Vectors
Difficulty: Easy

Question Paper 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Easy
Booklet	Question Paper 1

Time allowed: **41 minutes**

Score: **/32**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

(a) D is the point $(2, -5)$ and $\overrightarrow{DE} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$.

Find the co-ordinates of the point E.   [1]
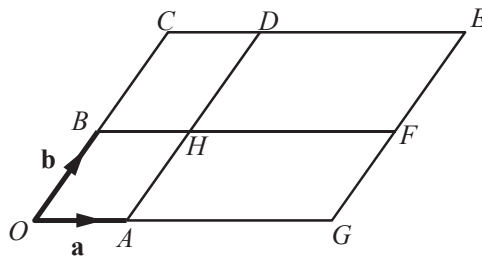
(b) $\mathbf{v} = \begin{pmatrix} t \\ 12 \end{pmatrix}$ and $|\mathbf{v}| = 13$.

Work out the value of t, where t is negative.   [2]

The diagram shows a parallelogram *OCEG*.

NOT TO
SCALE

O is the origin, $\overrightarrow{OA} = $ **a** and $\overrightarrow{OB} = $ **b**.
BHF and *AHD* are straight lines parallel to the sides of the parallelogram.
$\overrightarrow{OG} = 3\overrightarrow{OA}$ and $\overrightarrow{OC} = 2\overrightarrow{OB}$.

(a) Write the vector $\overrightarrow{HE}$ in terms of **a** and **b**.   [1]

(b) Complete this statement.

a + 2**b** is the position vector of point .... [1]

(c) Write down two vectors that can be written as 3**a** - **b**.   [2]

(a) $\overrightarrow{GH} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$

Find

    (i) $5\overrightarrow{GH}$,   [1]

    (ii) $\overrightarrow{HG}$.   [1]

(b) $\begin{pmatrix} 6 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 3 \end{pmatrix}$
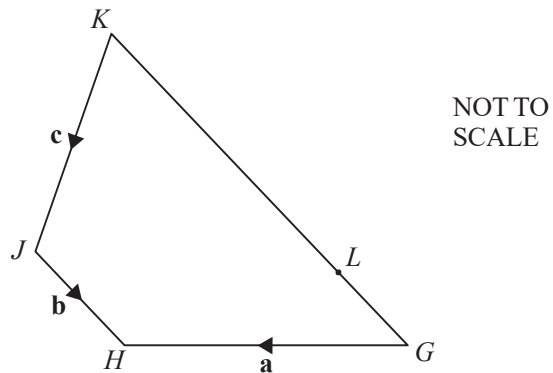
Find the value of y.   [1]

$$\overrightarrow{BC} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \qquad \overrightarrow{BA} = \begin{pmatrix} -5 \\ 6 \end{pmatrix}$$

(a) Find $\overrightarrow{CA}$.　　　　　　　　　　　　　　　　　　　　　　　[2]

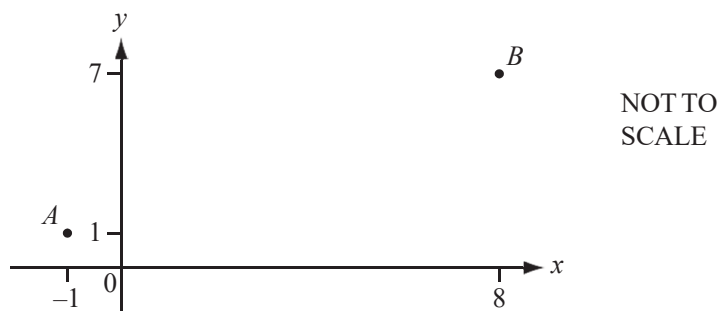**(b)** Work out $\left| \overrightarrow{BA} \right|$.　　　　　　　　　　　　　　　　　　　[2]

NOT TO
SCALE

GHJK is a quadrilateral.

$\overrightarrow{GH} = \mathbf{a}$, $\overrightarrow{JH} = \mathbf{b}$ and $\overrightarrow{KJ} = \mathbf{c}$.

L lies on *GK* so that $LK = 3GL$.

Find an expression, in terms of **a**, **b** and **c**, for $\overrightarrow{GL}$. [2]

A is the point (–1, 1) and *B* is the point (8, 7).

(a) Write $\overrightarrow{AB}$ as a column vector. [1]

(b) Find $|\overrightarrow{AB}|$. [2]

(c) $\overrightarrow{AC} = 2\overrightarrow{AB}$. [1]

Write down the co-ordinates of *C*.
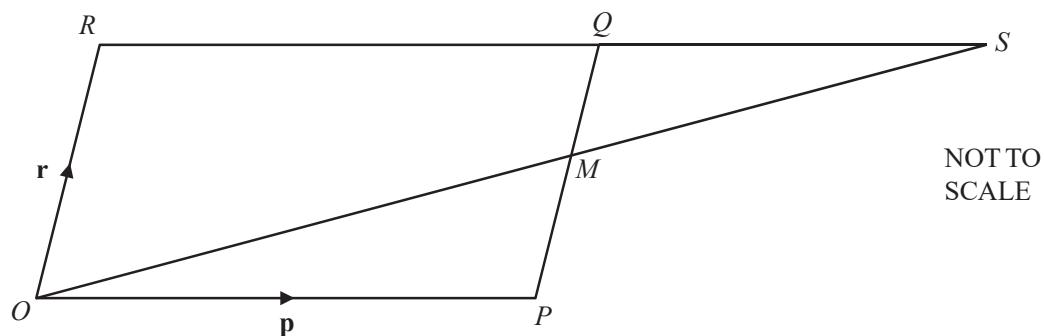
OPQR is a parallelogram, with *O* the origin.
M is the midpoint of *PQ*.
OM and *RQ* are extended to meet at *S*.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.

(a) Find, in terms of **p** and **r**, in its simplest form,

    (i) $\overrightarrow{OM}$,   [1]

    (ii) the position vector of *S*.   [1]

(b) When $\overrightarrow{PT} = -\frac{1}{2}\mathbf{p} + \mathbf{r}$, what can you write down about the position of *T* ?   [1]
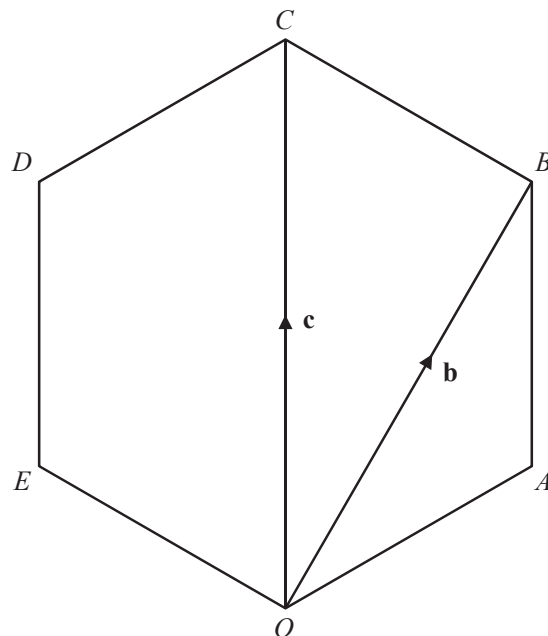
OABCDE is a regular polygon.

(a) Write down the geometrical name for this polygon. [1]

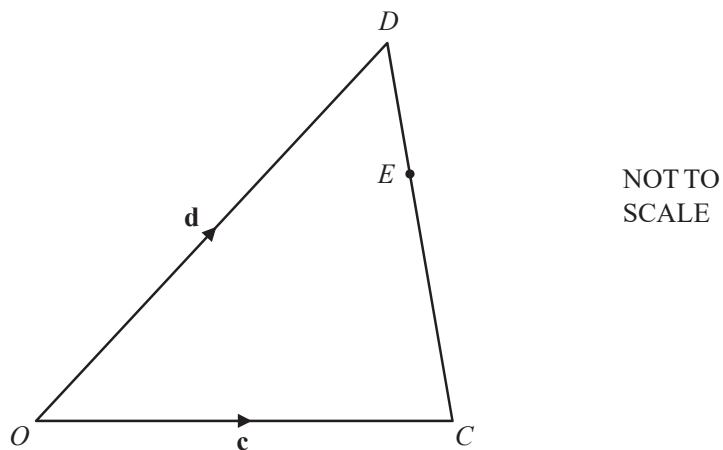**(b)** *O* is the origin. $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$.

Find, in terms of **b** and **c**, in their simplest form,

(i) $\overrightarrow{BC}$, [1]

(ii) $\overrightarrow{OA}$, [2]

(iii) the position vector of *E*. [1]

NOT TO SCALE

In the diagram, O is the origin.
$\overrightarrow{OC}$ = c and $\overrightarrow{OD}$ = d.
E is on CD so that $CE = 2ED$.

Find, in terms of c and d, in their simplest forms,

(a) $\overrightarrow{DE}$, [2]

(b) the position vector of E. [2]

Vectors
Difficulty: Easy

Question Paper 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Easy
Booklet	Question Paper 2

Time allowed: **37 minutes**

Score: **/29**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
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O is the origin and *OPQRST* is a regular hexagon.

$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OT} = \mathbf{t}$.

Find, in terms of **p** and **t**, in their simplest forms,

(a) $\overrightarrow{PT}$,   [1]

(b) $\overrightarrow{PR}$,

[2]

(c) the position vector of *R*.   [2]

NOT TO
SCALE
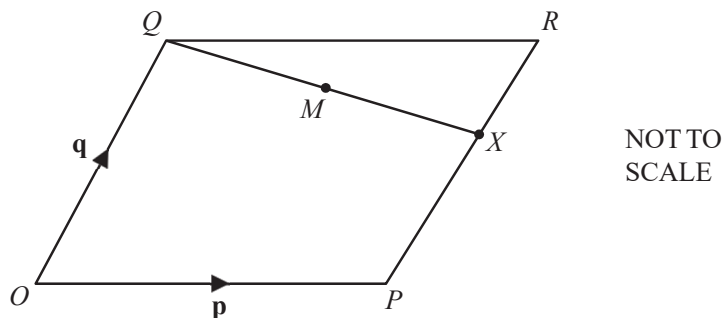
O is the origin and *OPRQ* is a parallelogram.
The position vectors of *P* and *Q* are p and q.
X is on *PR* so that *PX* = 2*XR*.

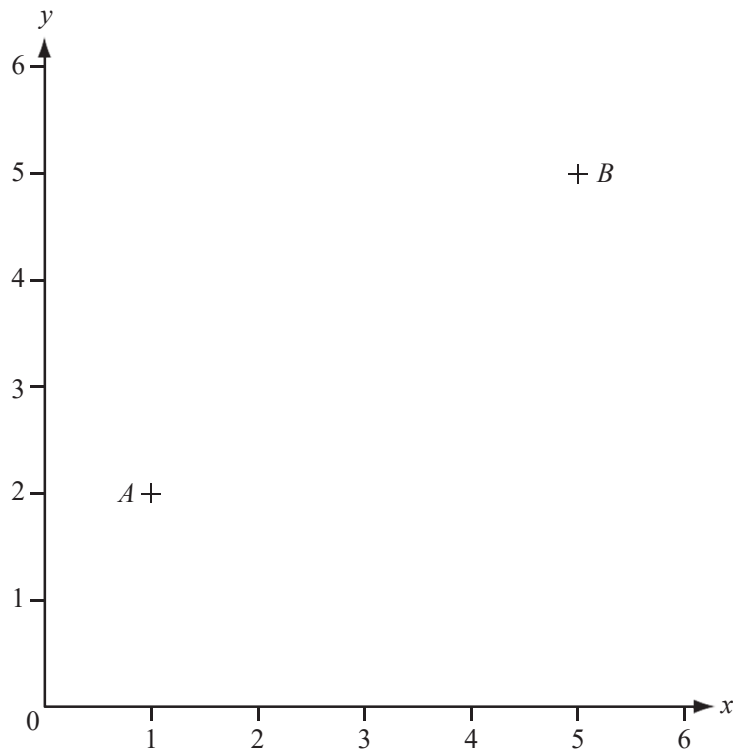Find, in terms of p and q, in their simplest forms

(a) $\overrightarrow{QX}$

[2]

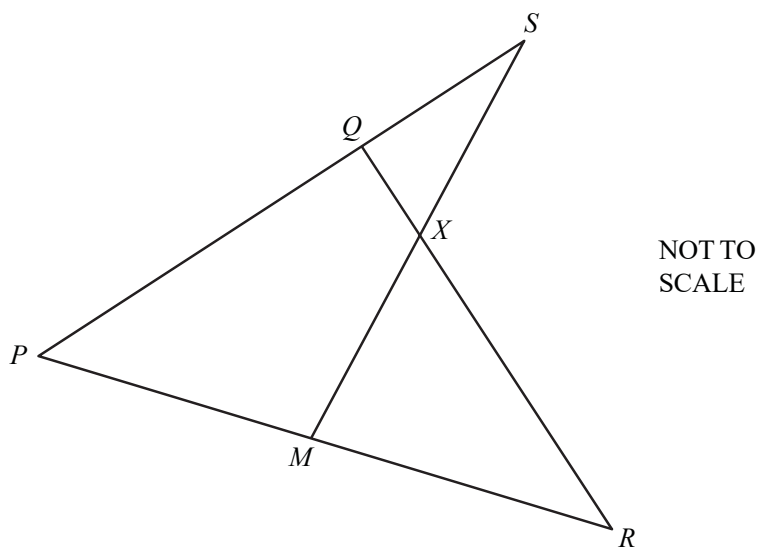(b) the position vector of *M*, the midpoint of *QX*.

[2]

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

(a) Work out the co-ordinates of the midpoint of AB. [1]

(b) Write down the column vector $\overrightarrow{AB}$. [1]

NOT TO
SCALE

In the diagram, *PQS*, *PMR*, *MXS* and *QXR* are straight lines.

PQ = 2 *QS*.
M is the midpoint of *PR*.
QX : *XR* = 1 : 3.

$\overrightarrow{PQ}$ = q and $\overrightarrow{PR}$ = r.

(a) Find, in terms of q and r,

(i) $\overrightarrow{RQ}$,   [1]

(ii) $\overrightarrow{MS}$.   [1]

(b) By finding $\overrightarrow{MX}$, show that *X* is the midpoint of *MS*.   [3]
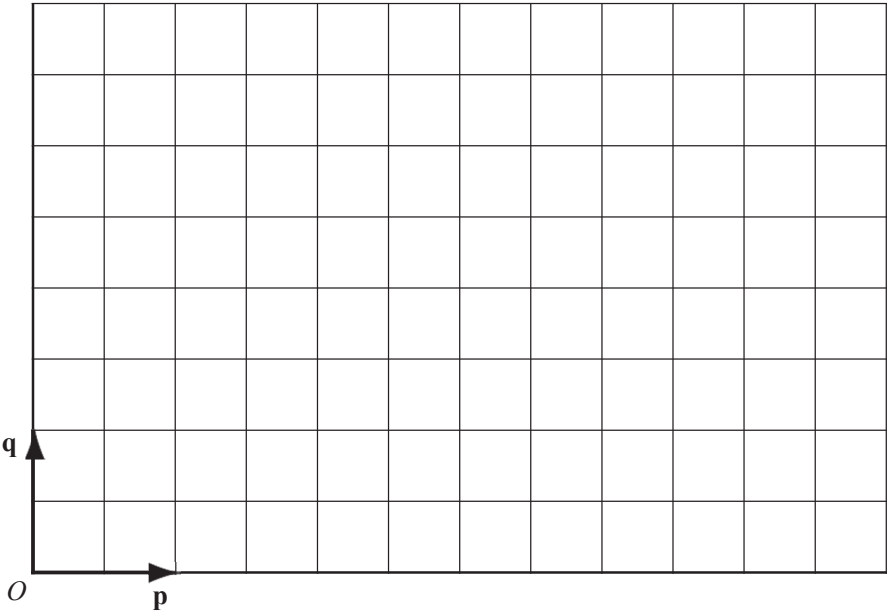
The position vector r is given by $\mathbf{r} = 2\mathbf{p} + t(\mathbf{p} + \mathbf{q})$.

(a) Complete the table below for the given values of t.
Write each vector in its simplest form.
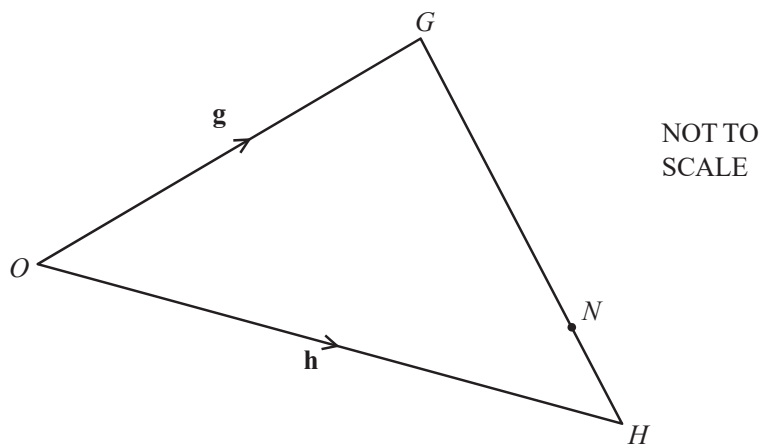One result has been done for you.   [3]

t	0	1	2	3
r			$4\mathbf{p} + 2\mathbf{q}$	

(b) O is the origin and **p** and **q** are shown on the diagram.

(i) Plot the 4 points given by the position vectors in the table.   [2]

(ii) What can you say about these four points?   [1]

In triangle *OGH*, the ratio *GN* : *NH* = 3 : 1.

$\overrightarrow{OG} = \mathbf{g}$ and $\overrightarrow{OH} = \mathbf{h}$.

Find the following in terms of **g** and **h**, giving your answers in their simplest form.
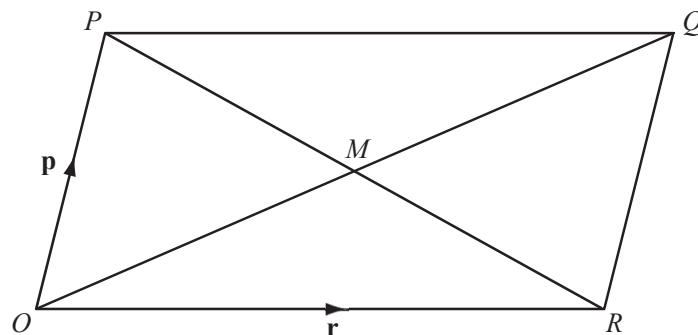
(a) $\overrightarrow{HG}$

[1]

(b) $\overrightarrow{ON}$

[2]

O is the origin and *OPQR* is a parallelogram whose diagonals intersect at *M*.

The vector $\overrightarrow{OP}$ is represented by p and the vector $\overrightarrow{OR}$ is represented by r.

(a) Write down a single vector which is represented by

    (i) **p** + **r**,   [1]

    (ii) $\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{r}$.   [1]

(b) On the diagram, mark with a cross (✗) and label with the letter *S* the point with position vector

                                                                                                [2]

    $\frac{1}{2}\mathbf{p} + \frac{3}{4}\mathbf{r}$.

Vectors
Difficulty: Easy

Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Easy
Booklet	Question Paper 3

Time allowed: **37 minutes**

Score: **/29**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
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The diagram is made from three identical parallelograms.

O is the origin. $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OG} = \mathbf{g}$.

Write down in terms of $\mathbf{a}$ and $\mathbf{g}$

(a) $\overrightarrow{GB}$, [1]
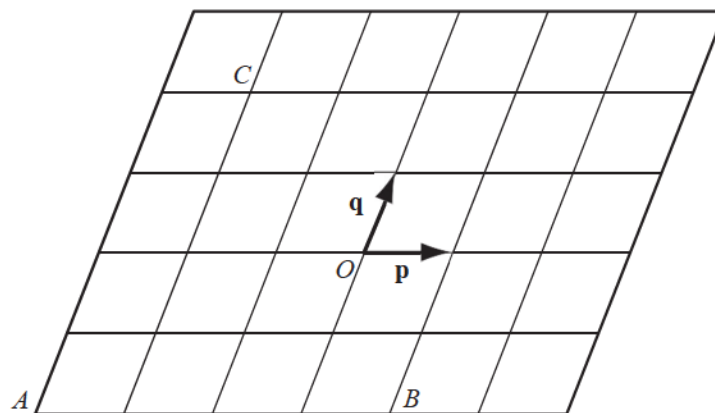
(b) the position vector of the centre of the parallelogram $BCDE$. [1]

O is the origin. Vectors p and q are shown in the diagram.

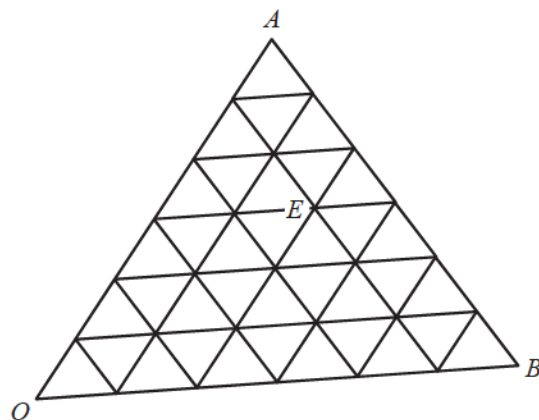(a)   Write down, in terms of p and q, in their simplest form

    (i)   the position vector of the point A,   [1]

    (ii) $\overrightarrow{BC}$,   [1]

    (iii) $\overrightarrow{BC} - \overrightarrow{AC}$.   [2]

(b) If $|\,p\,| = 2$, write down the value of $|\,AB\,|$.   [1]

O is the origin, $\overrightarrow{OA} = $ **a** and $\overrightarrow{OB} = $ **b**.

(a) C has position vector $\dfrac{1}{3}$ **a** $+ \dfrac{2}{3}$ **b**.

   Mark the point C on the diagram. [1]

(b) Write down, in terms of **a** and **b**, the position vector of the point E. [1]

(c) Find, in terms of **a** and **b**, the vector $\overrightarrow{EB}$. [2]
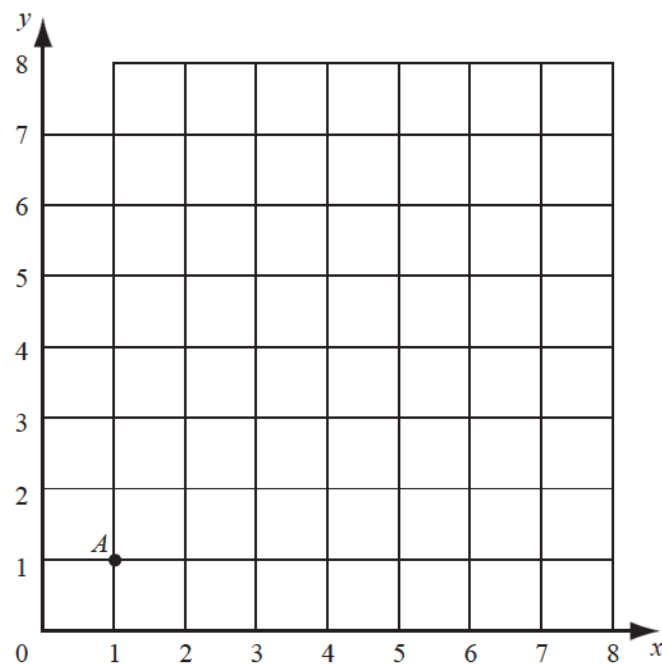
(a) Using a scale of 1cm to represent 1 unit, draw the vectors

$$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 5 \end{pmatrix} \text{ and } \overrightarrow{BC} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \text{ on the grid above.}$$ [2]
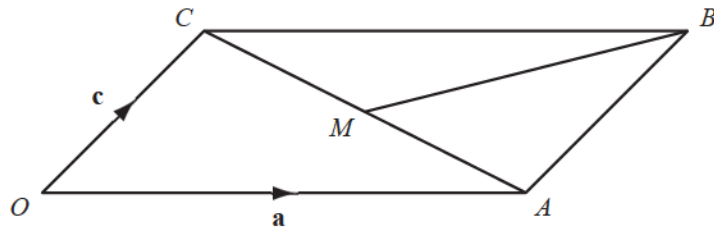
(b) *ABCD* is a parallelogram.
Write down the coordinates of *D*.   [2]

(c) Calculate $|\overrightarrow{AB}|$.   [2]

$OABC$ is a parallelogram. $\overrightarrow{OA}$ = a, $\overrightarrow{OC}$ = c and M is the mid-point of CA.
Find in terms of a and c

(a) $\overrightarrow{OB}$,

[1]
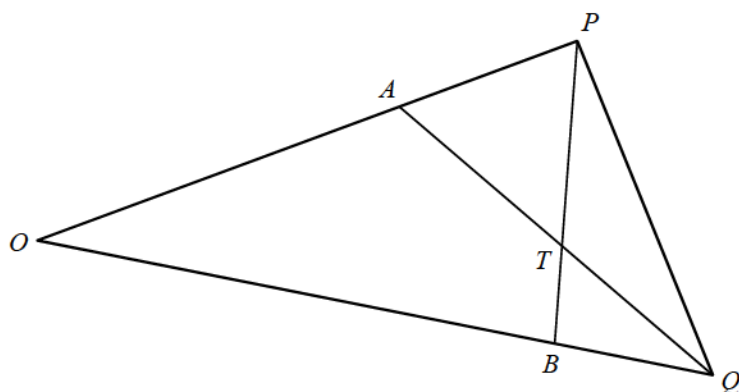
(b) $\overrightarrow{CA}$,

[1]

(c) $\overrightarrow{BM}$.

[2]

NOT TO
SCALE

In the diagram $OA = \frac{2}{3}OP$ and $OB = \frac{3}{4}OQ$.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

[2]

(a) Find in terms of **p** and **q**

   (i) $\overrightarrow{AQ}$,

   (ii) $\overrightarrow{BP}$.

[2]

(b) AQ and BP intersect at T.
$BT = \frac{1}{3}BP$.
Find $\overrightarrow{QT}$ in terms of **p** and **q**, in its simplest form.

[2]

7

$\mathbf{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$ Find $3\mathbf{a} - 2\mathbf{b}$.   [2]

Vectors
Difficulty: Hard

Question Paper 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Hard
Booklet	Question Paper 1

Time allowed: **28 minutes**

Score: **/22**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

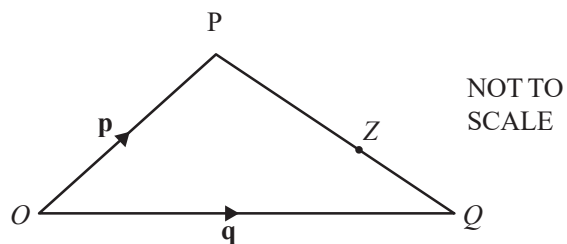| 9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%
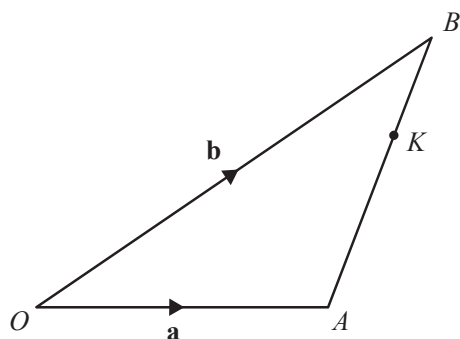
NOT TO
SCALE

O is the origin and *K* is the point on *AB* so that *AK* : *KB* = 2 : 1.
$\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b**.

Find the position vector of *K*.
Give your answer in terms of **a** and **b** in its simplest form. [3]

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
Z is a point on *PQ* such that $PZ : ZQ = 5 : 2$.

Work out, in terms of **p** and **q**, the position vector of *Z*.
Give your answer in its simplest form.   [3]
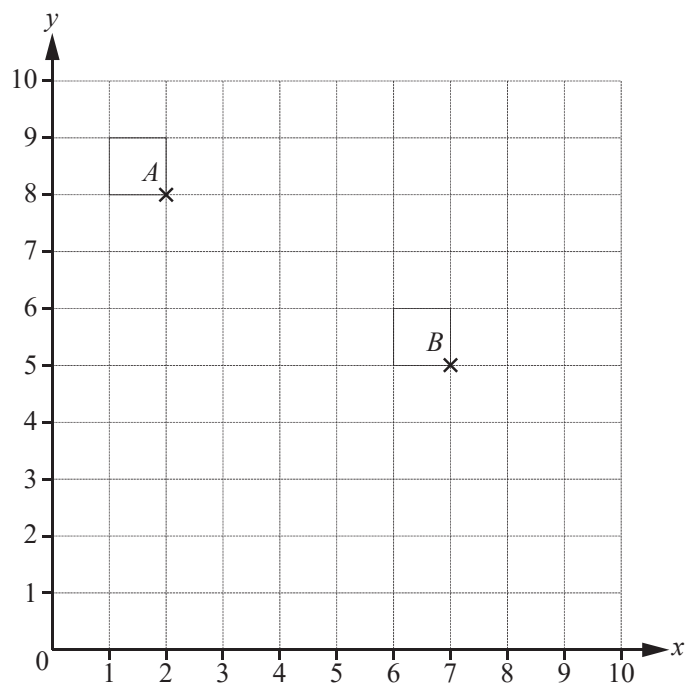
Points A and B are marked on the grid.

$$\overrightarrow{BC} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}$$

(a) On the grid, plot the point C. [1]

(b) Write $\overrightarrow{AC}$ as a column vector. [1]

(c) $\overrightarrow{DE}$ is a vector that is perpendicular to $\overrightarrow{BC}$.
    The magnitude of $\overrightarrow{DE}$ is equal to the magnitude of $\overrightarrow{BC}$. [2]

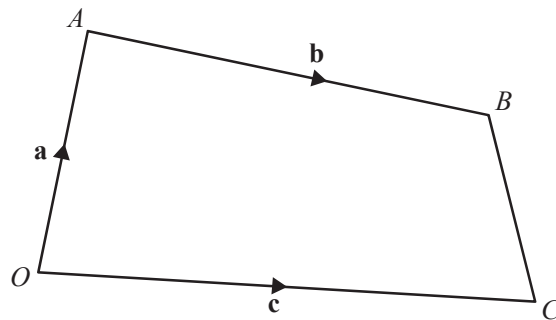   Write down a possible column vector for $\overrightarrow{DE}$.

4

Work out

$$2\begin{pmatrix} 3 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

[1]

In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{AB} = \mathbf{b}$.
P is on the line AB so that $AP : PB = 2 : 1$.
Q is the midpoint of BC.

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

(a) $\overrightarrow{CB}$,

[1]

(b)   the position vector of Q,
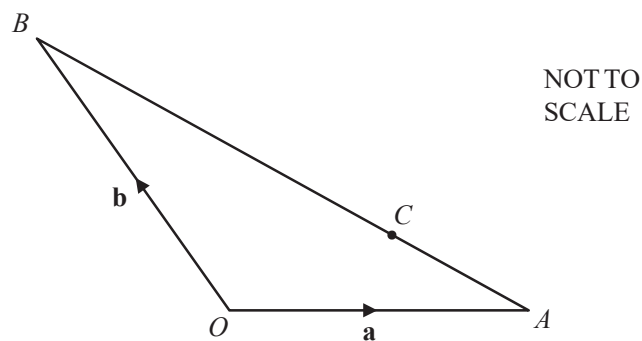
[2]

(c) $\overrightarrow{PQ}$.

[2]

$$\overrightarrow{AB} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$$

Find $\left|\overrightarrow{AB}\right|$.   [2]

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) $\overrightarrow{AC}$, [2]

(b) the position vector of C. [2]

8

Vectors
Difficulty: Hard

Question Paper 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Hard
Booklet	Question Paper 2

Time allowed: **34 minutes**

Score: **/26**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%
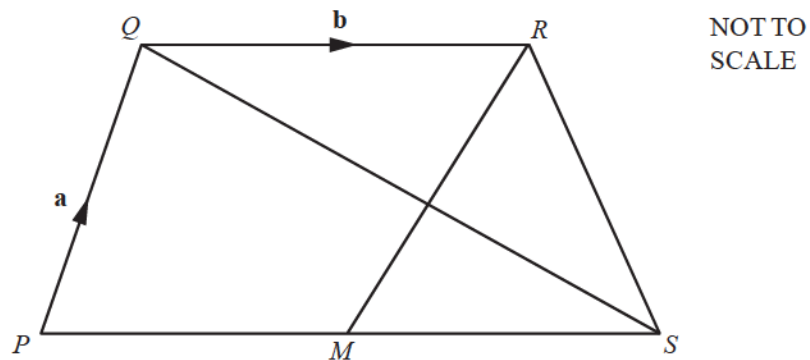
PQRS is a quadrilateral and *M* is the midpoint of *PS*.

$\overrightarrow{PQ} = \mathbf{a}$, $\overrightarrow{QR} = \mathbf{b}$ and $\overrightarrow{SQ} = \mathbf{a} - 2\mathbf{b}$.

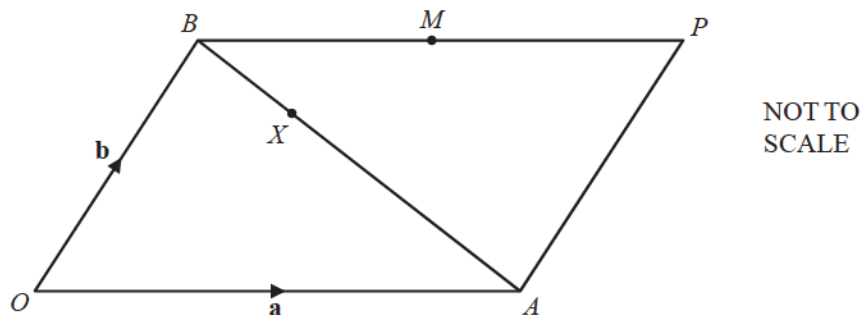**(a)** Show that $\overrightarrow{PS} = 2\mathbf{b}$.   [1]

(b) Write down the mathematical name for the quadrilateral *PQRM*, giving reasons for your answer.   [2]

NOT TO
SCALE

OAPB is a parallelogram.
O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
M is the midpoint of *BP*.

(a) Find, in terms of **a** and **b**, giving your answer in its simplest form,

   (i) $\overrightarrow{BA}$,   [1]

   (ii) the position vector of $\overrightarrow{M}$.   [1]

(b) *X* is on *BA* so that *BX* : *XA* = 1 : 2.   [4]

   Show that *X* lies on *OM*.

3

(a)

NOT TO
SCALE
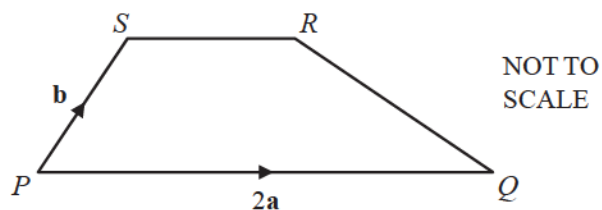
$PQRS$ is a trapezium with $PQ = 2SR$.
$\overrightarrow{PQ} = 2\mathbf{a}$ and $\overrightarrow{PS} = \mathbf{b}$.

Find $\overrightarrow{QR}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ in its simplest form.

[2]

(b)

NOT TO
SCALE
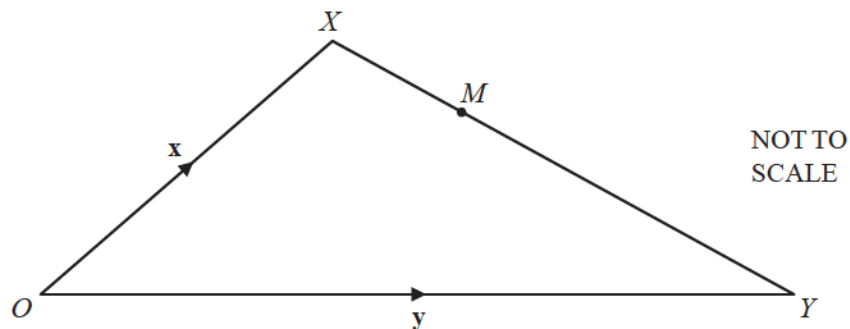
$\overrightarrow{OX} = \mathbf{x}$ and $\overrightarrow{OY} = \mathbf{y}$.
M is a point on XY such that $XM : MY = 3 : 5$.

Find $\overrightarrow{OM}$ in terms of $\mathbf{x}$ and $\mathbf{y}$ in its simplest form.

[2]
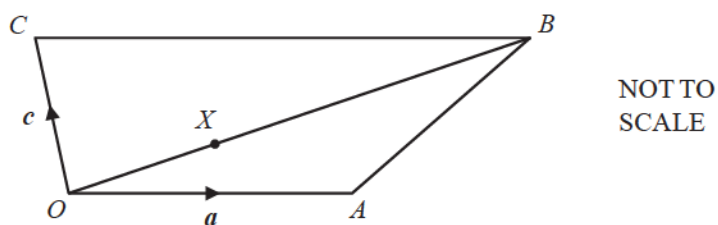
The diagram shows a quadrilateral $OABC$.
$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 2\mathbf{a}$.
X is a point on OB such that $OX:XB = 1:2$.

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

   (i) $\overrightarrow{AC}$, [1]

   (ii) $\overrightarrow{AX}$. [3]

(b) Explain why the vectors $\overrightarrow{AC}$ and $\overrightarrow{AX}$ show that C, X and A lie on a straight line. [2]
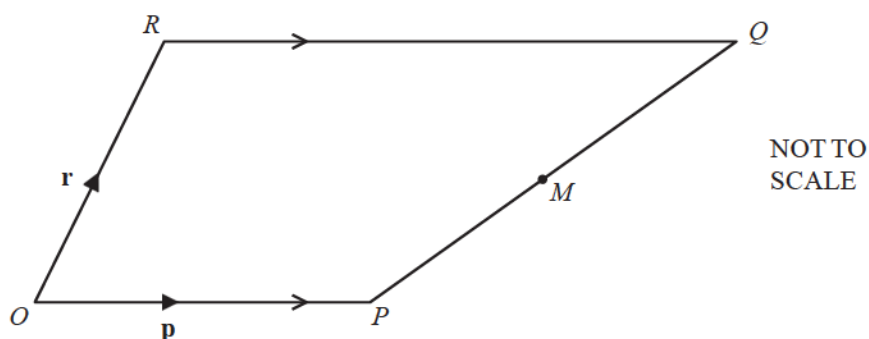
NOT TO
SCALE
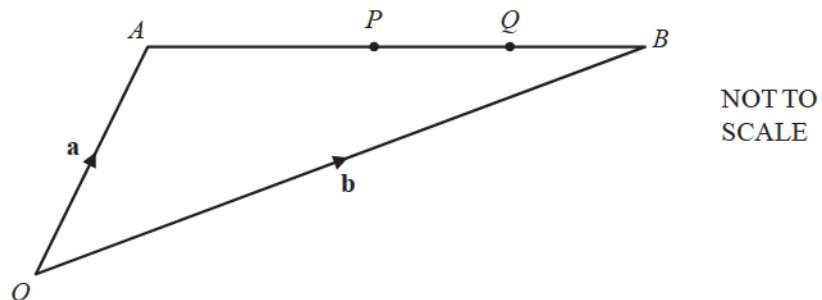
The diagram shows two points, P and Q, on a straight line AB.
P is the midpoint of AB and Q is the midpoint of PB.
O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

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

(a) $\overrightarrow{AP}$,   [2]

(b) the position vector of Q.   [2]

OPQR is a trapezium with *RQ* parallel to *OP* and *RQ* = 2*OP*.
O is the origin, $\overrightarrow{OP}$ = **p** and $\overrightarrow{OR}$ = **r**.
M is the midpoint of *PQ*.

Find, in terms of **p** and **r**, in its simplest form

(a) $\overrightarrow{PQ}$,   [1]

(b) $\overrightarrow{OM}$, the position vector of *M*.   [2]

Vectors
Difficulty: Hard

Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Hard
Booklet	Question Paper 3

Time allowed: **39 minutes**

Score: **/30**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
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O is the origin.
ABCDEF is a regular hexagon and *O* is the midpoint of *AD*.

$\overrightarrow{OA}$ = **a** and $\overrightarrow{OC}$ = **c**.

Find, in terms of **a** and **c**, in their simplest form

(a) $\overrightarrow{BE}$,   [2]

(b) $\overrightarrow{DB}$,   [2]

(c) the position vector of *E*.   [2]
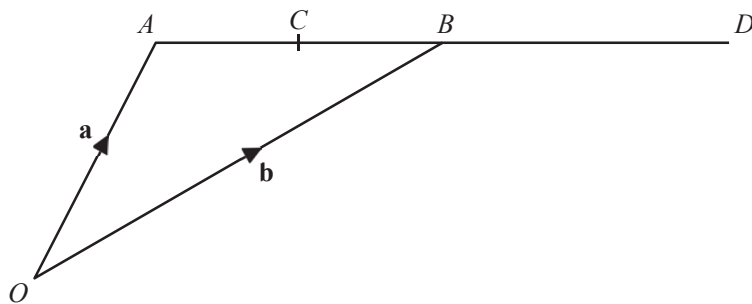
A and *B* have position vectors **a** and **b** relative to the origin *O*.
C is the midpoint of *AB* and *B* is the midpoint of *AD*.

Find, in terms of **a** and **b**, in their simplest form

(a) the position vector of *C*,   [2]

(b)   the vector $\overrightarrow{CD}$.   [2]

3
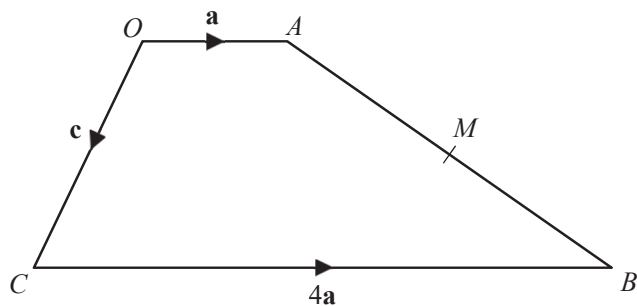
O is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 4\mathbf{a}$.
M is the midpoint of AB.

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

  (i)   the vector $\overrightarrow{AB}$,   [2]

  (ii) the position vector of M.   [2]

(b) Mark the point D on the diagram where $\overrightarrow{OD} = 3\mathbf{a} + \mathbf{c}$.   [2]
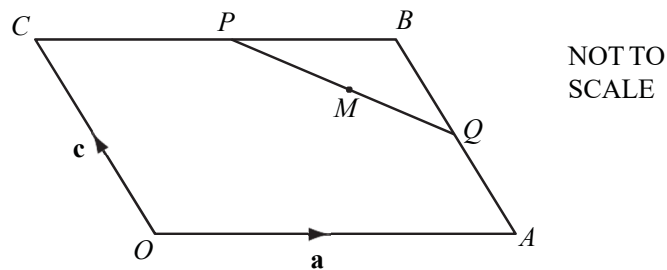
O is the origin and *OABC* is a parallelogram.
CP = *PB* and *AQ* = *QB*.

$\overrightarrow{OA}$ = a and $\overrightarrow{OC}$ = c .
Find in terms of a and c, in their simplest form,

(a) $\overrightarrow{PQ}$,   [2]

(b) the position vector of *M*, where *M* is the midpoint of *PQ*.   [2]

$\overrightarrow{AB} = \mathbf{a} + t\mathbf{b}$ and $\overrightarrow{CD} = \mathbf{a} + (3t - 5)\mathbf{b}$ where t is a number.

Find the value of t when $\overrightarrow{AB} = \overrightarrow{CD}$.

[2]
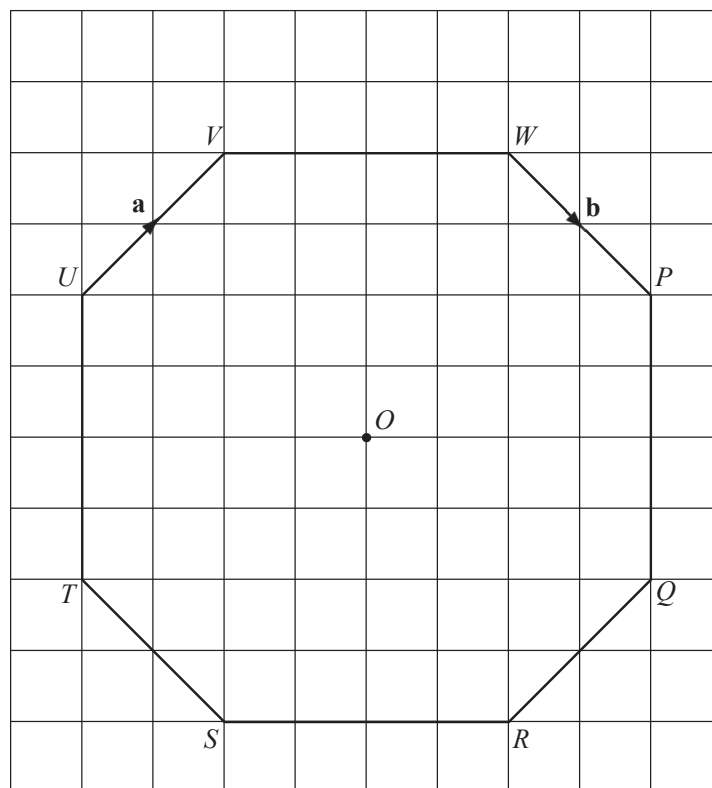
The origin O is the centre of the octagon $PQRSTUVW$.
$\overrightarrow{UV} = \mathbf{a}$ and $\overrightarrow{WP} = \mathbf{b}$.

(a) Write down in terms of $\mathbf{a}$ and $\mathbf{b}$

    (i) $\overrightarrow{VW}$,   [1]

    (ii) $\overrightarrow{TU}$,   [1]

    (iii) $\overrightarrow{TP}$,   [2]

    (iv) the position vector of the point P.   [1]

(b) In the diagram, 1 centimetre represents 1 unit.
    Write down the value of $\left|\mathbf{a} - \mathbf{b}\right|$.   [1]
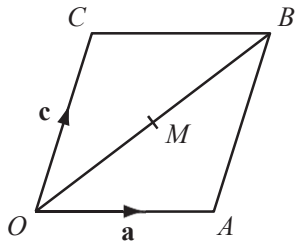
$OABC$ is a parallelogram. $\overrightarrow{OA}$ = a and $\overrightarrow{OC}$ = c.
M is the mid-point of OB.
Find $\overrightarrow{MA}$ in terms of a and c.

[2]

Transformations Difficulty: Easy

Question Paper 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Transformations
Paper	Paper 2
Difficulty	Easy
Booklet	Question Paper 1

Time allowed: **30 minutes**

Score: **/23**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%
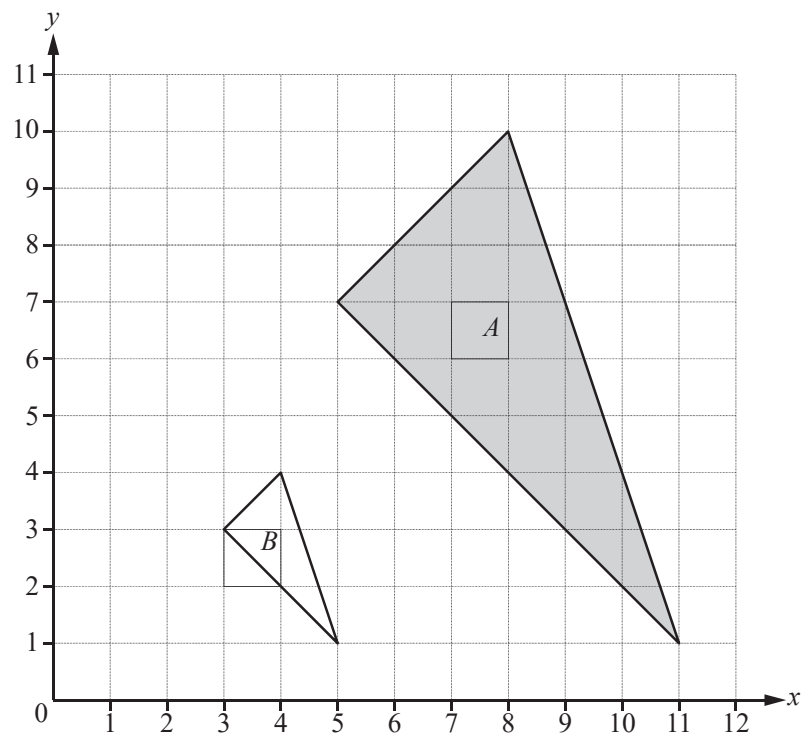
Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.   [3]
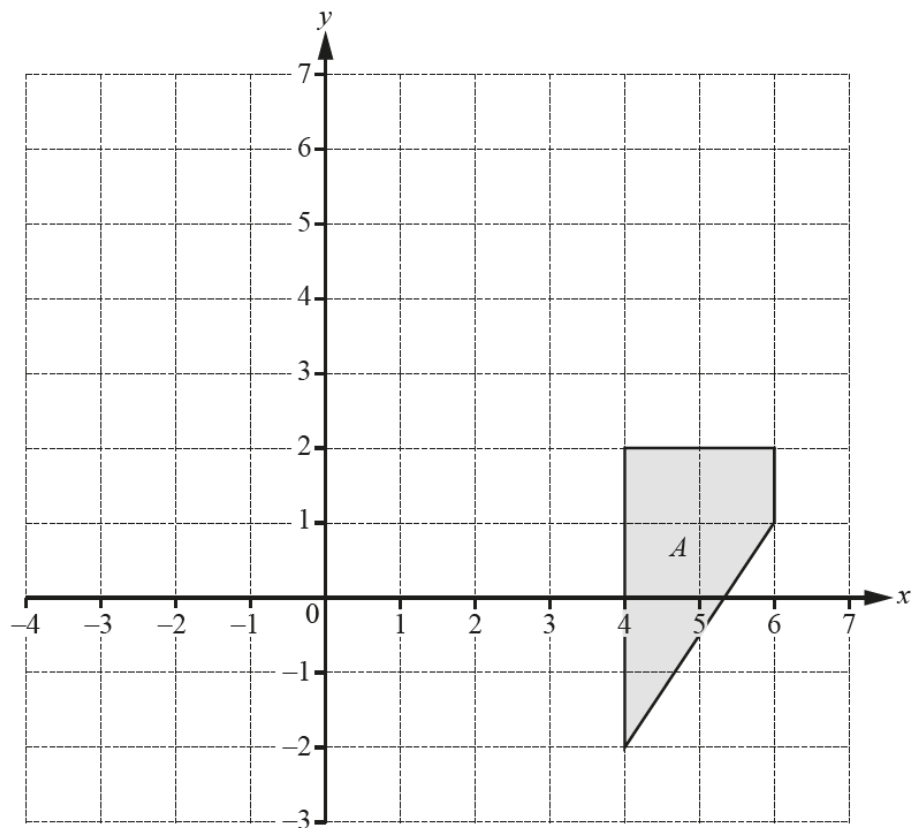
T(X) is the image of the shape X after translation by the vector $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

M(Y) is the image of the shape Y after reflection in the line $x = 2$.

On the grid, draw MT(A), the image of shape A after the transformation MT.   [3]
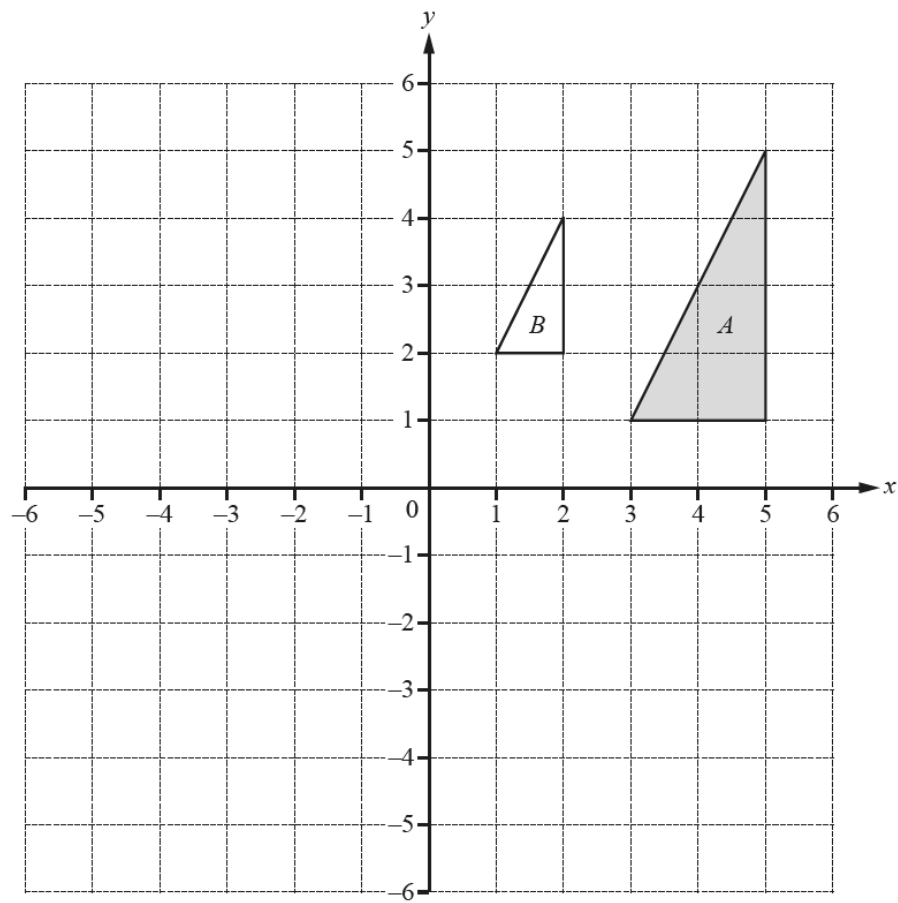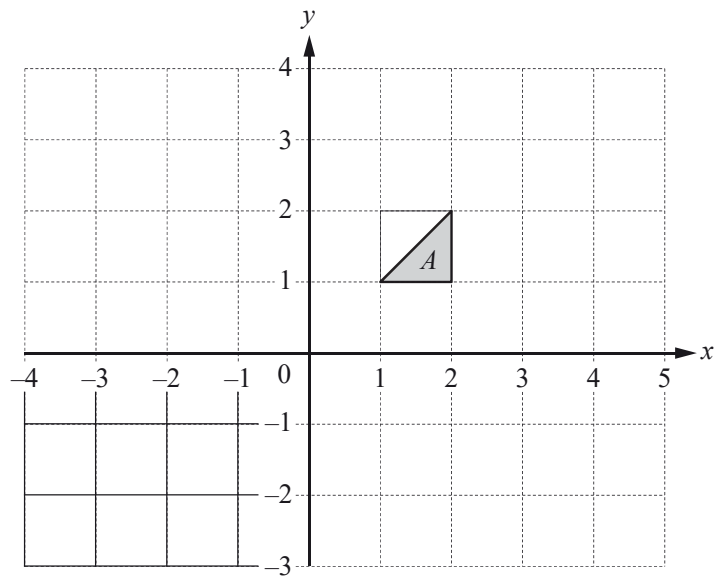
(a) Describe fully the **single** transformation that maps triangle A onto triangle B. [3]

Draw the image of shape A after a translation by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

[2]
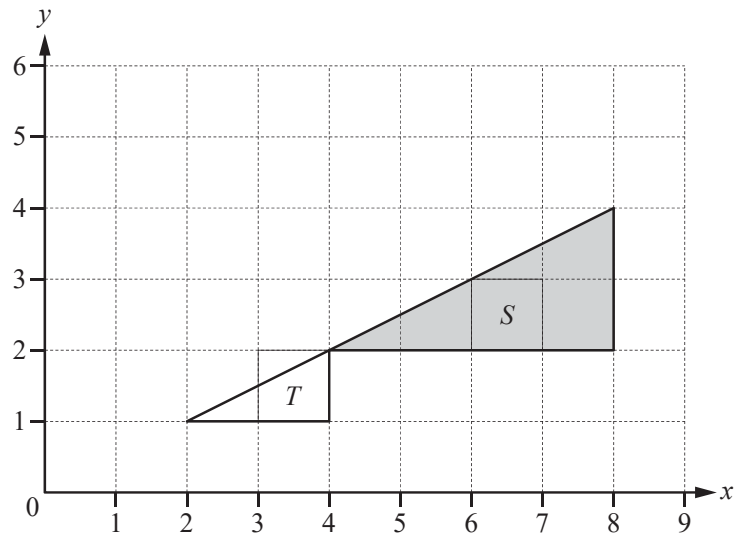
(a) Describe fully the **single** transformation that maps triangle S onto triangle T.   [3]

(b) Find the matrix which represents the transformation that maps triangle S onto triangle T.   [2]

Find the 2 × 2 matrix that represents a rotation through 90° clockwise about (0, 0).   [2]

(p, q) is the image of the point (x, y) under this combined transformation.

$$\begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Draw the image of the triangle under the combined transformation. [3]
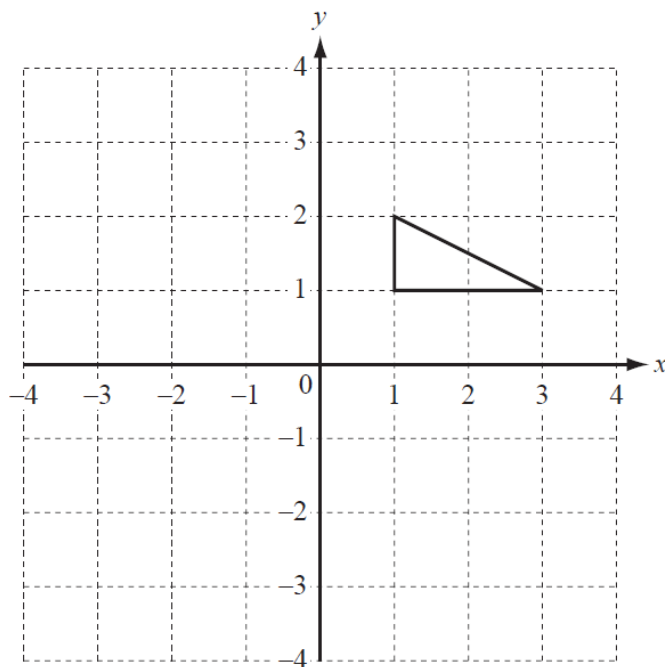
(b) Describe fully the **single** transformation represented by $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$. [2]

Transformations Difficulty: Easy

Question Paper 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Transformations
Paper	Paper 2
Difficulty	Easy
Booklet	Question Paper 2

Time allowed: 39 minutes

Score: /30

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

The triangle *PQR* has co-ordinates *P*(-1, 1), *Q*(1, 1) and *R*(1, 2).

(a) Rotate triangle *PQR* by 90° clockwise about (0, 0).
 Label your image *P'Q'R'*. [2]

(b) Reflect your triangle *P'Q'R'* in the line $y = -x$.
 Label your image *P"Q"R"*. [2]

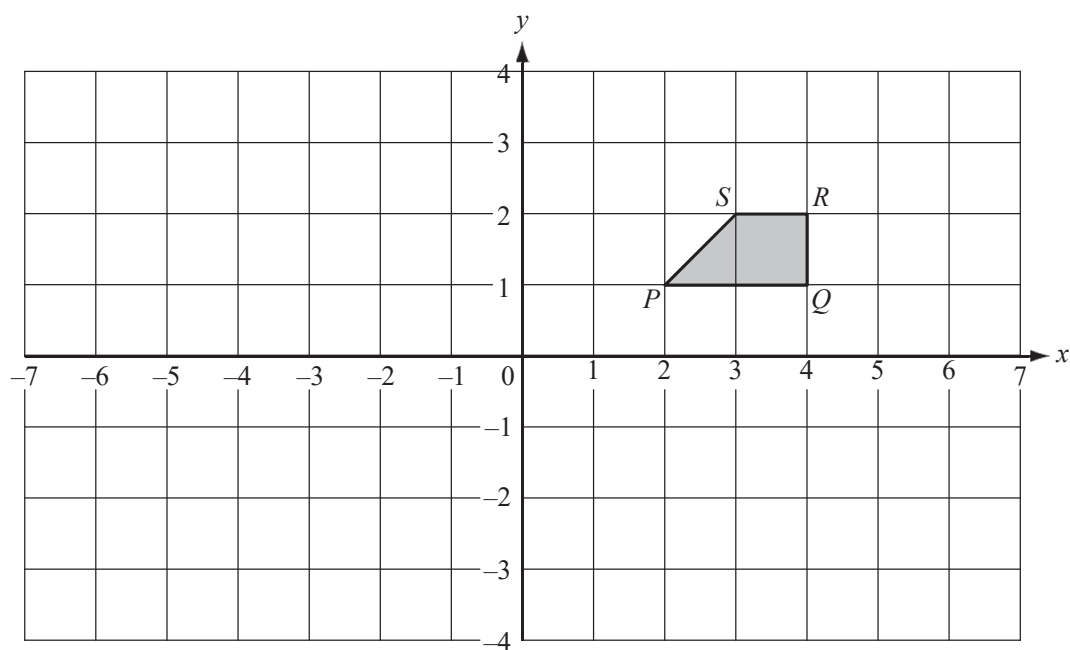(c) Describe fully the single transformation which maps triangle *PQR* onto triangle *P"Q"R"*. [2]
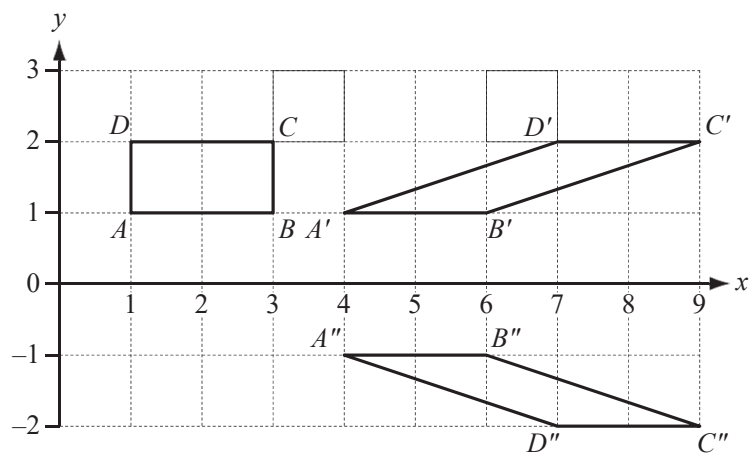
(a) Describe the single transformation which maps $ABCD$ onto $A'\,B'\,C'\,D'$. [3]

(b) A single transformation maps $A'\,B'\,C'\,D'$ onto $A''\,B''\,C''\,D''$. [2]
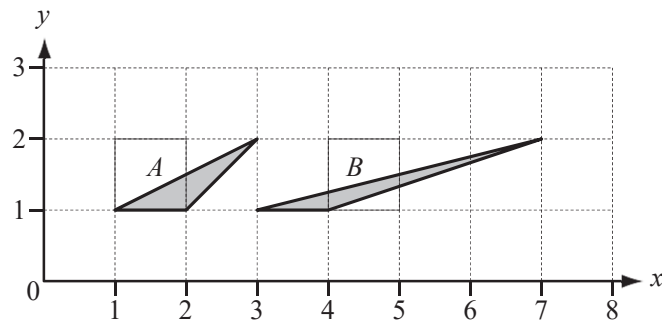   Find the matrix which represents this transformation.

$$A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \qquad B = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

On the grid on the next page, draw the image of *PQRS* after the transformation represented by **BA**.
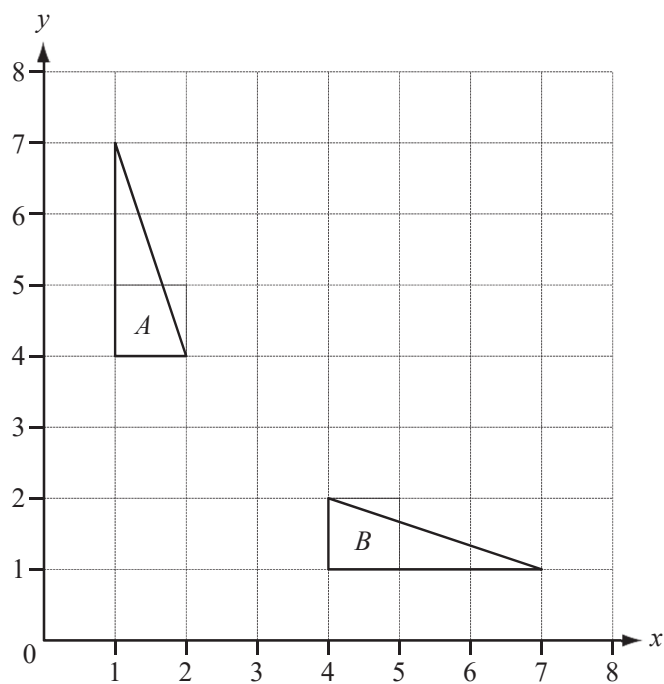

[5]

(a) Describe fully the single transformation that maps triangle *A* onto triangle *B*.

[3]

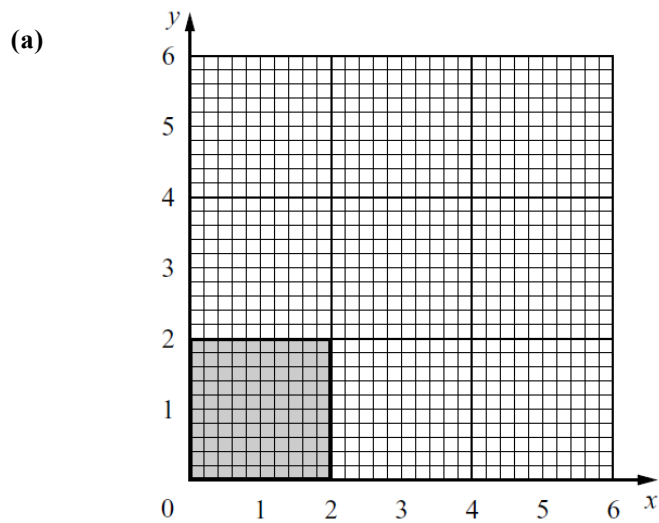(b) Find the 2 × 2 matrix which represents this transformation.

[2]

(a) Describe fully the **single** transformation which maps triangle *A* onto triangle *B*.

[2]

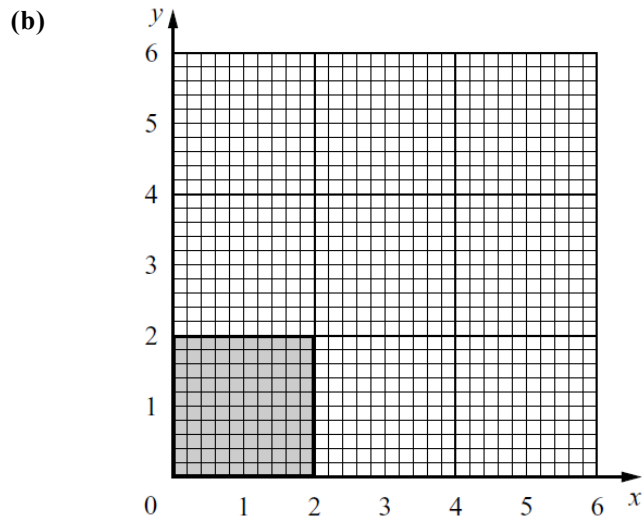(b) On the grid, draw the image of triangle *A* after rotation by 90° clockwise about the point (4, 4).

[2]

(a)

Draw the shear of the shaded square with the *x*-axis invariant and the point (0, 2) mapping onto the point (3, 2).

[2]

(b)

(i) Draw the one-way stretch of the shaded square with the *x*-axis invariant and the point (0, 2) mapping onto the point (0, 6).

[2]

(ii) Write down the matrix of this stretch. [1]

Transformations Difficulty: Hard

Question Paper 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Transformations
Paper	Paper 2
Difficulty	Hard
Booklet	Question Paper 1

Time allowed: **31 minutes**

Score: **/24**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

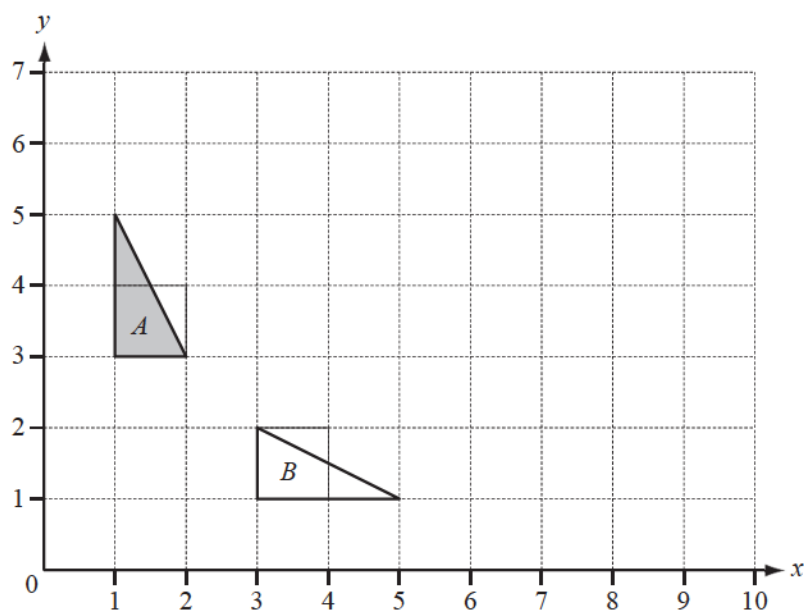| 9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

(a) $\quad N = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Describe fully the **single** transformation represented by **N**.　　　　[3]

(b) Find the matrix which represents the **single** transformation that maps triangle A onto triangle B.
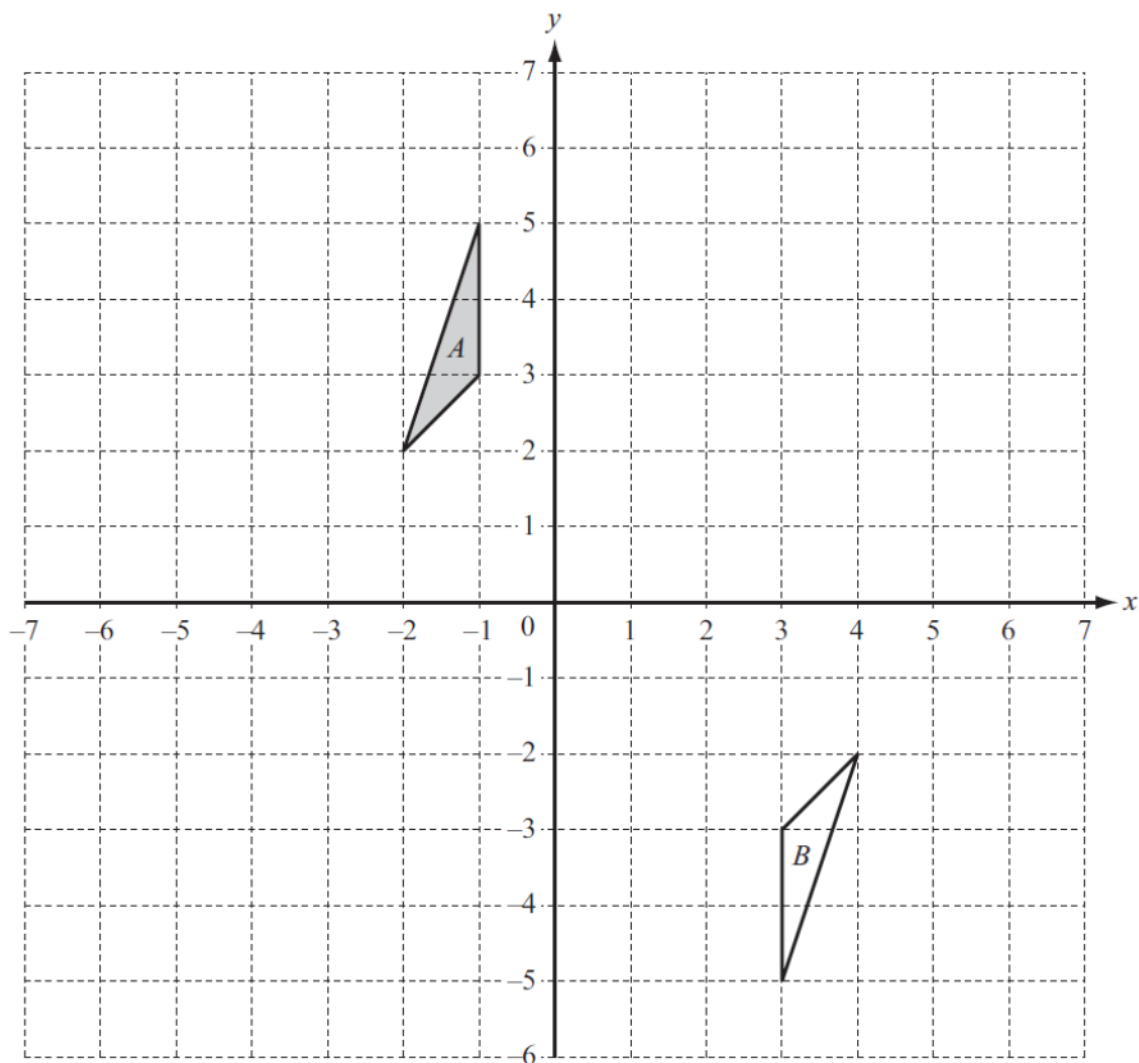
[2]

(c) On the grid, draw the image of triangle A under a stretch, factor 3, with the y-axis invariant.　　　　[2]

(a) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation which maps triangle A onto triangle B. [3]

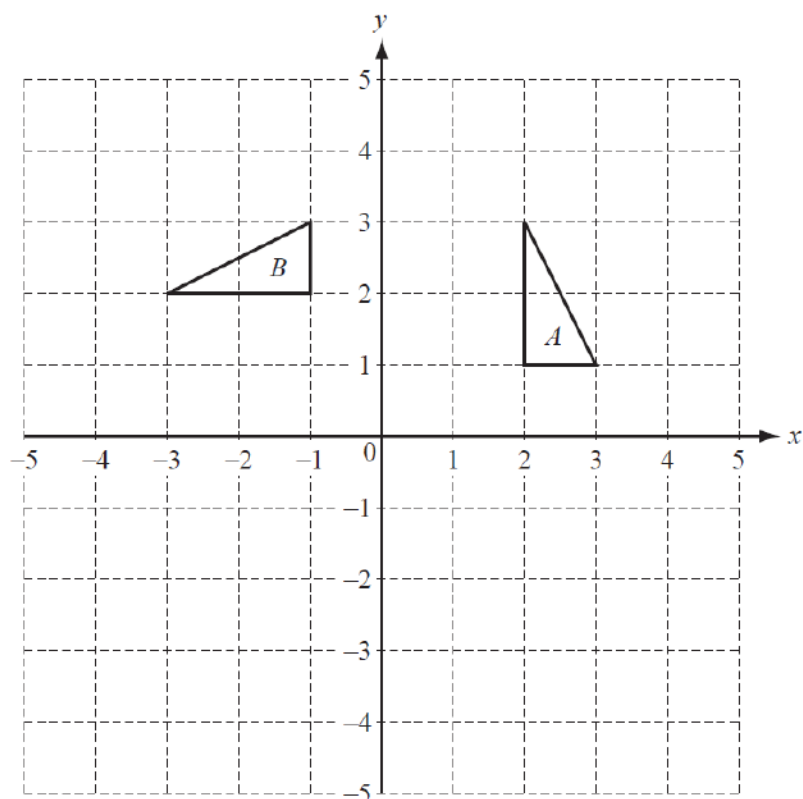**(c)** Draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$. [3]

3

Find the matrix which represents the combined transformation of a reflection in the x axis **followed** by a reflection in the line $y = x$.

[3]

(a) A transformation is represented by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

    (i) **On the grid above**, draw the image of triangle A after this transformation.   [2]

    (ii) Describe fully this transformation.   [2]

(b) Find the 2 by 2 matrix representing the transformation which maps triangle A onto triangle B.

    [2]