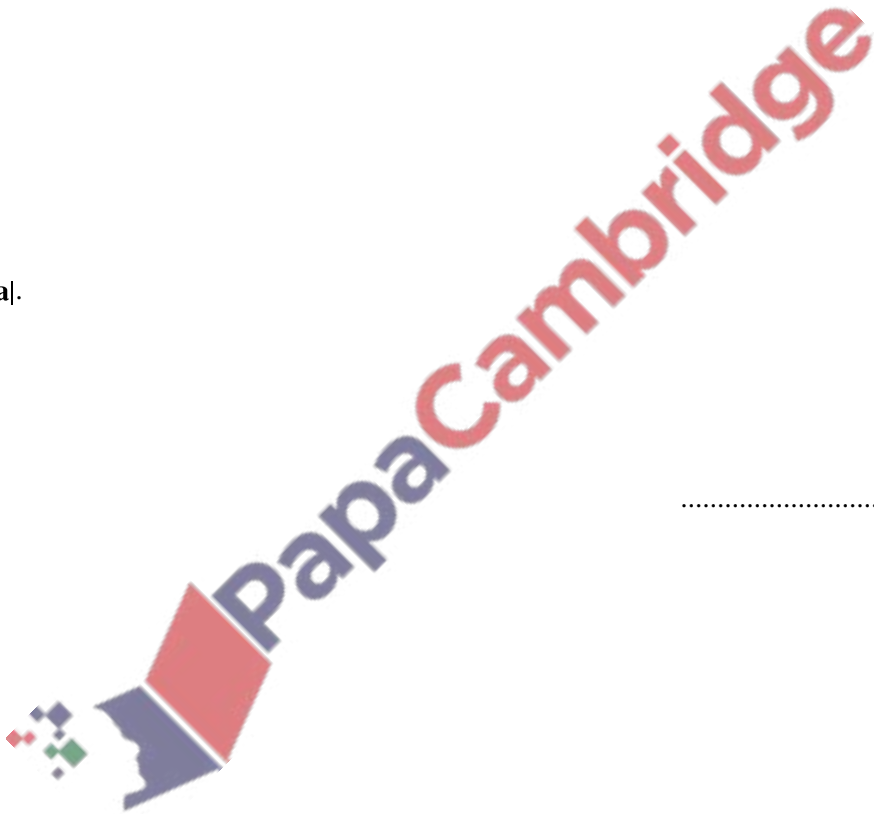
9  $\mathbf{a} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$      $\mathbf{b} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$      $\mathbf{c} = \begin{pmatrix} 14 \\ 9 \end{pmatrix}$

(a) Find  $3\mathbf{a} - 2\mathbf{b}$ .

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [2]

(b) Find  $|\mathbf{a}|$ .

..... [2]



(c)  $ma + nb = c$

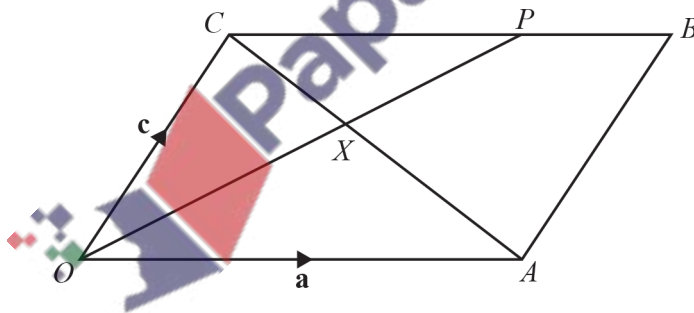
Write down two simultaneous equations and solve them to find the value of  $m$  and the value of  $n$ .  
Show all your working.

$m = \dots\dots\dots$

$n = \dots\dots\dots$  [5]

[Total: 9]

10



NOT TO SCALE

In the diagram,  $OACB$  is a parallelogram.  
 $OP$  and  $CA$  intersect at  $X$  and  $CP : PB = 2 : 1$ .  
 $\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$ .

(a) Find  $\vec{OP}$ , in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in its simplest form.

$\vec{OP} = \dots\dots\dots$  [2]



(b)  $CX : XA = 2 : 3$

(i) Find  $\vec{OX}$ , in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in its simplest form.

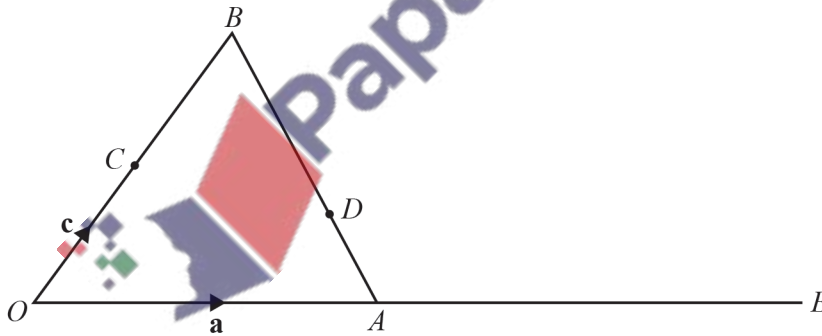
$\vec{OX} = \dots\dots\dots$  [2]

(ii) Find  $OX : XP$ .

$OX : XP = \dots\dots\dots : \dots\dots\dots$  [2]

[Total: 6]

11



NOT TO SCALE

$OAB$  is a triangle and  $C$  is the mid-point of  $OB$ .

$D$  is on  $AB$  such that  $AD : DB = 3 : 5$ .

$OAE$  is a straight line such that  $OA : AE = 2 : 3$ .

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

(a) Find, in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in its simplest form,

(i)  $\vec{AB}$ ,

$\vec{AB} = \dots\dots\dots$  [1]

(ii)  $\vec{AD}$ ,

$\vec{AD} = \dots\dots\dots$  [1]

(iii)  $\vec{CE}$ ,

$\vec{CE} = \dots\dots\dots$  [1]

(iv)  $\vec{CD}$ .

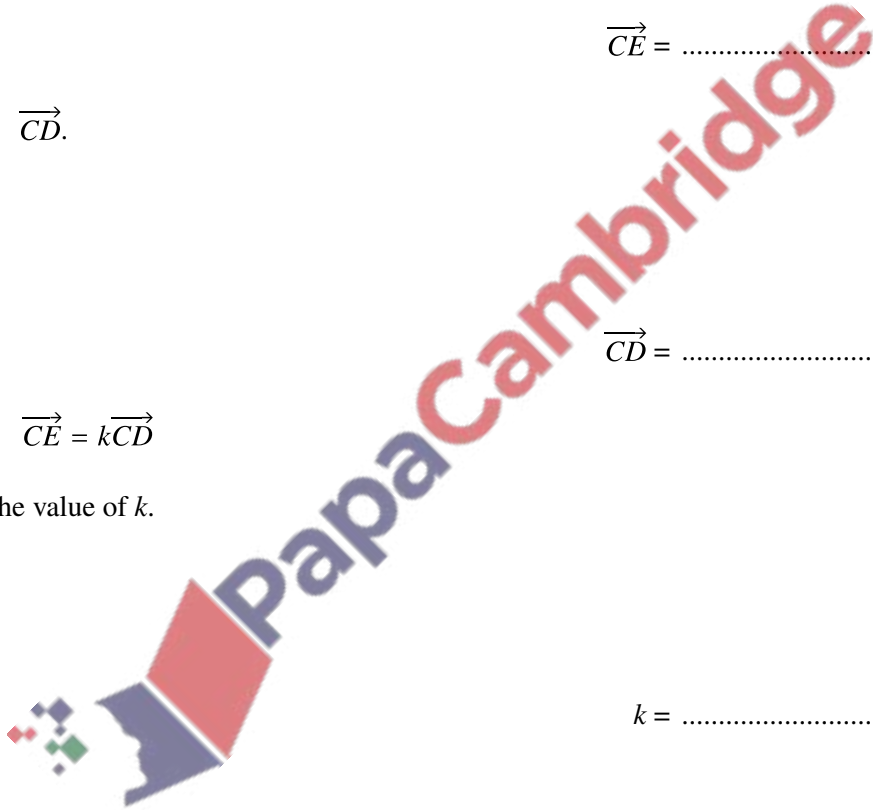
$\vec{CD} = \dots\dots\dots$  [2]

(b)  $\vec{CE} = k\vec{CD}$

Find the value of  $k$ .

$k = \dots\dots\dots$  [1]

[Total: 6]



12

$\vec{OA} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$        $\vec{AB} = \begin{pmatrix} 8 \\ -7 \end{pmatrix}$        $\vec{AC} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$

Find

(a)  $|\vec{OB}|$ ,

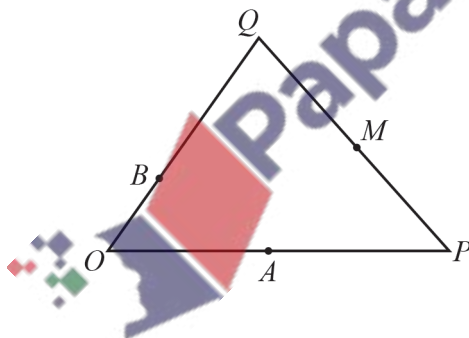
$|\vec{OB}| = \dots\dots\dots$  [3]

(b)  $\vec{BC}$ .

$\vec{BC} = \left( \begin{array}{c} \\ \end{array} \right)$  [2]

[Total: 5]

13



NOT TO SCALE

$O$  is the origin,  $\vec{OP} = 2\vec{OA}$ ,  $\vec{OQ} = 3\vec{OB}$  and  $\vec{PM} = \vec{MQ}$ .  
 $\vec{OP} = \mathbf{p}$  and  $\vec{OQ} = \mathbf{q}$ .

Find, in terms of  $\mathbf{p}$  and  $\mathbf{q}$ , in its simplest form

(a)  $\vec{BA}$ ,

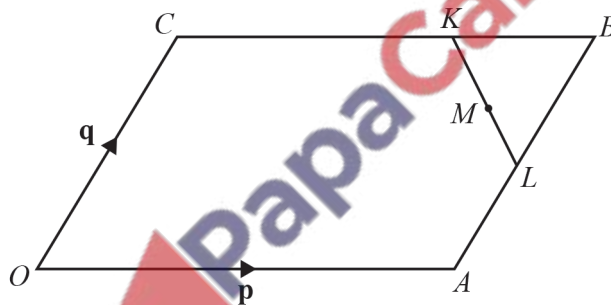
$\vec{BA} = \dots\dots\dots$  [2]

(b) the position vector of  $M$ .

$\dots\dots\dots$  [2]

[Total: 4]

14



NOT TO SCALE

$OACB$  is a parallelogram and  $O$  is the origin.

$CK = 2KB$  and  $AL = LB$ .

$M$  is the midpoint of  $KL$ .

$\vec{OA} = \mathbf{p}$  and  $\vec{OC} = \mathbf{q}$ .

Find, in terms of  $\mathbf{p}$  and  $\mathbf{q}$ , giving your answer in its simplest form

(a)  $\vec{KL}$ ,

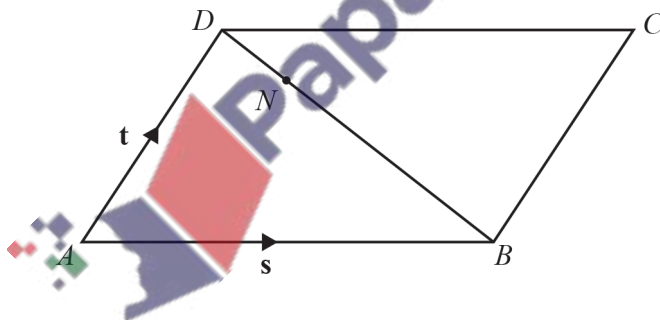
$\vec{KL} = \dots\dots\dots$  [2]

(b) the position vector of  $M$ .

$\dots\dots\dots$  [2]

[Total: 4]

15



NOT TO SCALE

$ABCD$  is a parallelogram.

$N$  is the point on  $BD$  such that  $BN : ND = 4 : 1$ .

$\vec{AB} = \mathbf{s}$  and  $\vec{AD} = \mathbf{t}$ .

Find, in terms of  $\mathbf{s}$  and  $\mathbf{t}$ , an expression in its simplest form for

(a)  $\vec{BD}$ ,

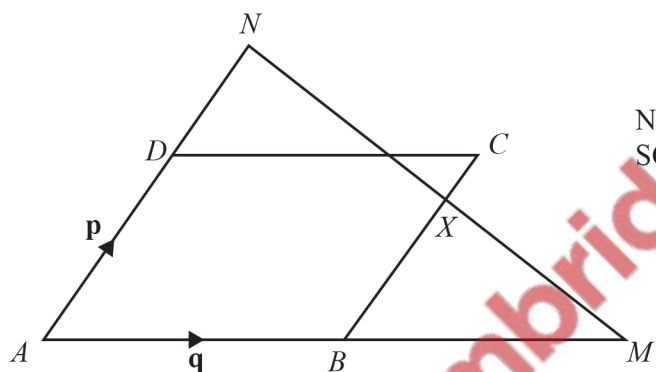
$\vec{BD} = \dots\dots\dots$  [1]

(b)  $\overrightarrow{CN}$ .

$\overrightarrow{CN} = \dots\dots\dots$  [3]

[Total: 4]

16



$ABCD$  is a parallelogram with  $\overrightarrow{AB} = \mathbf{q}$  and  $\overrightarrow{AD} = \mathbf{p}$ .  
 $ABM$  is a straight line with  $AB : BM = 1 : 1$ .  
 $ADN$  is a straight line with  $AD : DN = 3 : 2$ .

(a) Write  $\overrightarrow{MN}$ , in terms of  $\mathbf{p}$  and  $\mathbf{q}$ , in its simplest form.

$\overrightarrow{MN} = \dots\dots\dots$  [2]

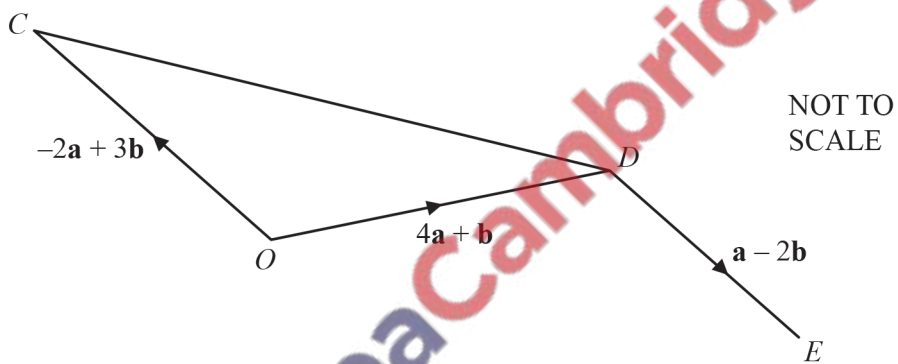
- (b) The straight line  $NM$  cuts  $BC$  at  $X$ .  
 $X$  is the midpoint of  $MN$ .

$$\overrightarrow{BX} = k\mathbf{p}$$

Find the value of  $k$ .

$k = \dots\dots\dots$  [2]

[Total: 4]



- 17 In the diagram,  $O$  is the origin,  $\overrightarrow{OC} = -2\mathbf{a} + 3\mathbf{b}$  and  $\overrightarrow{OD} = 4\mathbf{a} + \mathbf{b}$ .

- (a) Find  $\overrightarrow{CD}$ , in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , in its simplest form.

$\overrightarrow{CD} = \dots\dots\dots$  [2]

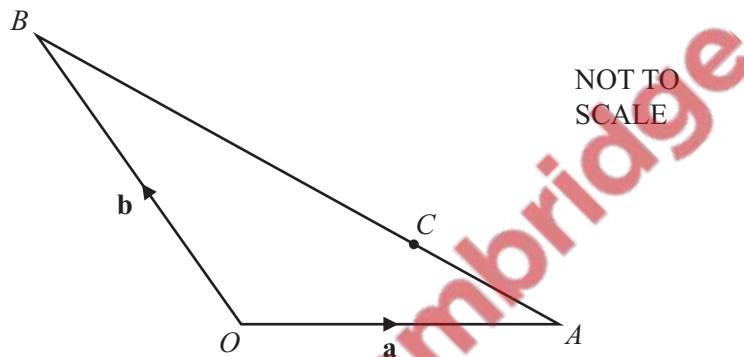
(b)  $\overrightarrow{DE} = \mathbf{a} - 2\mathbf{b}$

Find the position vector of  $E$ , in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , in its simplest form.

..... [2]

[Total: 4]

18



In the diagram,  $O$  is the origin,  $\overrightarrow{OA} = \mathbf{a}$  and  $\overrightarrow{OB} = \mathbf{b}$ .  
 $C$  is on the line  $AB$  so that  $AC : CB = 1 : 2$ .

Find, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , in its simplest form,

(a)  $\overrightarrow{AC}$ ,

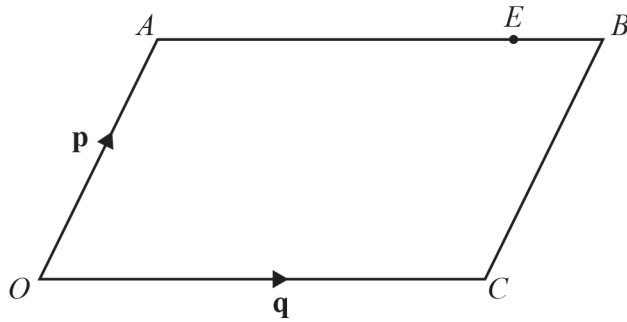
Answer(a)  $\overrightarrow{AC} = \dots\dots\dots$  [2]

(b) the position vector of  $C$ .

Answer(b) ..... [2]



19



NOT TO SCALE

$OACB$  is a parallelogram.

$\vec{OA} = \mathbf{p}$  and  $\vec{OC} = \mathbf{q}$ .

$E$  is the point on  $AB$  such that  $AE : EB = 3 : 1$ .

Find  $\vec{OE}$ , in terms of  $\mathbf{p}$  and  $\mathbf{q}$ , in its simplest form.

$\vec{OE} = \dots\dots\dots$  [2]

[Total: 2]

20

$\vec{VW} = \begin{pmatrix} 10 \\ -24 \end{pmatrix}$

Find  $|\vec{VW}|$ .

$\dots\dots\dots$  [2]

[Total: 2]

21  $O$  is the origin,  $\vec{OA} = 2\mathbf{x} + 3\mathbf{y}$  and  $\vec{BA} = \mathbf{x} - 4\mathbf{y}$ .

Find the position vector of  $B$ , in terms of  $\mathbf{x}$  and  $\mathbf{y}$ , in its simplest form.

..... [2]

[Total: 2]

