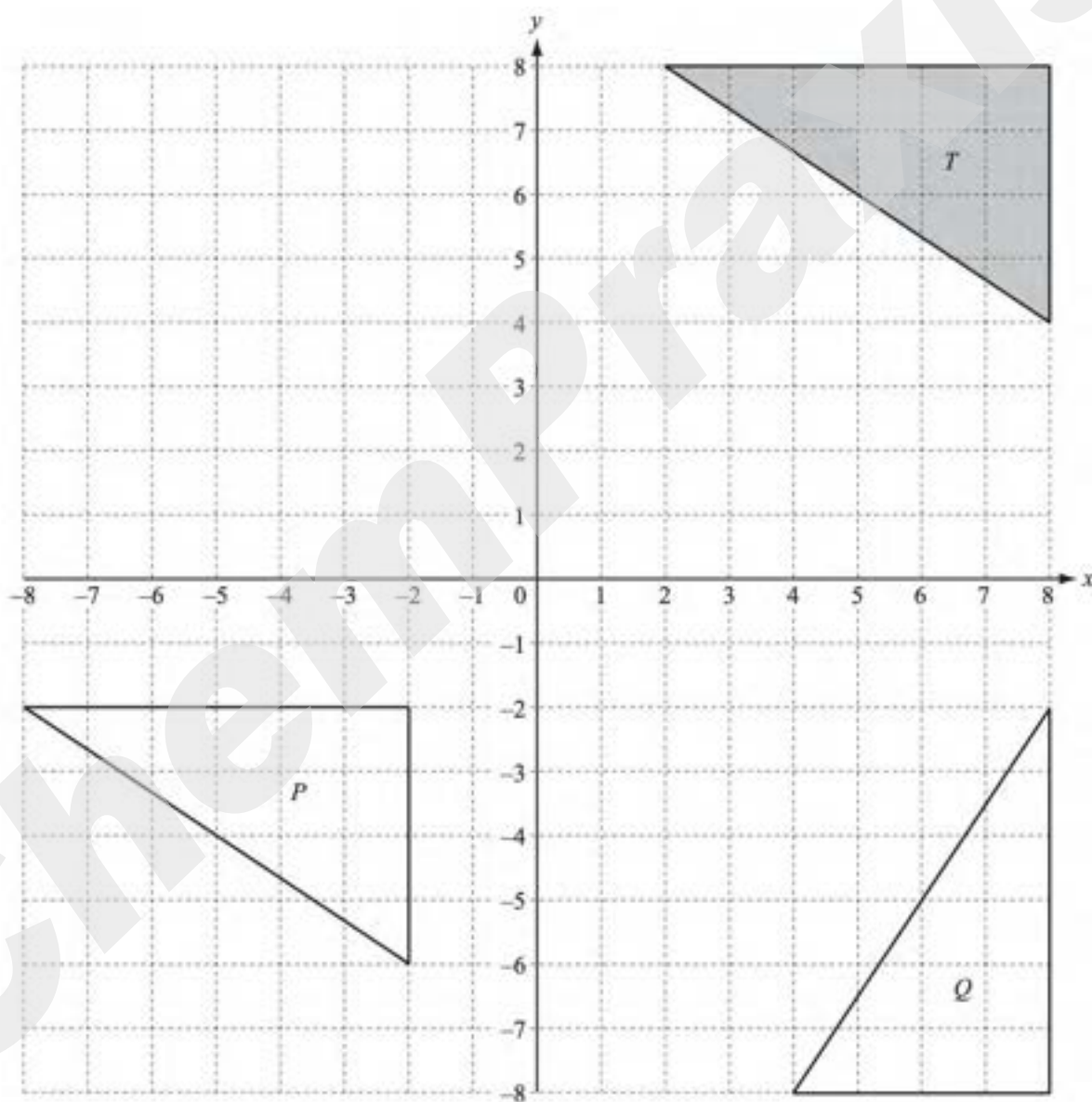


Transformations and Vectors*(Past Year Topical Questions 2010-2015)*May/June 2010 (41)

3



(a) On the grid, draw the enlargement of the triangle T , centre $(0, 0)$, scale factor $\frac{1}{2}$.

[2]

(c) Describe fully the **single** transformation which maps

(i) triangle T onto triangle P ,

Answer(c)(i) [2]

(ii) triangle T onto triangle Q .

Answer(c)(ii) [3]

May/June 2010 (42)

2 (a) $\mathbf{p} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$.

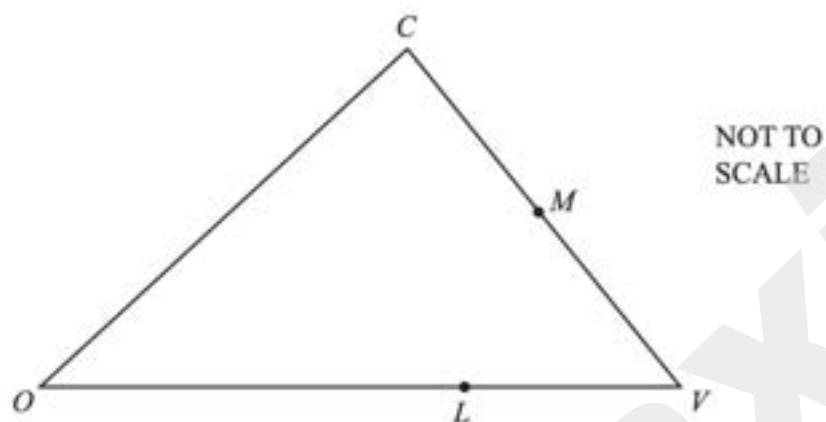
(i) Find, as a single column vector, $\mathbf{p} + 2\mathbf{q}$.

Answer(a)(i) $\begin{pmatrix} \\ \end{pmatrix}$ [2]

(ii) Calculate the value of $|\mathbf{p} + 2\mathbf{q}|$.

Answer(a)(ii) [2]

(b)



In the diagram, $CM = MV$ and $OL = 2LV$.
 O is the origin. $\vec{OC} = \mathbf{c}$ and $\vec{OV} = \mathbf{v}$.

Find, in terms of \mathbf{c} and \mathbf{v} , in their simplest forms

(i) \vec{CM} ,

Answer(b)(i) [2]

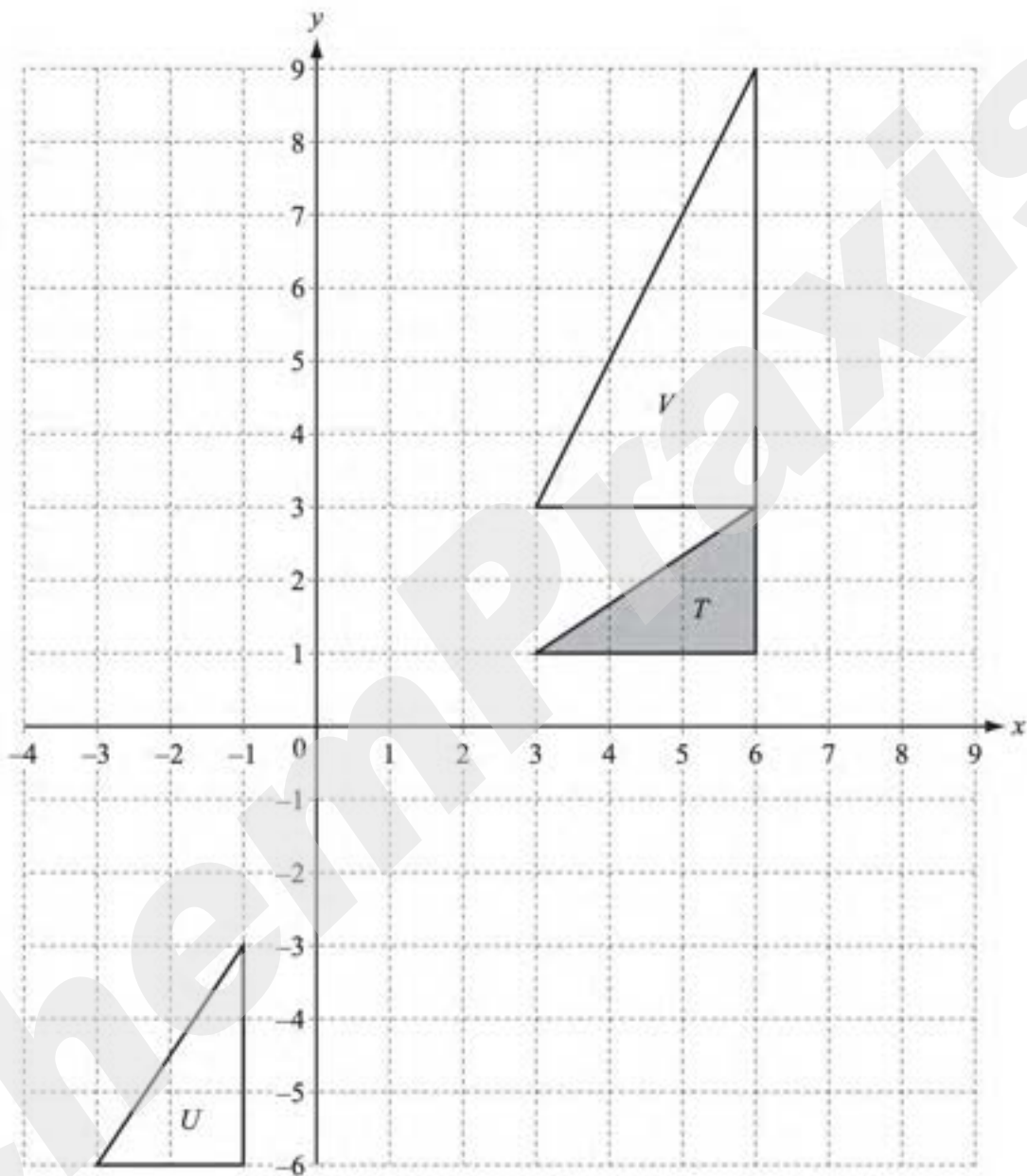
(ii) the position vector of M ,

Answer(b)(ii) [2]

(iii) \vec{ML} .

Answer(b)(iii) [2]

4



(a) On the grid, draw

(i) the translation of triangle T by the vector $\begin{pmatrix} -7 \\ 3 \end{pmatrix}$, [2]

(ii) the rotation of triangle T about $(0, 0)$, through 90° clockwise. [2]

(b) Describe fully the **single** transformation that maps

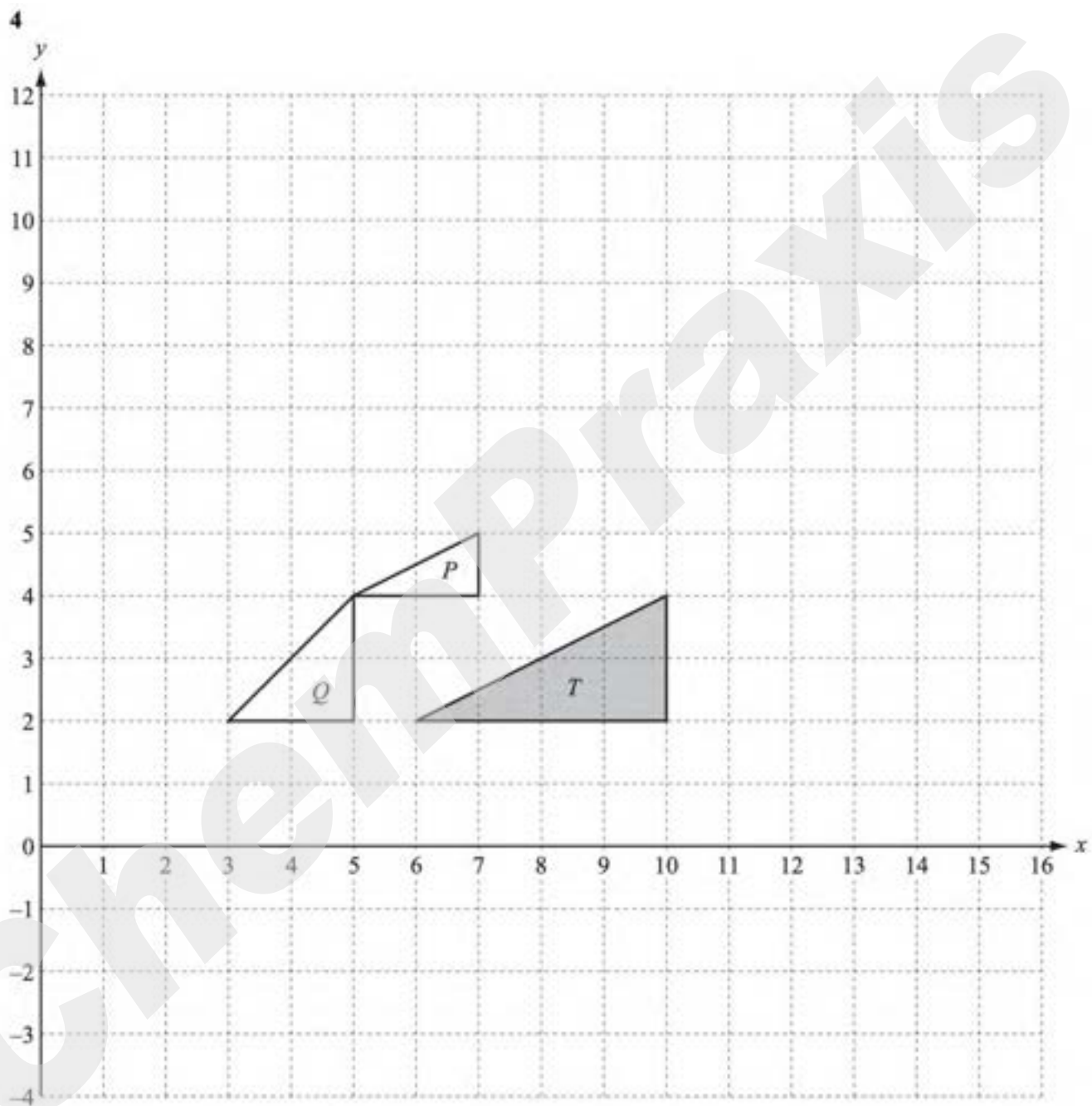
(i) triangle T onto triangle U ,

Answer(b)(i) [2]

(ii) triangle T onto triangle V .

Answer(b)(ii) [3]

May/June 2010 (43)



- (a) Draw the reflection of triangle T in the line $y = 6$.

Label the image A .

[2]

- (b) Draw the translation of triangle T by the vector $\begin{pmatrix} -4 \\ 6 \end{pmatrix}$.

Label the image B .

[2]

- (c) Describe fully the **single** transformation which maps triangle B onto triangle T .

Answer(c)

[2]

- (d) (i) Describe fully the **single** transformation which maps triangle T onto triangle P .

Answer(d)(i)

[3]

- (ii) Complete the following statement.

Area of triangle $P = \dots \times$ Area of triangle T

[1]

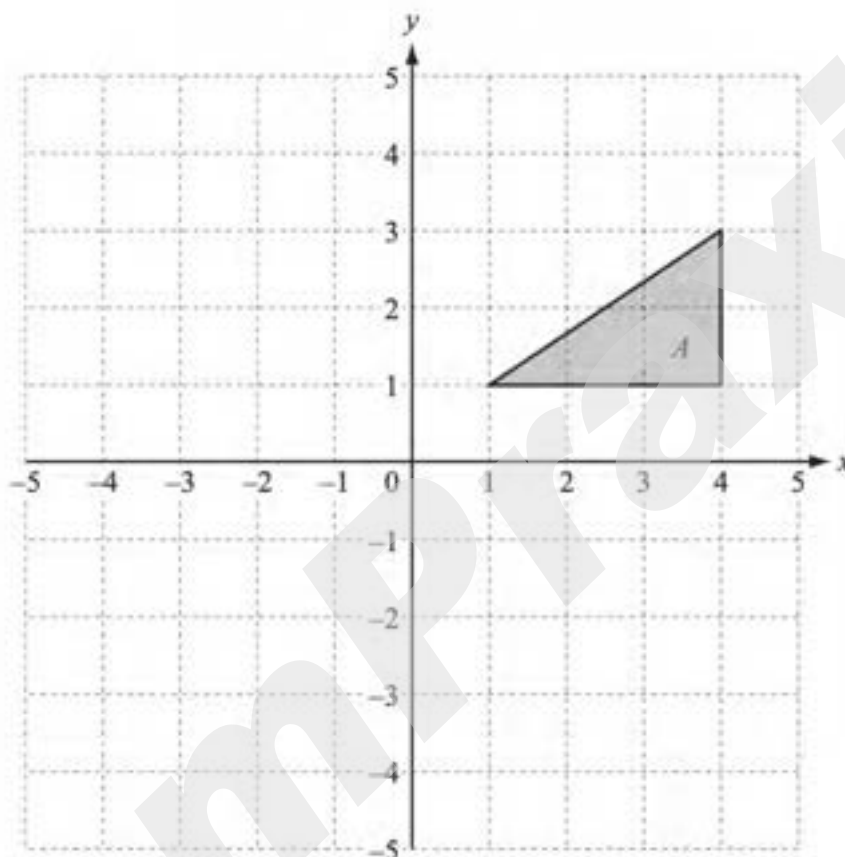
- (e) (i) Describe fully the **single** transformation which maps triangle T onto triangle Q .

Answer(e)(i)

[3]

October/November 2010 (41)

2 (a)

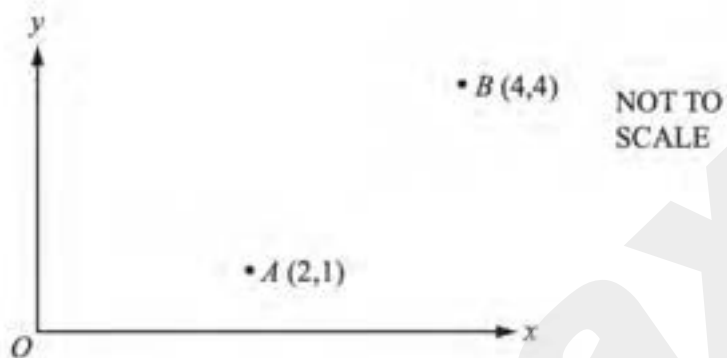


- (i) Draw the image when triangle A is reflected in the line $y = 0$.
Label the image B . [2]
- (ii) Draw the image when triangle A is rotated through 90° anticlockwise about the origin.
Label the image C . [2]
- (iii) Describe fully the **single** transformation which maps triangle B onto triangle C .

Answer(a)(iii) [2]

Question 7b and 7c

(b)


 (i) Write down \vec{AB} as a column vector.

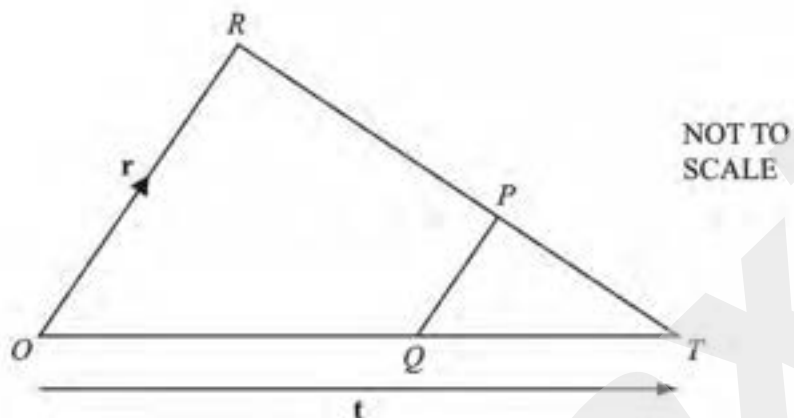
$$\text{Answer}(b)(i) \vec{AB} = \begin{pmatrix} \\ \end{pmatrix} \quad [1]$$

(ii) $\vec{AC} = \begin{pmatrix} 0 \\ 7 \end{pmatrix}$.

 Work out \vec{BC} as a column vector.

$$\text{Answer}(b)(ii) \vec{BC} = \begin{pmatrix} \\ \end{pmatrix} \quad [2]$$

(c)



$$\vec{OR} = \mathbf{r} \text{ and } \vec{OT} = \mathbf{t}.$$

P is on RT such that $RP : PT = 2 : 1$.

Q is on OT such that $OQ = \frac{2}{3} OT$.

Write the following in terms of \mathbf{r} and/or \mathbf{t} .
Simplify your answers where possible.

 (i) \vec{QT}

Answer(c)(i) $\vec{QT} = \dots\dots\dots$ [1]

 (ii) \vec{TP}

Answer(c)(ii) $\vec{TP} = \dots\dots\dots$ [2]

 (iii) \vec{QP}

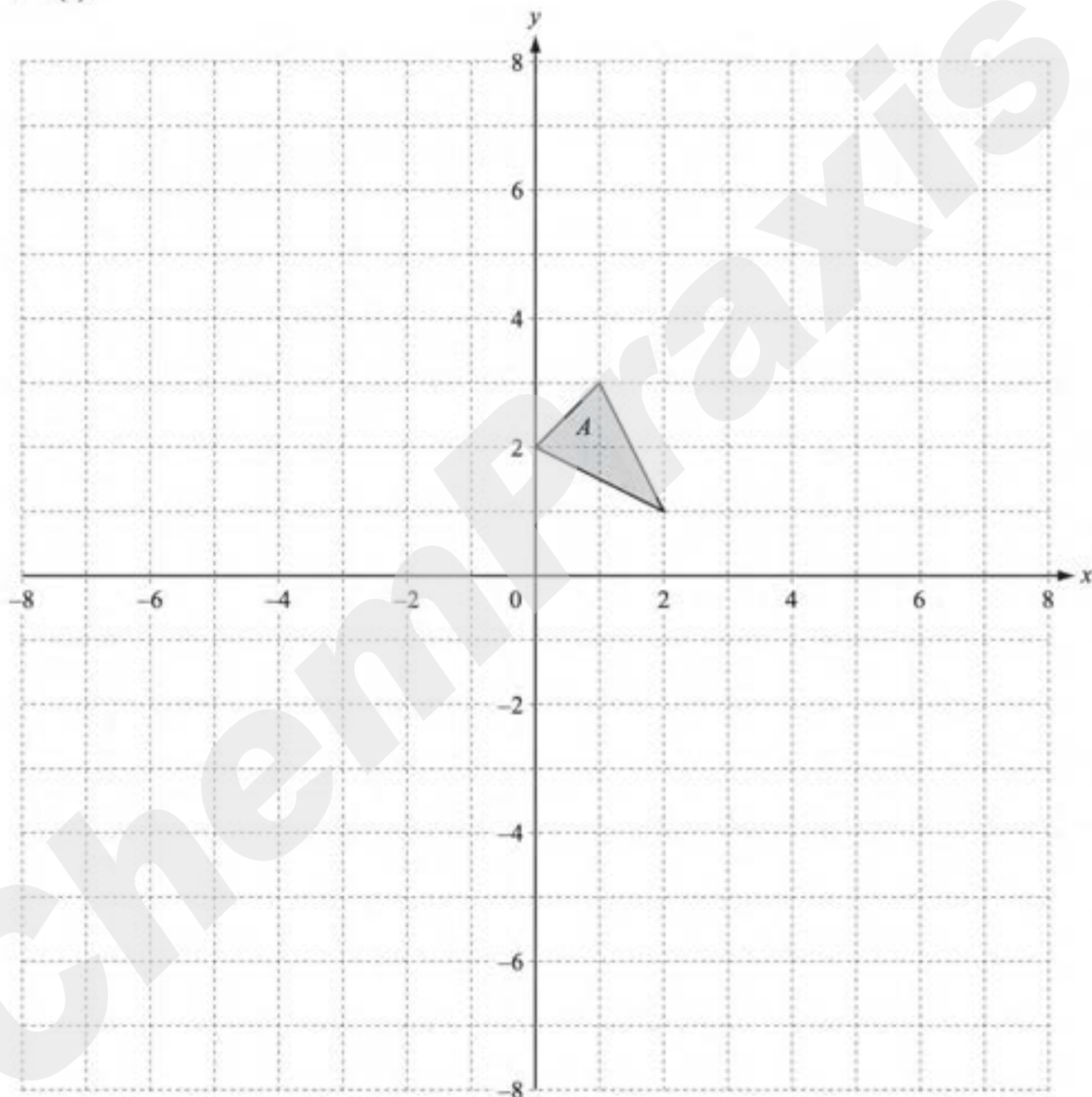
Answer(c)(iii) $\vec{QP} = \dots\dots\dots$ [2]

 (iv) Write down two conclusions you can make about the line segment QP .

Answer(c)(iv) $\dots\dots\dots$
 $\dots\dots\dots$ [2]

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8 (a)

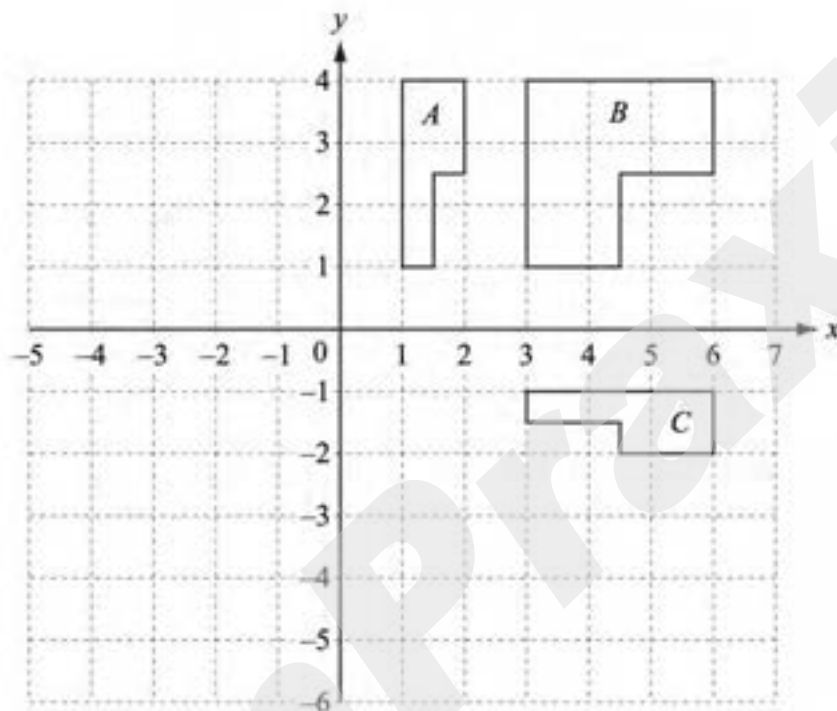


Draw the images of the following transformations on the grid above.

- (i) Translation of triangle A by the vector $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$. Label the image B . [2]
- (ii) Reflection of triangle A in the line $x = 3$. Label the image C . [2]
- (iii) Rotation of triangle A through 90° anticlockwise around the point $(0, 0)$. Label the image D . [2]
- (iv) Enlargement of triangle A by scale factor -4 , with centre $(0, 1)$. Label the image E . [2]

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(a) On the grid above, draw the image of

(i) shape A after translation by the vector $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$, [2]

(ii) shape A after reflection in the line $x = -1$. [2]

(b) Describe fully the **single** transformation which maps

(i) shape A onto shape B ,

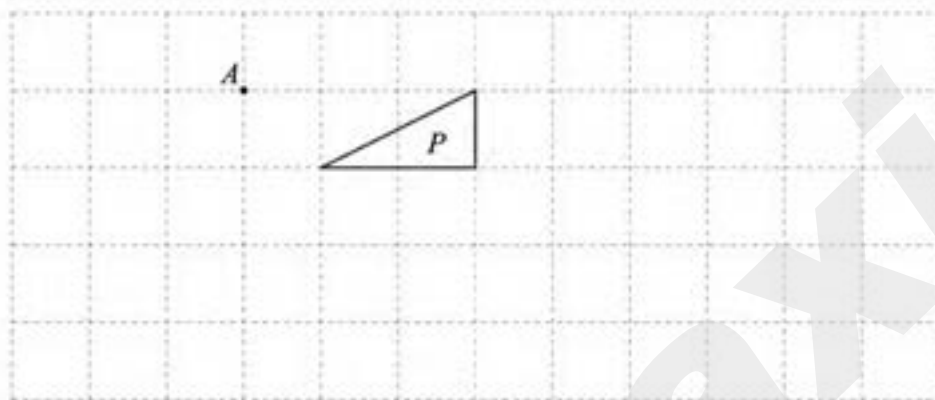
Answer(b)(i) [3]

(ii) shape A onto shape C .

Answer(b)(ii) [3]

May/June 2011 (42)

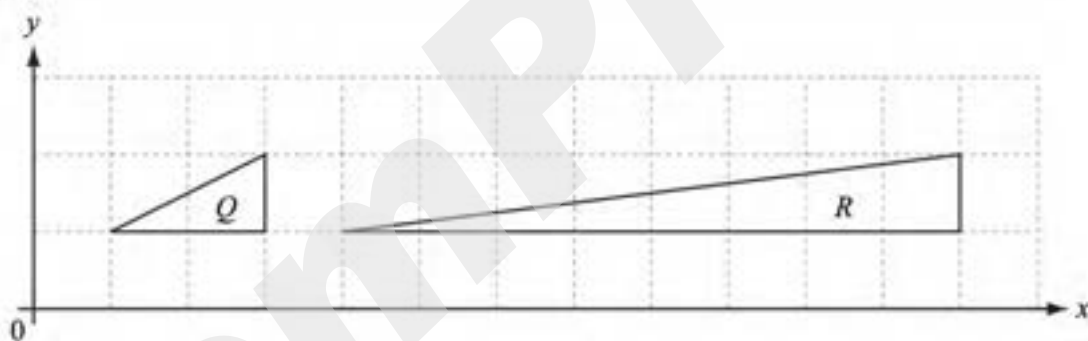
8 (a)



Draw the enlargement of triangle P with centre A and scale factor 2.

[2]

(b)



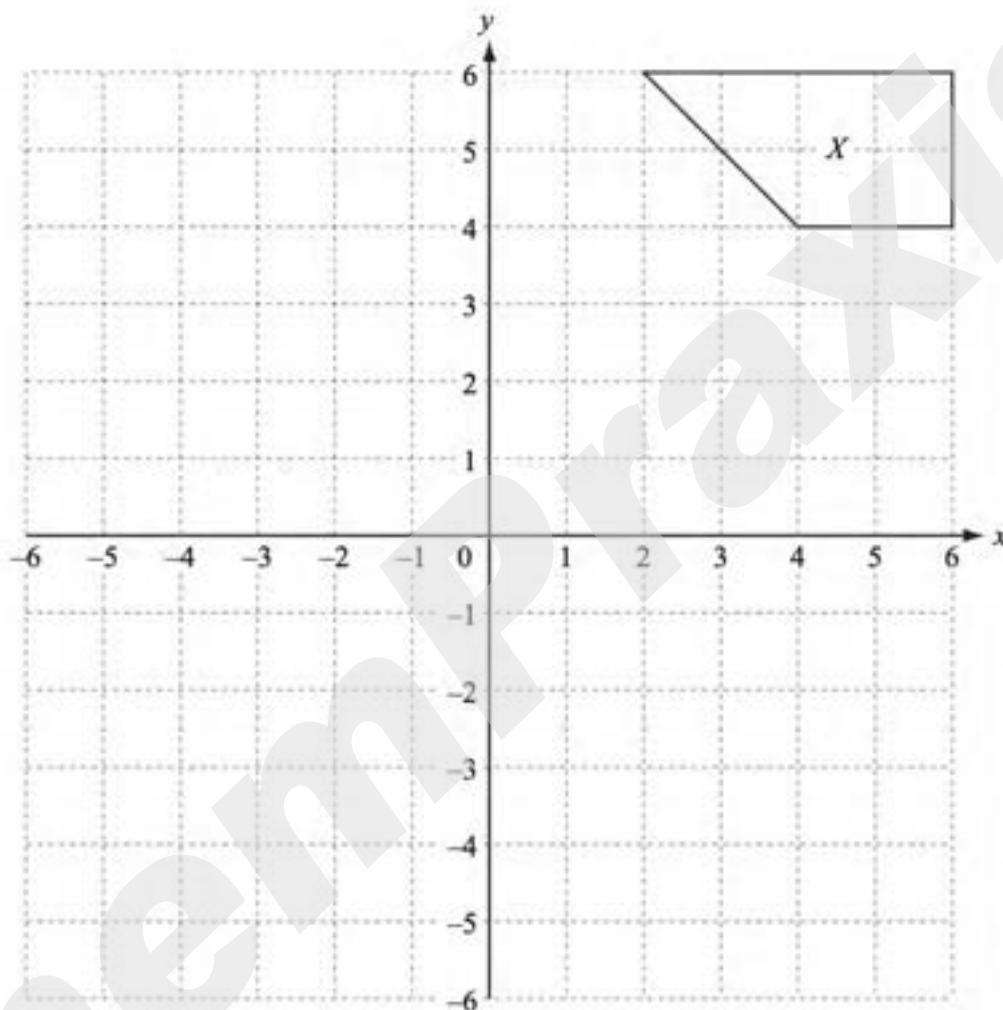
(i) Describe fully the single transformation which maps shape Q onto shape R .

Answer (b)(i)

[3]

May/June 2011 (43)

2

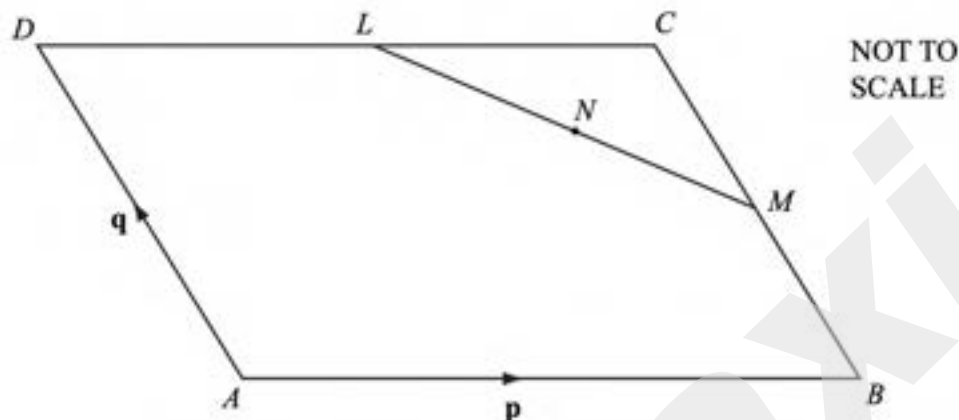


- (a) (i) Draw the reflection of shape **X** in the **x**-axis. Label the image **Y**. [2]
- (ii) Draw the rotation of **shape Y**, 90° clockwise about (0, 0). Label the image **Z**. [2]
- (iii) Describe fully the **single** transformation that maps shape **Z** onto shape **X**.

Answer(a)(iii)

- (b) (i) Draw the enlargement of shape **X**, centre (0, 0), scale factor $\frac{1}{2}$. [2]

10 (a)



$ABCD$ is a parallelogram.
 L is the midpoint of DC , M is the midpoint of BC and N is the midpoint of LM .
 $\vec{AB} = \mathbf{p}$ and $\vec{AD} = \mathbf{q}$.

(i) Find the following in terms of \mathbf{p} and \mathbf{q} , in their simplest form.

(a) \vec{AC}

Answer(a)(i)(a) $\vec{AC} = \dots\dots\dots$ [1]

(b) \vec{LM}

Answer(a)(i)(b) $\vec{LM} = \dots\dots\dots$ [2]

(c) \vec{AN}

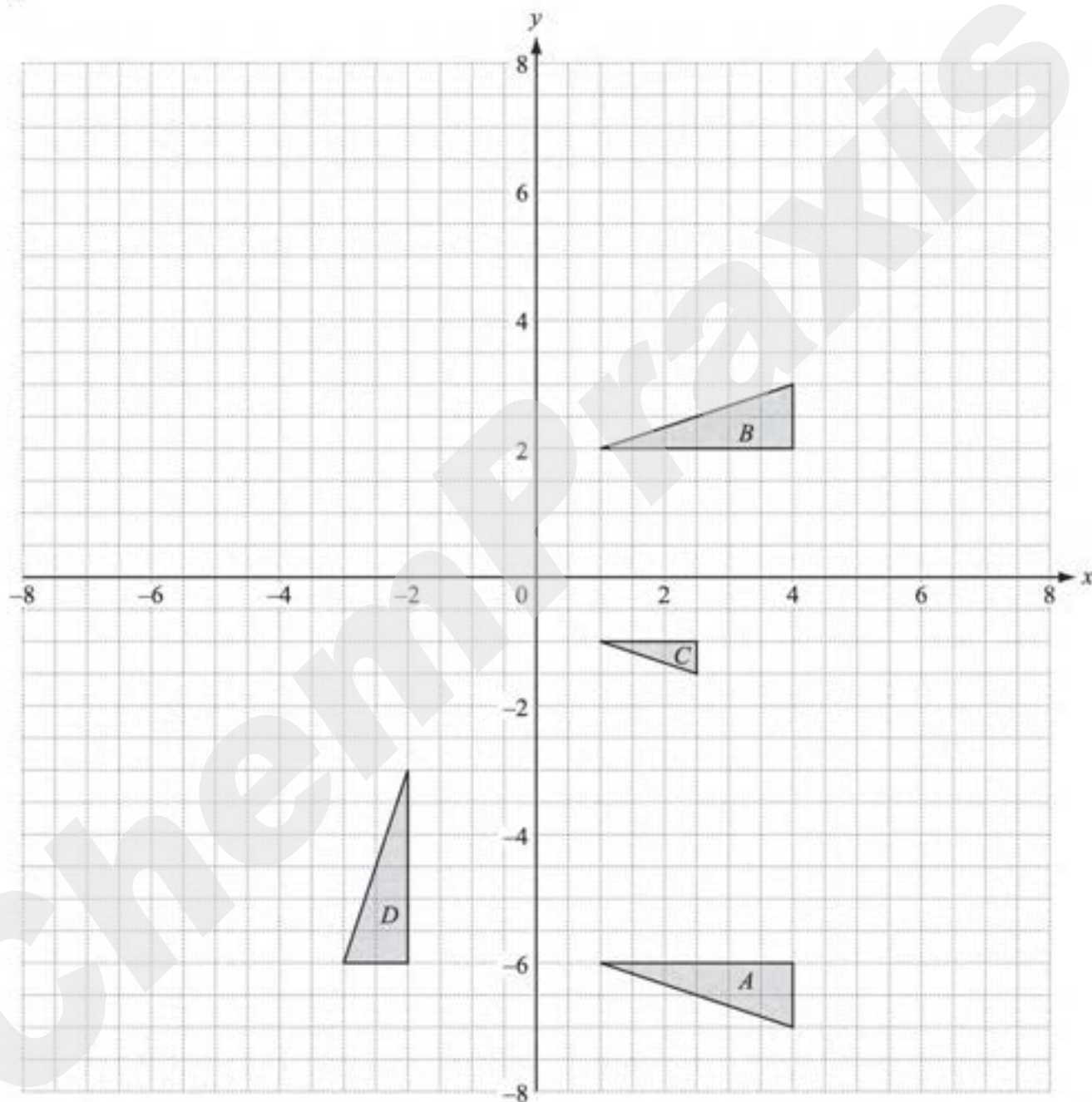
Answer(a)(i)(c) $\vec{AN} = \dots\dots\dots$ [2]

(ii) Explain why your answer for \vec{AN} shows that the point N lies on the line AC .

Answer(a)(ii) $\dots\dots\dots$ [1]

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7



(a) Describe fully the **single** transformation which maps

(i) triangle A onto triangle B ,

Answer(a)(i) [2]

(ii) triangle A onto triangle C ,

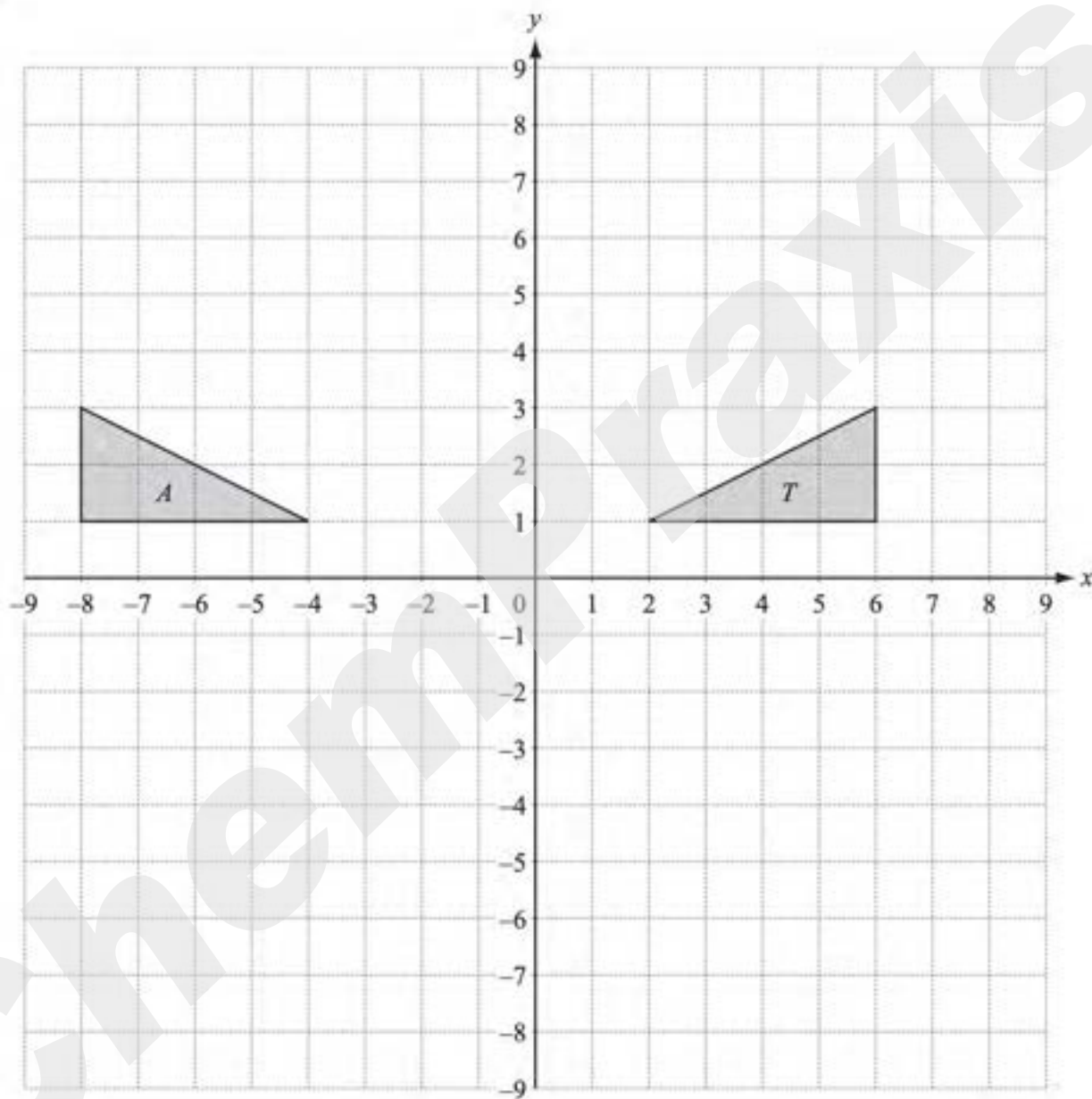
Answer(a)(ii) [3]

(iii) triangle A onto triangle D .

Answer(a)(iii) [3]

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3



Triangles T and A are drawn on the grid above.

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

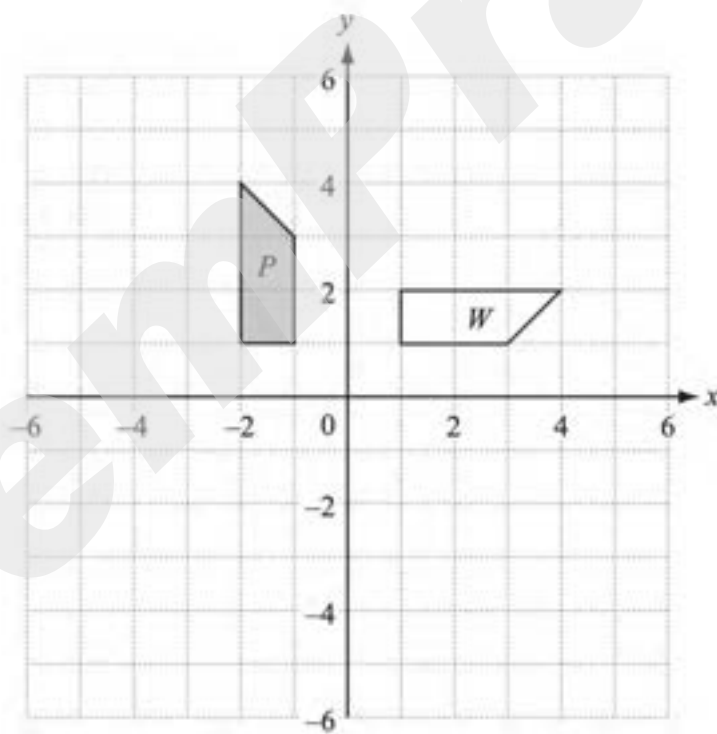
Answer(a)

[2]

- (b) (i) Draw the image of triangle T after a rotation of 90° anticlockwise about the point $(0,0)$.
Label the image B . [2]
- (ii) Draw the image of triangle T after a reflection in the line $x + y = 0$.
Label the image C . [2]
- (iii) Draw the image of triangle T after an enlargement with centre $(4, 5)$ and scale factor 1.5 .
Label the image D . [2]

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4

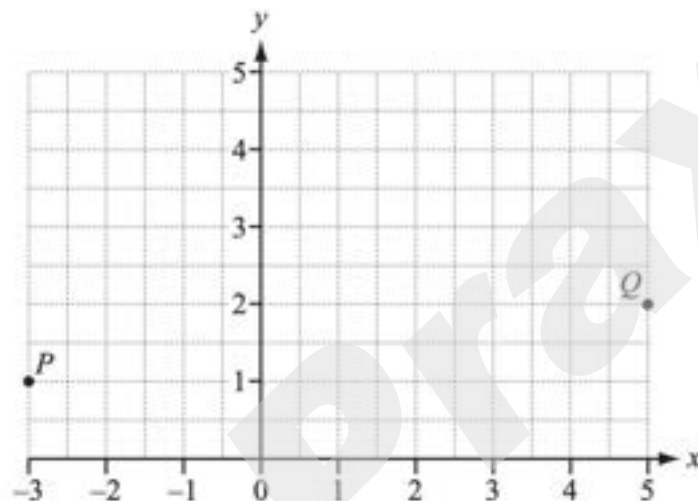


- (a) Draw the reflection of shape P in the line $y = x$. [2]
- (b) Draw the translation of shape P by the vector $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$. [2]

- (c) (i) Describe fully the **single** transformation that maps shape P onto shape W .

Answer(c)(i) [3]

11 (a)



The points P and Q have co-ordinates $(-3, 1)$ and $(5, 2)$.

- (i) Write \vec{PQ} as a column vector.

$$\text{Answer(a)(i) } \vec{PQ} = \begin{pmatrix} \\ \end{pmatrix} \quad [1]$$

(ii) $\vec{QR} = 2 \begin{pmatrix} -1 \\ 1 \end{pmatrix}$

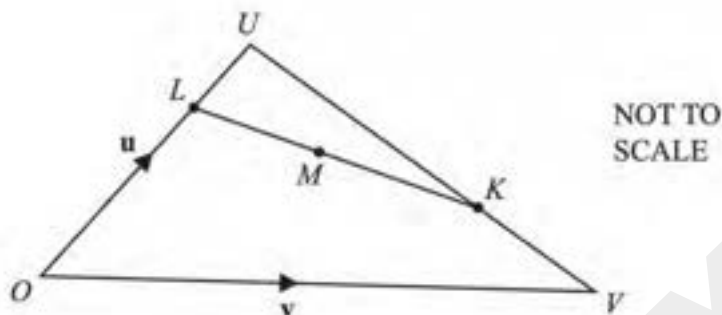
Mark the point R on the grid.

[1]

- (iii) Write down the position vector of the point P .

$$\text{Answer(a)(iii) } \begin{pmatrix} \\ \end{pmatrix} \quad [1]$$

(b)



In the diagram, $\vec{OU} = \mathbf{u}$ and $\vec{OV} = \mathbf{v}$.

K is on UV so that $\vec{UK} = \frac{2}{3} \vec{UV}$ and L is on OU so that $\vec{OL} = \frac{3}{4} \vec{OU}$.

M is the midpoint of KL .

Find the following in terms of \mathbf{u} and \mathbf{v} , giving your answers in their simplest form.

 (i) \vec{LK}

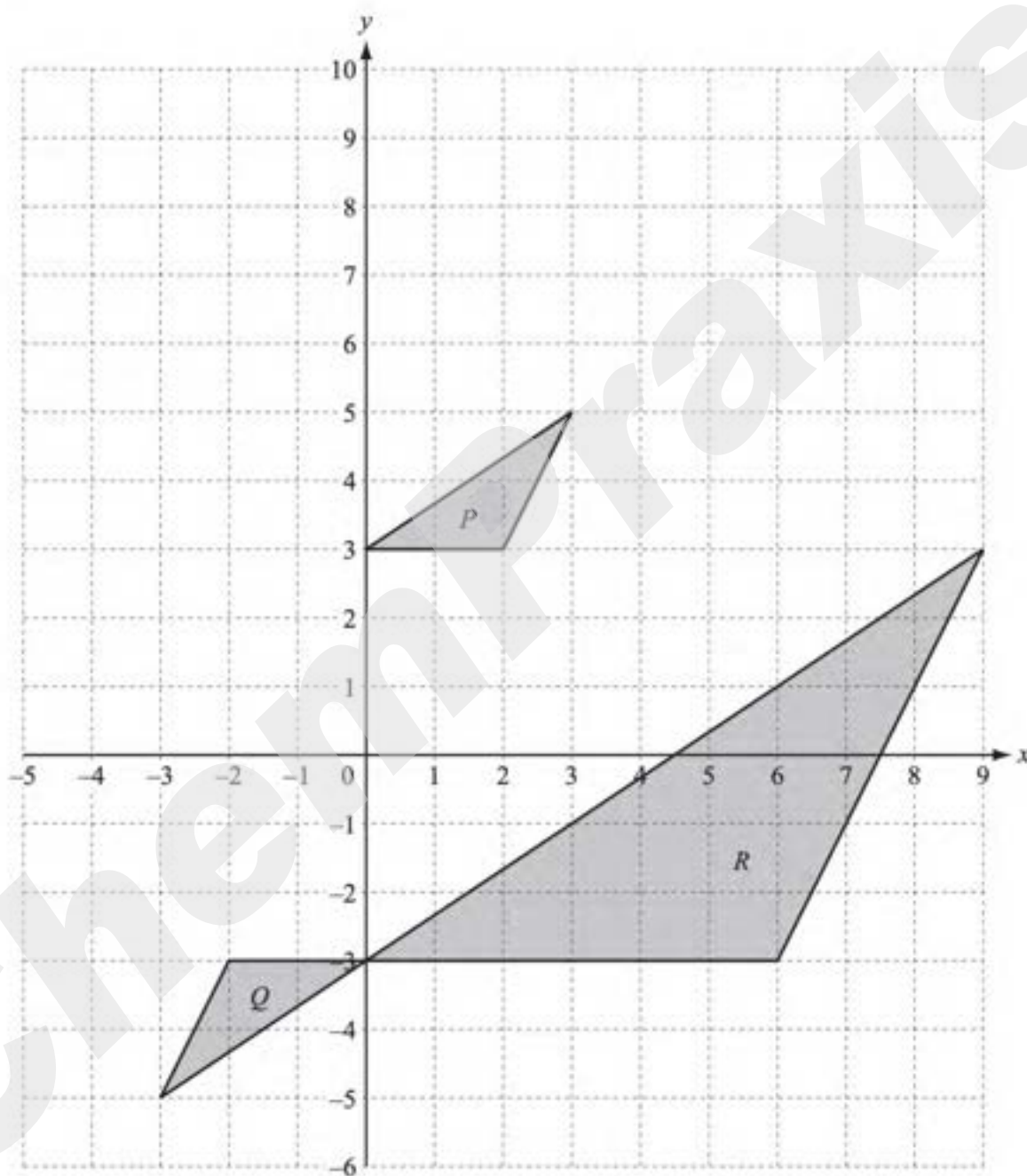
Answer(b)(i) $\vec{LK} = \dots\dots\dots$ [4]

 (ii) \vec{OM}

Answer(b)(ii) $\vec{OM} = \dots\dots\dots$ [2]

May/June 2012 (41)

7



(a) Describe fully

(i) the **single** transformation which maps **triangle P** onto triangle **Q**,

Answer(a)(i) [3]

(ii) the **single** transformation which maps **triangle Q** onto triangle **R**,

Answer(a)(ii) [3]

(iii) the **single** transformation which maps **triangle R** onto triangle **P**.

Answer(a)(iii) [3]

(b) On the grid, draw the image of

(i) **triangle P** after translation by $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$, [2]

(ii) **triangle P** after reflection in the line $x = -1$. [2]

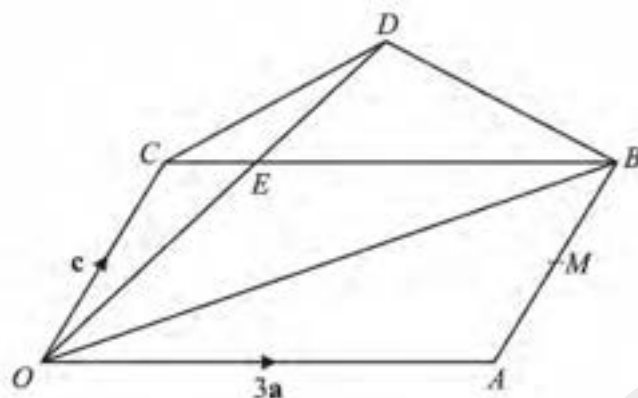
May/June 2012 (42)

7 (a) P is the point $(2, 5)$ and $\vec{PQ} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

Write down the co-ordinates of Q .

Answer(a) (..... ,) [1]

(b)



NOT TO SCALE

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

M is the midpoint of AB .

$\vec{OC} = \mathbf{c}$, $\vec{OA} = 3\mathbf{a}$ and $CE = \frac{1}{3}CB$.

OED is a straight line with $OE : ED = 2 : 1$.

Find in terms of \mathbf{a} and \mathbf{c} , in their simplest forms

(i) \vec{OB} ,

Answer(b)(i) $\vec{OB} = \dots\dots\dots$ [1]

(ii) the position vector of M ,

Answer(b)(ii) $\dots\dots\dots$ [2]

(iii) \vec{OE} ,

Answer(b)(iii) $\vec{OE} = \dots\dots\dots$ [1]

(iv) \vec{CD} .

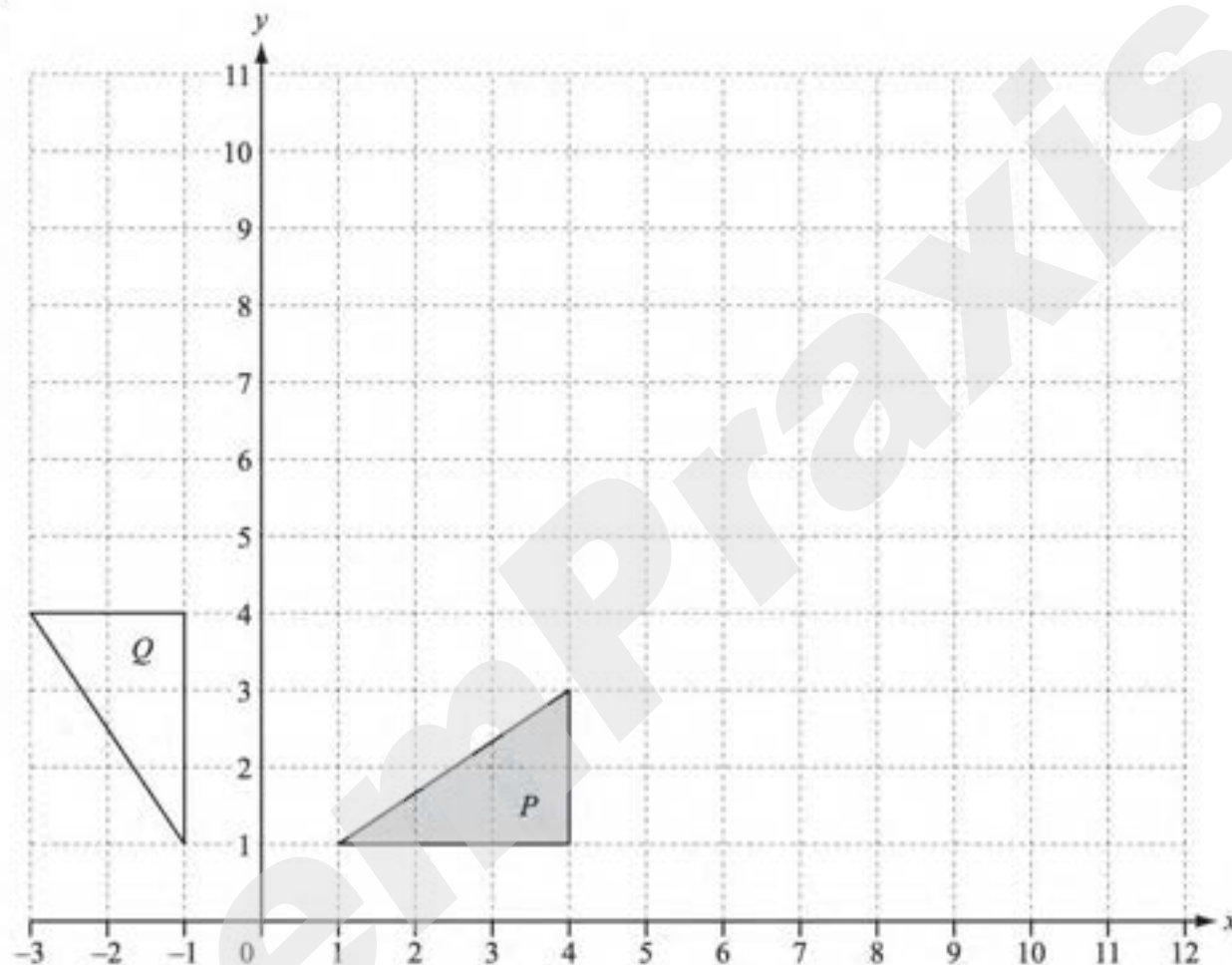
Answer(b)(iv) $\vec{CD} = \dots\dots\dots$ [2]

(c) Write down two facts about the lines CD and OB .

Answer (c) $\dots\dots\dots$
 $\dots\dots\dots$ [2]

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3



(a) Draw the translation of triangle P by $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$. [2]

(b) Draw the reflection of triangle P in the line $x = 6$. [2]

(c) (i) Describe fully the **single** transformation that maps triangle P onto triangle Q .

Answer(c)(i) [3]

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$$6 \quad (a) \quad \mathbf{a} = \begin{pmatrix} -2 \\ 3 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 2 \\ -7 \end{pmatrix} \quad \mathbf{c} = \begin{pmatrix} -10 \\ 21 \end{pmatrix}$$

(i) Find $2\mathbf{a} + \mathbf{b}$.

Answer(a)(i) $\begin{pmatrix} \\ \end{pmatrix}$ [1]

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

Answer(a)(ii) [2]

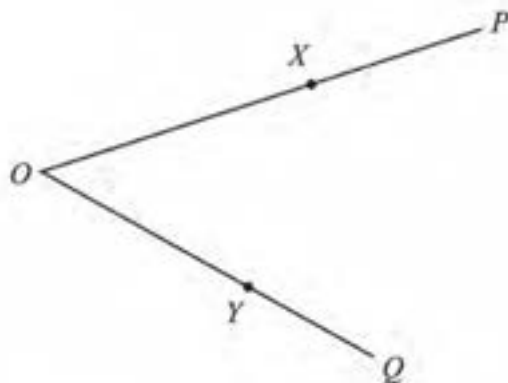
(iii) $m\mathbf{a} + n\mathbf{b} = \mathbf{c}$

Find the values of m and n .
Show all your working.

Answer(a)(iii) $m = \dots\dots\dots$

$n = \dots\dots\dots$ [6]

(b)


 NOT TO
SCALE

In the diagram, $OX:XP = 3:2$ and $OY:YQ = 3:2$.
 $\vec{OP} = \mathbf{p}$ and $\vec{OQ} = \mathbf{q}$.

 (i) Write \vec{PQ} in terms of \mathbf{p} and \mathbf{q} .

Answer(b)(i) $\vec{PQ} = \dots\dots\dots$ [1]

 (ii) Write \vec{XY} in terms of \mathbf{p} and \mathbf{q} .

Answer(b)(ii) $\vec{XY} = \dots\dots\dots$ [1]

(iii) Complete the following sentences.

 The lines XY and PQ are $\dots\dots\dots$

 The triangles OXY and OPQ are $\dots\dots\dots$

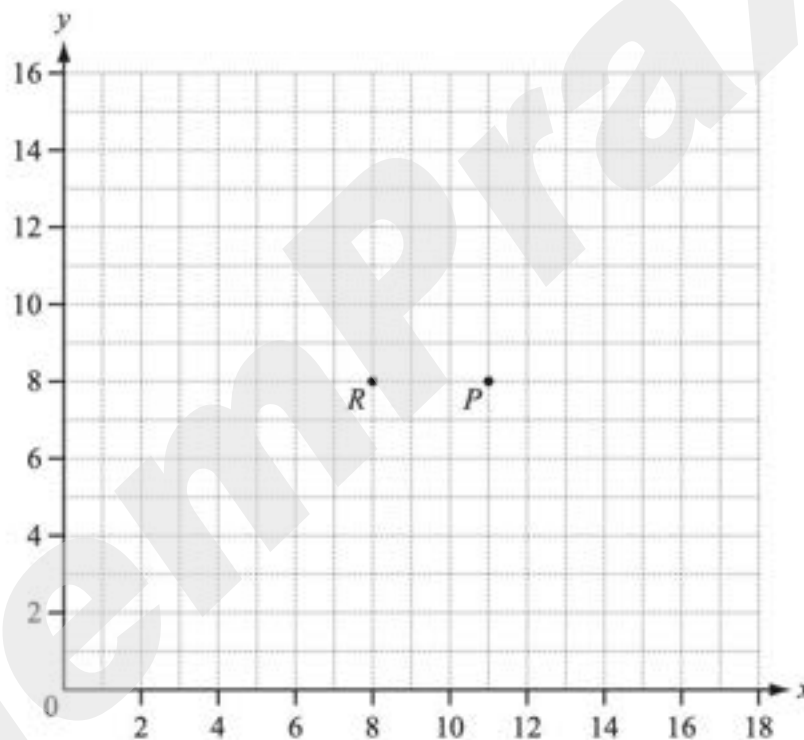
 The ratio of the area of triangle OXY to the area of triangle OPQ is $\dots\dots : \dots\dots$ [3]

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- 6 (a) Calculate the magnitude of the vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$.

Answer(a) [2]

(b)



- (i) The points P and R are marked on the grid above.

$\vec{PQ} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$. Draw the vector \vec{PQ} on the grid above. [1]

- (ii) Draw the image of vector \vec{PQ} after rotation by 90° anticlockwise about R . [2]

(c) $\vec{DE} = 2\mathbf{a} + \mathbf{b}$ and $\vec{DC} = 3\mathbf{b} - \mathbf{a}$.

Find \vec{CE} in terms of \mathbf{a} and \mathbf{b} . Write your answer in its simplest form.

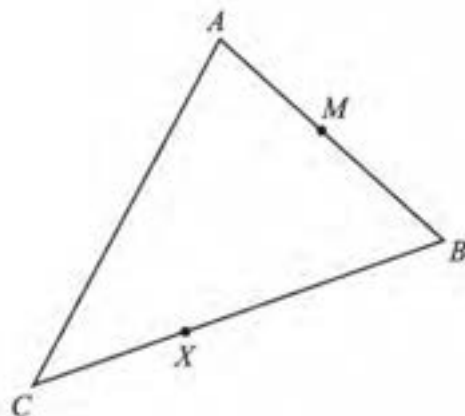
Answer(c) $\vec{CE} = \dots\dots\dots$ [2]

(d) $\vec{OT} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ and $\vec{OV} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$.

Write \vec{TV} as a column vector.

Answer(d) $\vec{TV} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(e)


 NOT TO
SCALE

$$\vec{AB} = \mathbf{b} \quad \text{and} \quad \vec{AC} = \mathbf{c}.$$

 (i) Find \vec{CB} in terms of \mathbf{b} and \mathbf{c} .

$$\text{Answer(e)(i)} \vec{CB} = \dots\dots\dots [1]$$

 (ii) X divides CB in the ratio $1:3$.
 M is the midpoint of AB .

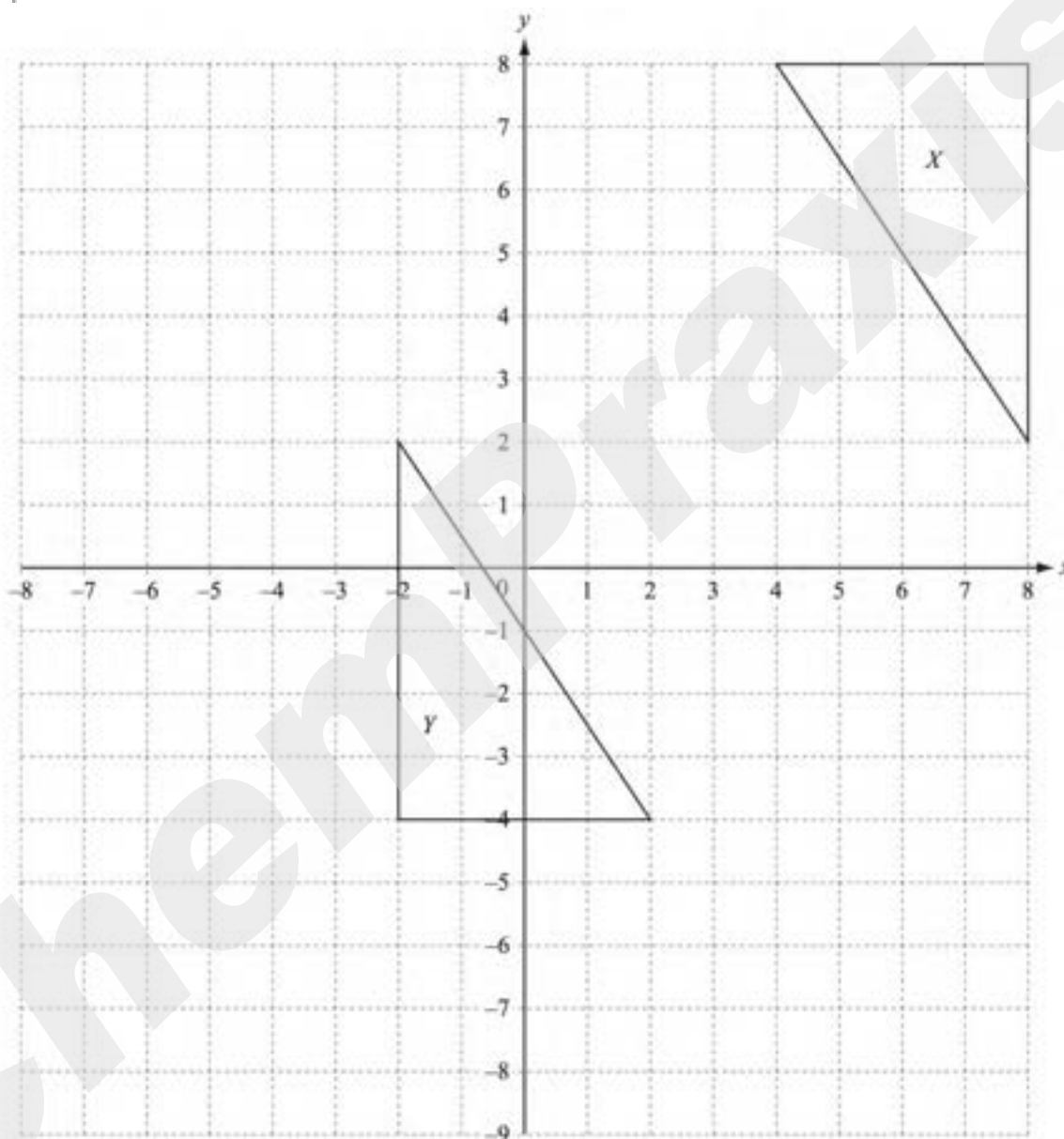
 Find \vec{MX} in terms of \mathbf{b} and \mathbf{c} .

Show all your working and write your answer in its simplest form.

$$\text{Answer(e)(ii)} \vec{MX} = \dots\dots\dots [4]$$

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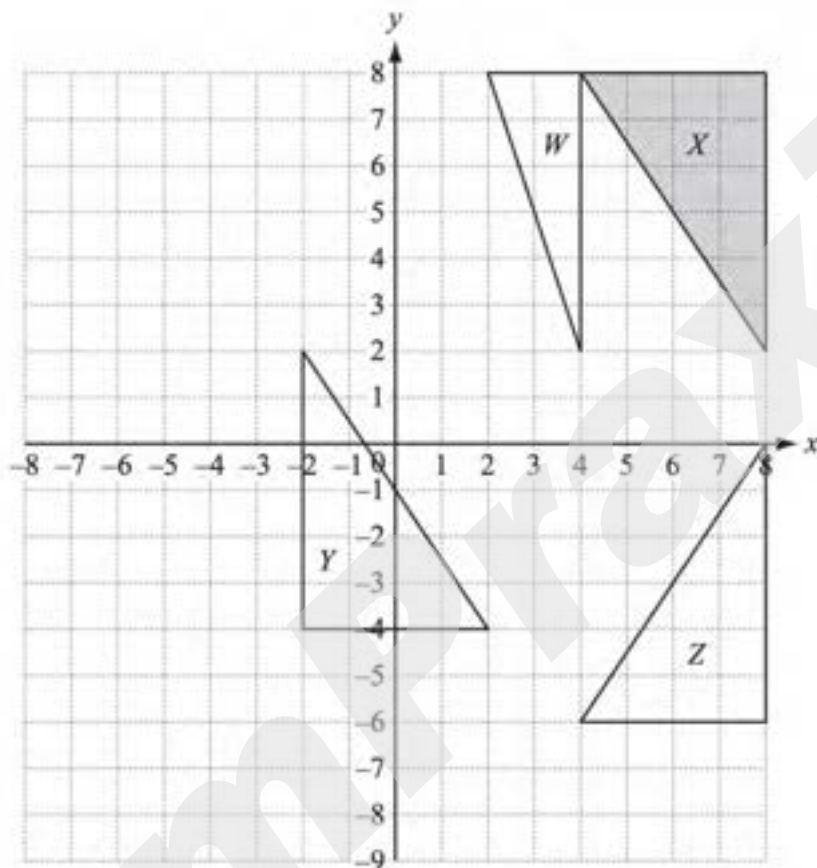
2 (a)



(i) Draw the translation of triangle X by the vector $\begin{pmatrix} -11 \\ -1 \end{pmatrix}$. [2]

(ii) Draw the enlargement of triangle Y with centre $(-6, -4)$ and scale factor $\frac{1}{2}$. [2]

(b)


 Describe fully the **single** transformation that maps

 (i) triangle X onto triangle Z ,

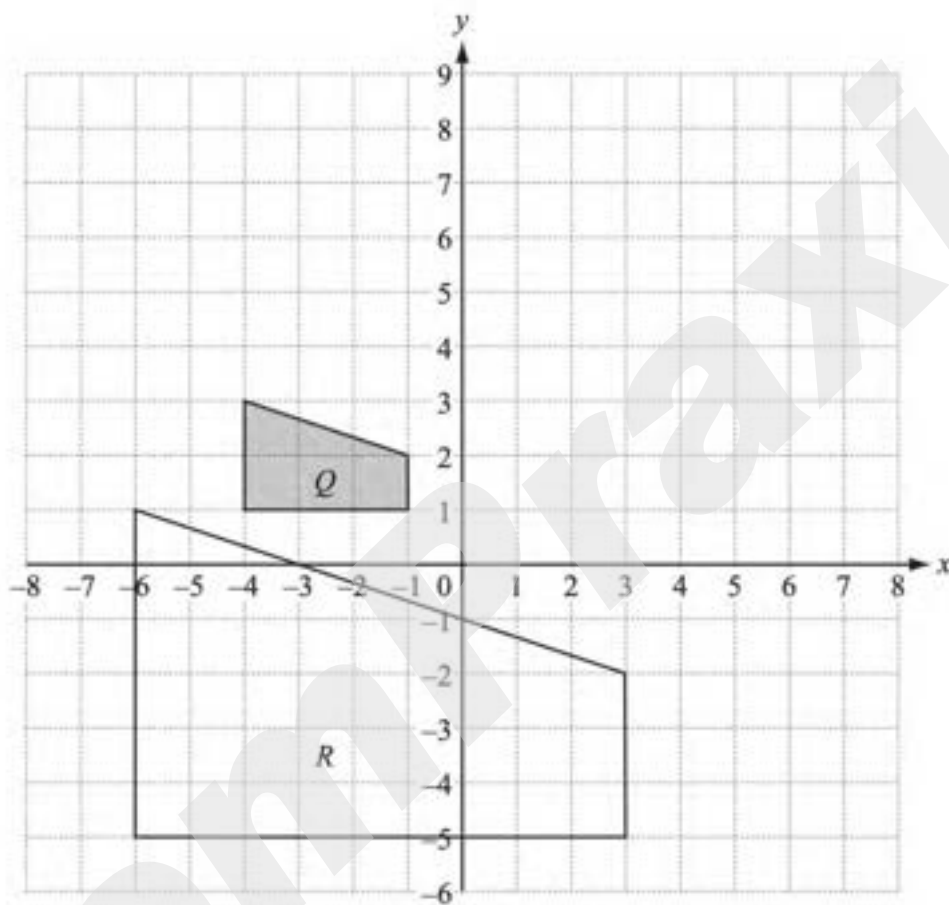
Answer(b)(i) [2]

 (ii) triangle X onto triangle Y ,

Answer(b)(ii) [3]

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4



(a) Describe fully the single transformation that maps shape Q onto shape R .

Answer(a) [3]

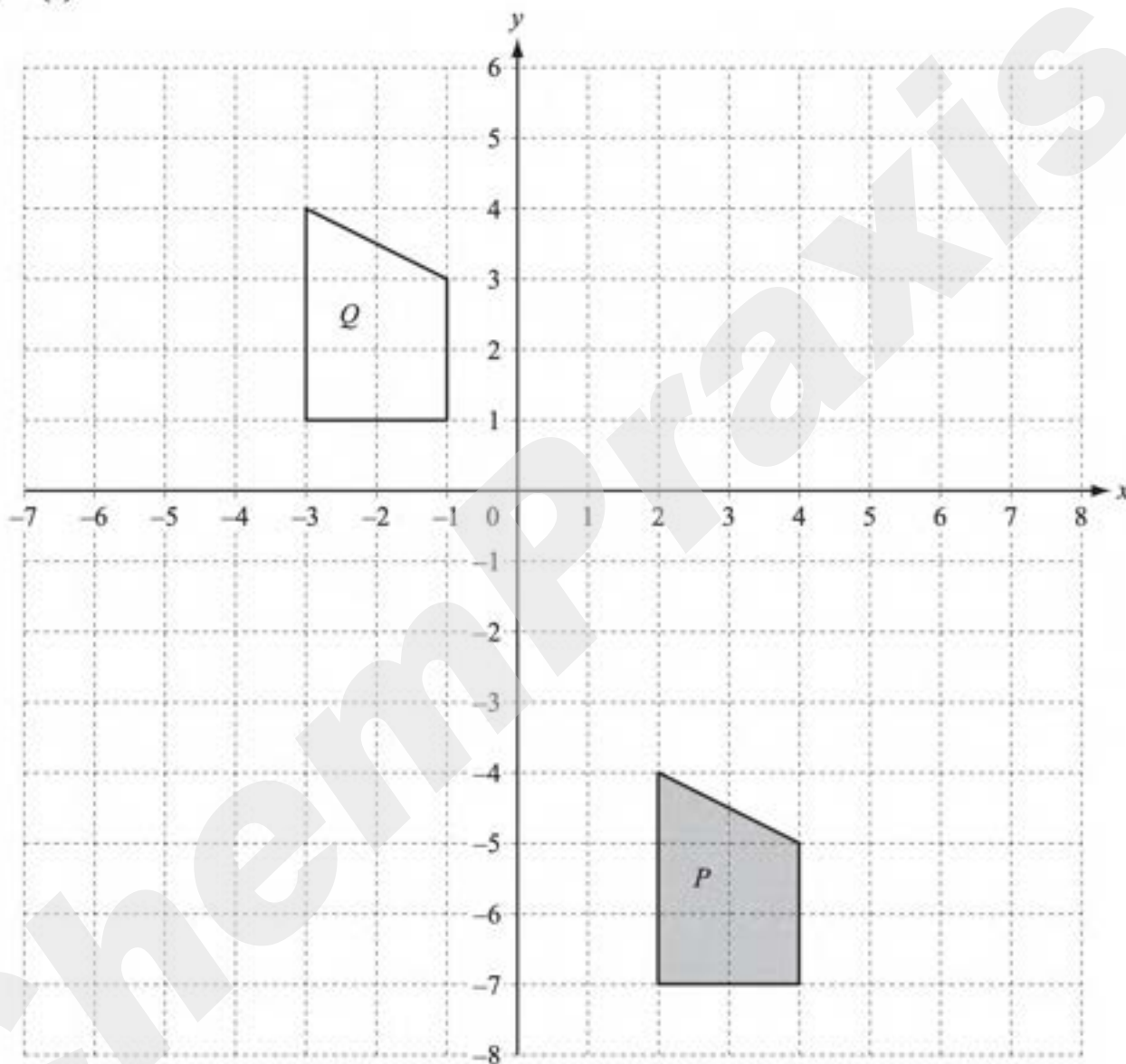
(b) (i) Draw the image when shape Q is translated by the vector $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$. [2]

(ii) Draw the image when shape Q is reflected in the line $x = 2$. [2]

(iii) Draw the image when shape Q is stretched, factor 3, x -axis invariant. [2]

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2 (a)

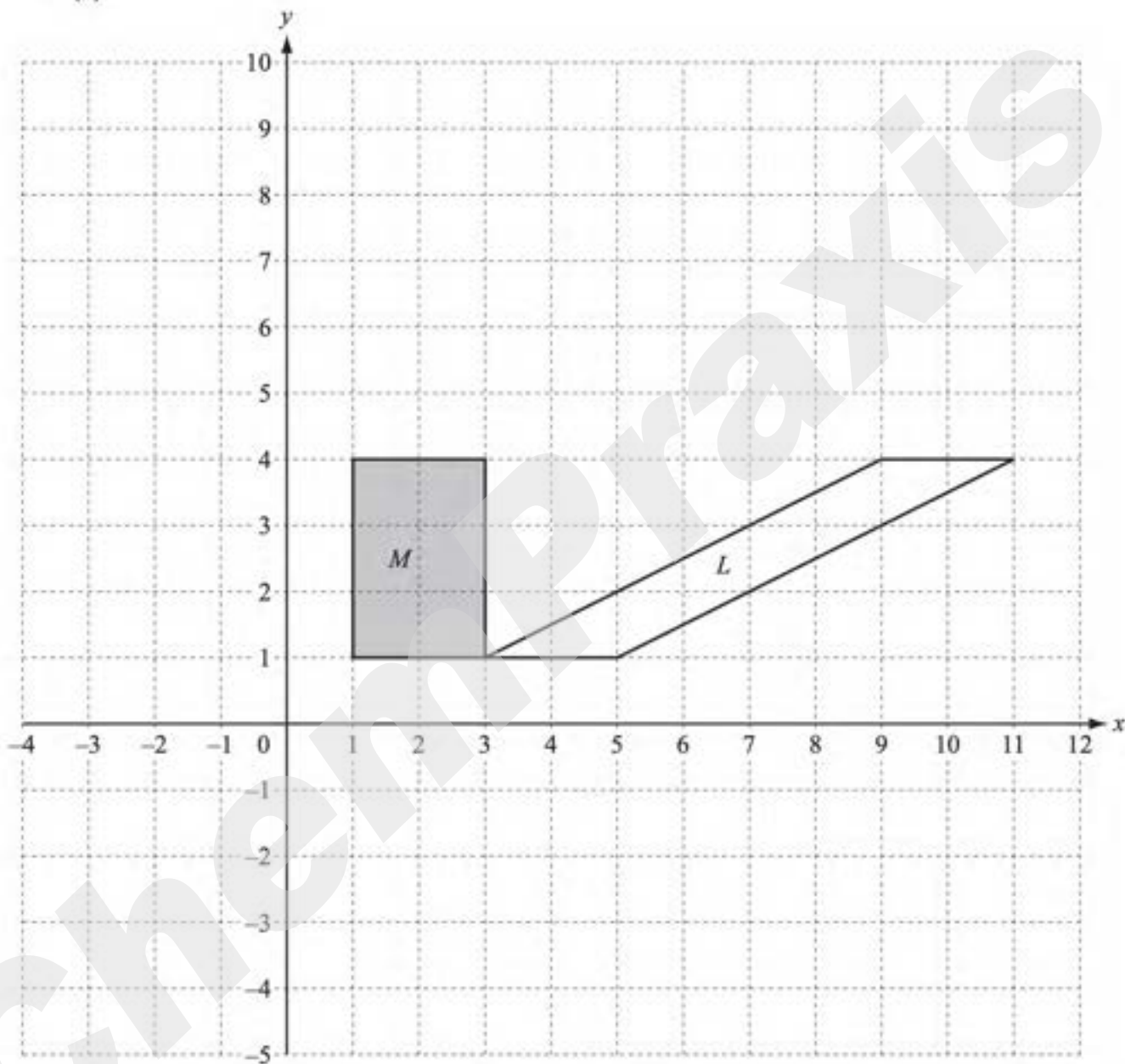


- (i) Describe fully the **single** transformation which maps shape *P* onto shape *Q*.

Answer(a)(i) [2]

- (ii) On the grid above, draw the image of shape *P* after reflection in the line $y = -1$. [2]

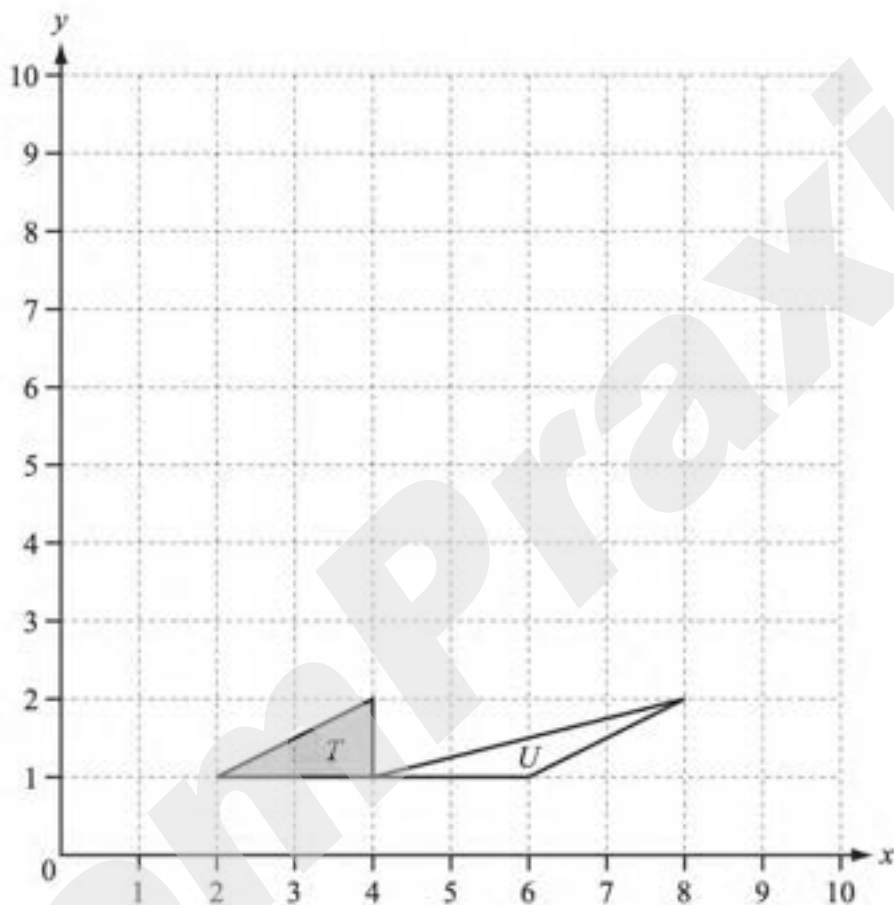
(b)



- (ii) On the grid above, draw the image of shape *M* after enlargement by scale factor 2, centre (5, 0). [2]

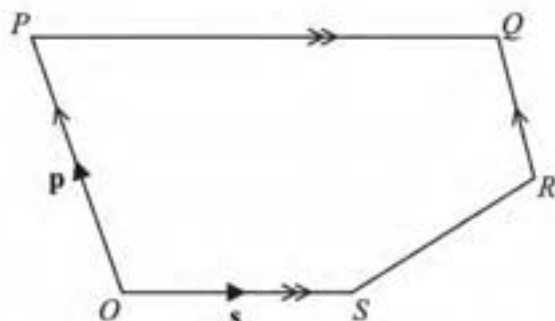
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5 (a)



- (i) Draw the reflection of triangle T in the line $y = 5$. [2]
- (ii) Draw the rotation of triangle T about the point $(4, 2)$ through 180° . [2]

(b)



NOT TO SCALE

In the pentagon $OPQRS$, OP is parallel to RQ and OS is parallel to PQ .
 $PQ = 2OS$ and $OP = 2RQ$.
 O is the origin, $\vec{OP} = \mathbf{p}$ and $\vec{OS} = \mathbf{s}$.

Find, in terms of \mathbf{p} and \mathbf{s} , in their simplest form,

(i) the position vector of Q ,

Answer(b)(i) [2]

(ii) \vec{SR} .

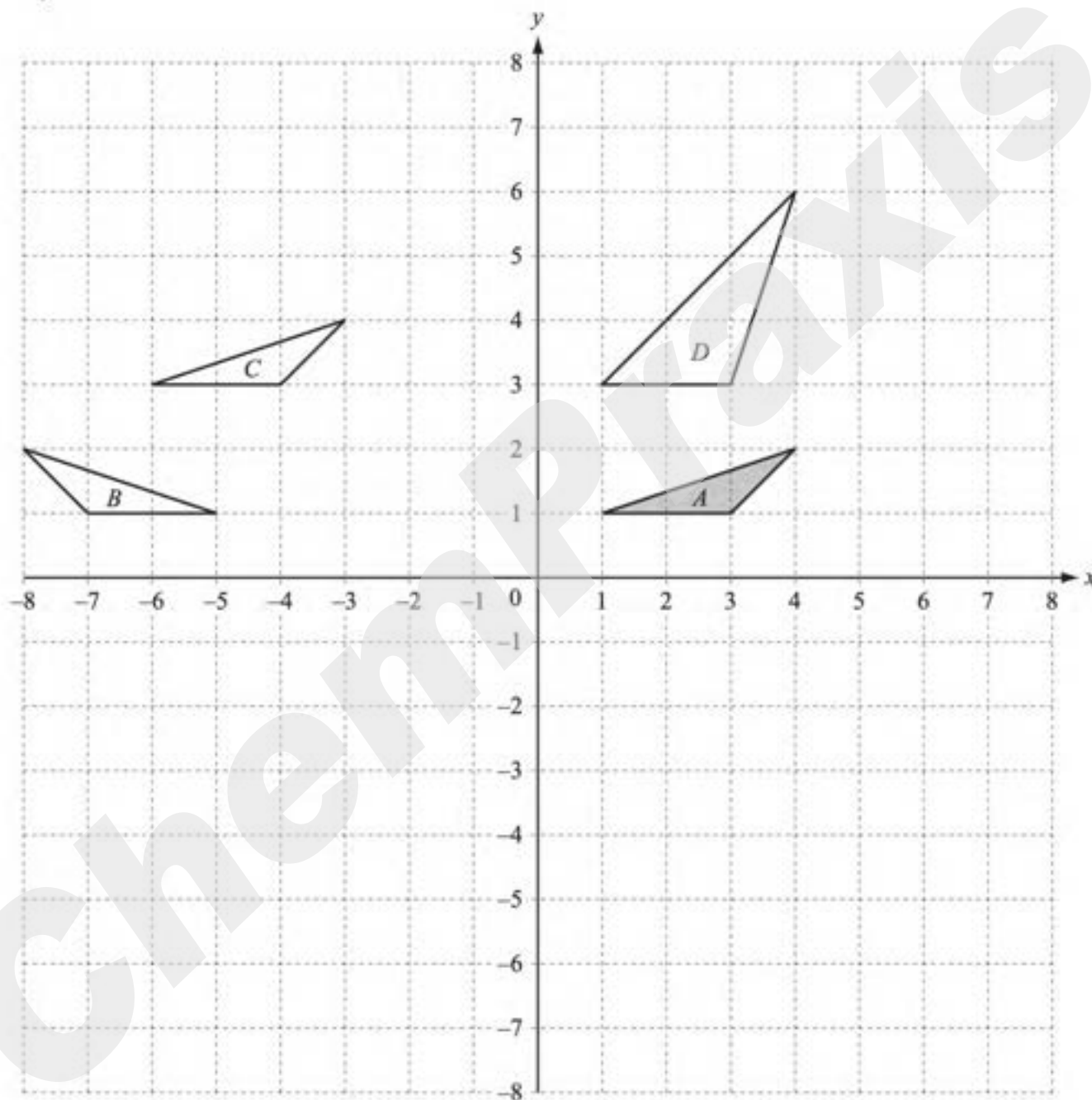
Answer(b)(ii) $\vec{SR} =$ [2]

(c) Explain what your answers in **part (b)** tell you about the lines OQ and SR .

Answer(c) [1]

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9



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

(i) triangle B ,

Answer(a)(i) [2]

(ii) triangle C ,

Answer(a)(ii) [2]

(b) On the grid, draw

(i) the rotation of triangle A about $(6, 0)$ through 90° clockwise, [2]

(ii) the enlargement of triangle A by scale factor -2 with centre $(0, -1)$, [2]

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7 (a) The co-ordinates of P are $(-4, -4)$ and the co-ordinates of Q are $(8, 14)$.

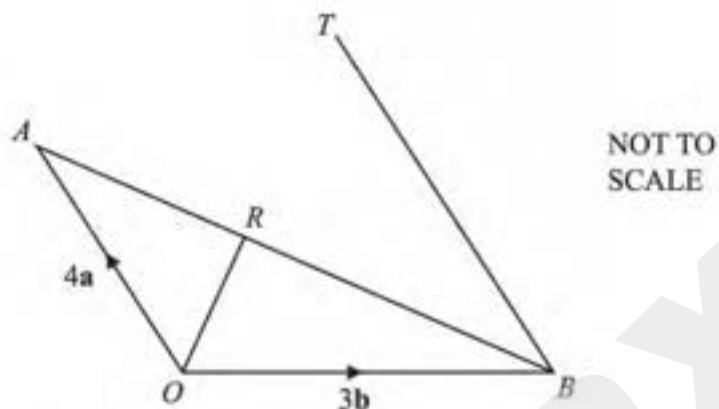
(iii) Write \vec{PQ} as a column vector.

Answer(a)(iii) $\vec{PQ} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

(iv) Find the magnitude of \vec{PQ} .

Answer(a)(iv) [2]

(b)



In the diagram, $\vec{OA} = 4\mathbf{a}$ and $\vec{OB} = 3\mathbf{b}$.

R lies on AB such that $\vec{OR} = \frac{1}{5}(12\mathbf{a} + 6\mathbf{b})$.

T is the point such that $\vec{BT} = \frac{3}{2}\vec{OA}$.

(i) Find the following in terms of \mathbf{a} and \mathbf{b} , giving each answer in its simplest form.

(a) \vec{AB}

Answer(b)(i)(a) $\vec{AB} = \dots\dots\dots$ [1]

(b) \vec{AR}

Answer(b)(i)(b) $\vec{AR} = \dots\dots\dots$ [2]

(c) \vec{OT}

Answer(b)(i)(c) $\vec{OT} = \dots\dots\dots$ [1]

(ii) Complete the following statement.

The points O , R and T are in a straight line because

..... [1]

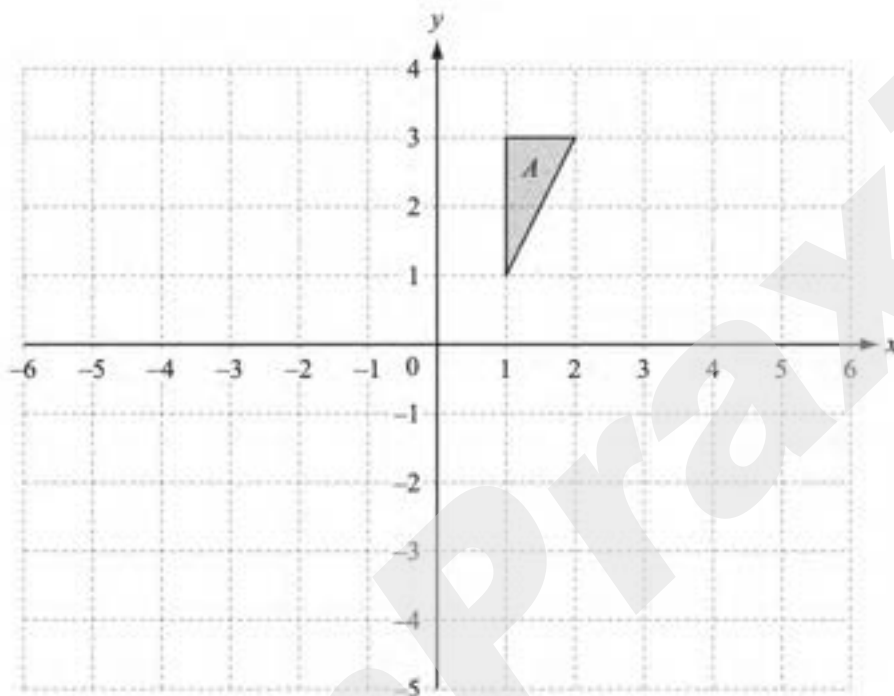
(iii) Triangle OAR and triangle TBR are similar.

Find the value of $\frac{\text{area of triangle } TBR}{\text{area of triangle } OAR}$.

Answer(b)(iii) [2]

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7



(a) On the grid,

(i) draw the image of shape A after a translation by the vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$, [2]

(ii) draw the image of shape A after a rotation through 90° clockwise about the origin. [2]

11 (a) $\vec{PQ} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

- (i) P is the point $(-2, 3)$.

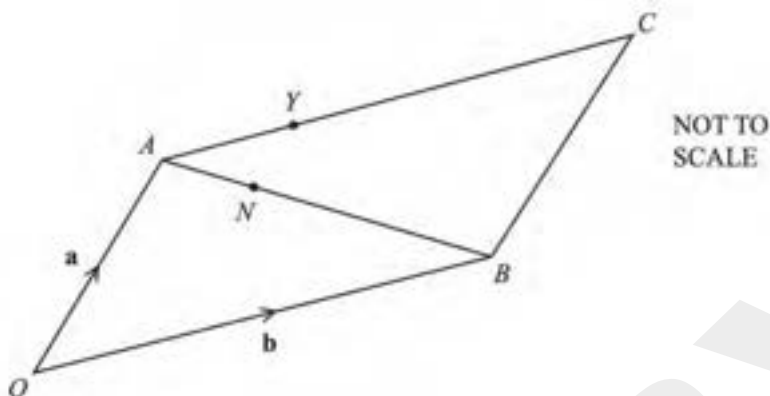
Work out the co-ordinates of Q .

Answer(a)(i) (.....,) [1]

- (ii) Work out $|\vec{PQ}|$, the magnitude of \vec{PQ} .

Answer(a)(ii) [2]

(b)



$OACB$ is a parallelogram.

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

$AN:NB = 2:3$ and $AY = \frac{2}{5}AC$.

- (i) Write each of the following in terms of \mathbf{a} and/or \mathbf{b} .
Give your answers in their simplest form.

(a) \vec{ON}

Answer(b)(i)(a) $\vec{ON} = \dots\dots\dots$ [2]

(b) \vec{NY}

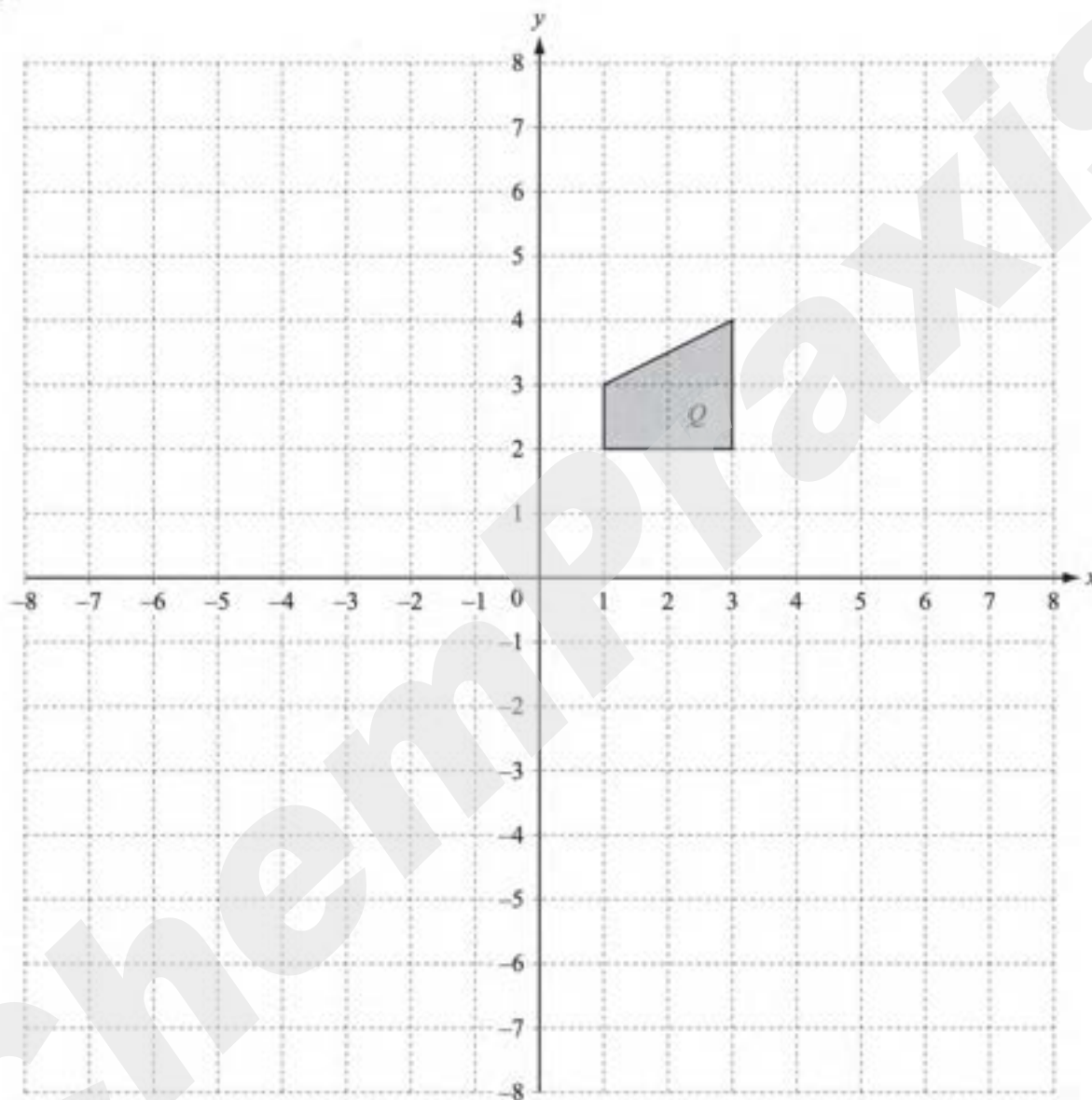
Answer(b)(i)(b) $\vec{NY} = \dots\dots\dots$ [2]

- (ii) Write down two conclusions you can make about the line segments NY and BC .

Answer(b)(ii) $\dots\dots\dots$
 $\dots\dots\dots$ [2]

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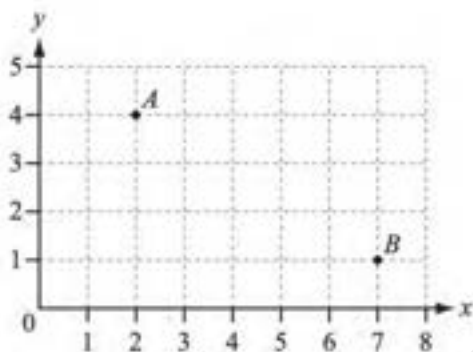
4



- (a) Draw the reflection of shape Q in the line $x = -1$. [2]
- (b) (i) Draw the enlargement of shape Q , centre $(0, 0)$, scale factor -2 . [2]

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5 (a)

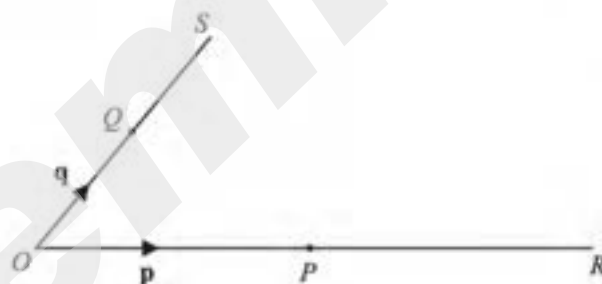

 (i) Write down the position vector of A .

 Answer(a)(i) $\left(\begin{array}{c} \\ \end{array} \right)$ [1]

 (ii) Find $|\vec{AB}|$, the magnitude of \vec{AB} .

Answer(a)(ii) [2]

(b)



O is the origin, $\vec{OP} = \mathbf{p}$ and $\vec{OQ} = \mathbf{q}$.
 OP is extended to R so that $OP = PR$.
 OQ is extended to S so that $OQ = QS$.

 (i) Write down \vec{RQ} in terms of \mathbf{p} and \mathbf{q} .

 Answer(b)(i) $\vec{RQ} = \dots\dots\dots$ [1]

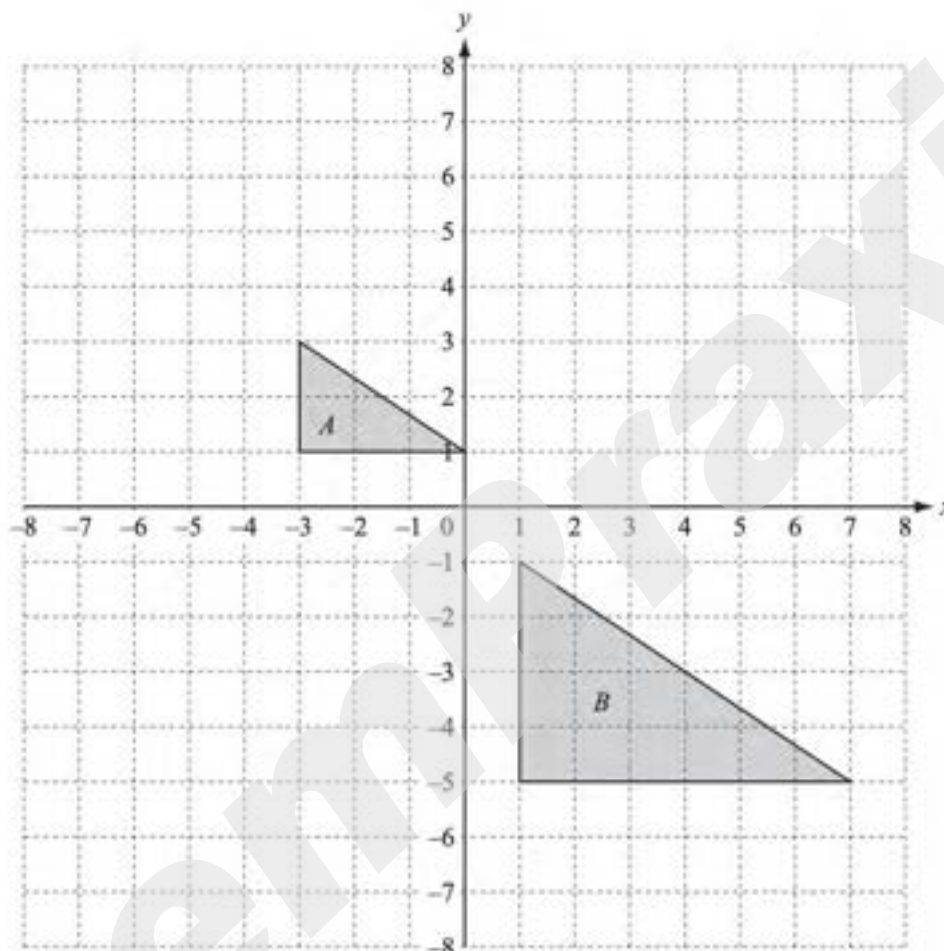
(ii) PS and RQ intersect at M and $RM = 2MQ$.

Use vectors to find the ratio $PM : PS$, showing all your working.

Answer(b)(ii) $PM : PS = \dots\dots\dots : \dots\dots\dots$ [4]

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3



(a) Draw the image when triangle A is reflected in the line $x = 0$. [1]

(b) Draw the image when triangle A is rotated through 90° anticlockwise about $(-4, 0)$. [2]

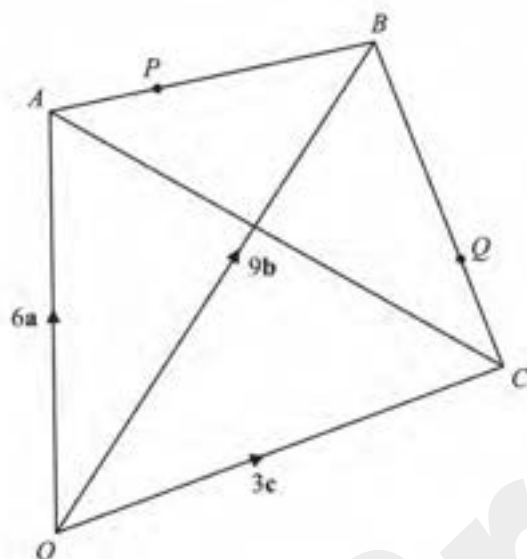
(c) (i) Describe fully the **single** transformation that maps triangle A onto triangle B .

Answer(c)(i) [3]

(ii) Complete the following statement.

Area of triangle A : Area of triangle $B = \dots : \dots$ [2]

8



In the diagram, O is the origin and $\vec{OA} = 6\mathbf{a}$, $\vec{OB} = 9\mathbf{b}$ and $\vec{OC} = 3\mathbf{c}$.

The point P lies on AB such that $\vec{AP} = 3\mathbf{b} - 2\mathbf{a}$.

The point Q lies on BC such that $\vec{BQ} = 2\mathbf{c} - 6\mathbf{b}$.

- (a) Find, in terms of \mathbf{b} and \mathbf{c} , the position vector of Q .
Give your answer in its simplest form.

Answer(a) [2]

(b) Find, in terms of **a** and **c**, in its simplest form

(i) \vec{AC} ,

Answer(b)(i) $\vec{AC} = \dots\dots\dots$ [1]

(ii) \vec{PQ} .

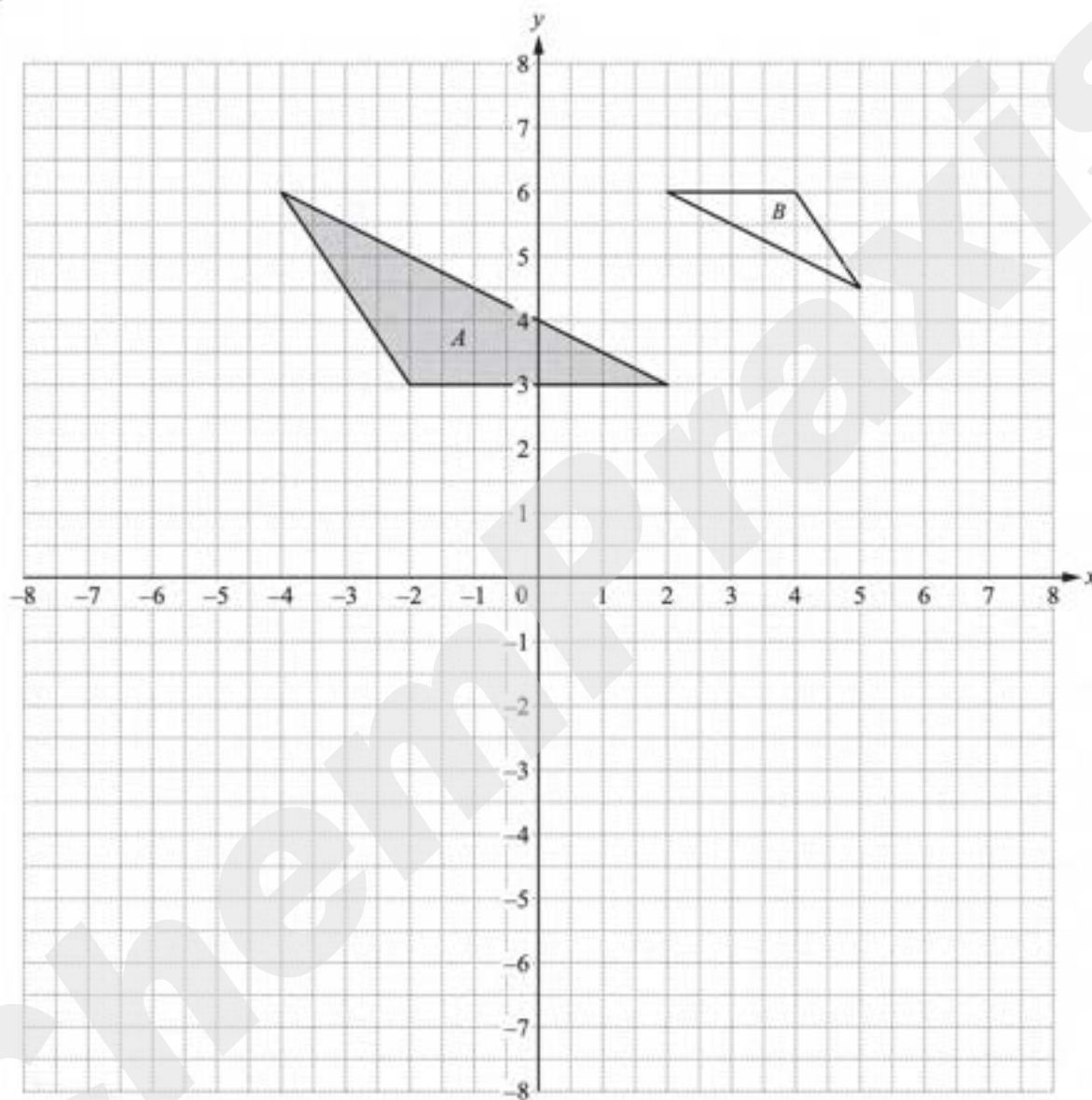
Answer(b)(ii) $\vec{PQ} = \dots\dots\dots$ [2]

(c) Explain what your answers in **part (b)** tell you about PQ and AC .

Answer(c) $\dots\dots\dots$
 $\dots\dots\dots$ [2]

October/November 2014 (42)

4



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

Answer(a)

..... [3]

(b) On the grid, draw the image of

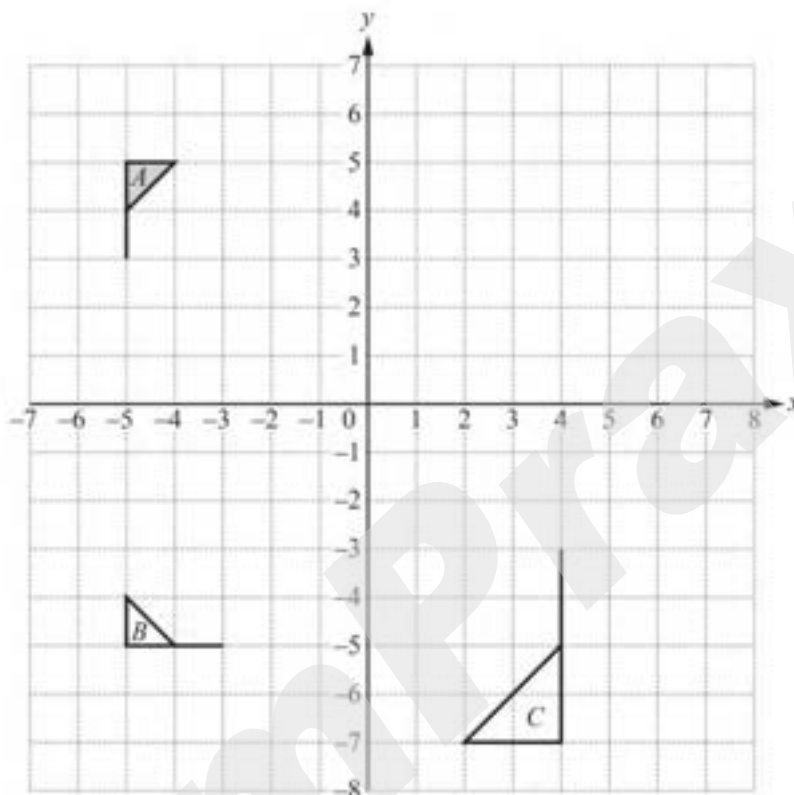
(i) triangle A after a reflection in the line $x = -3$, [2]

(ii) triangle A after a rotation about the origin through 270° anticlockwise, [2]

(iii) triangle A after a translation by the vector $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$. [2]

February/March 2015 (42)

7



(a) Describe fully the **single** transformation that maps

(i) flag *A* onto flag *B*,

Answer(a)(i) [3]

(ii) flag *A* onto flag *C*.

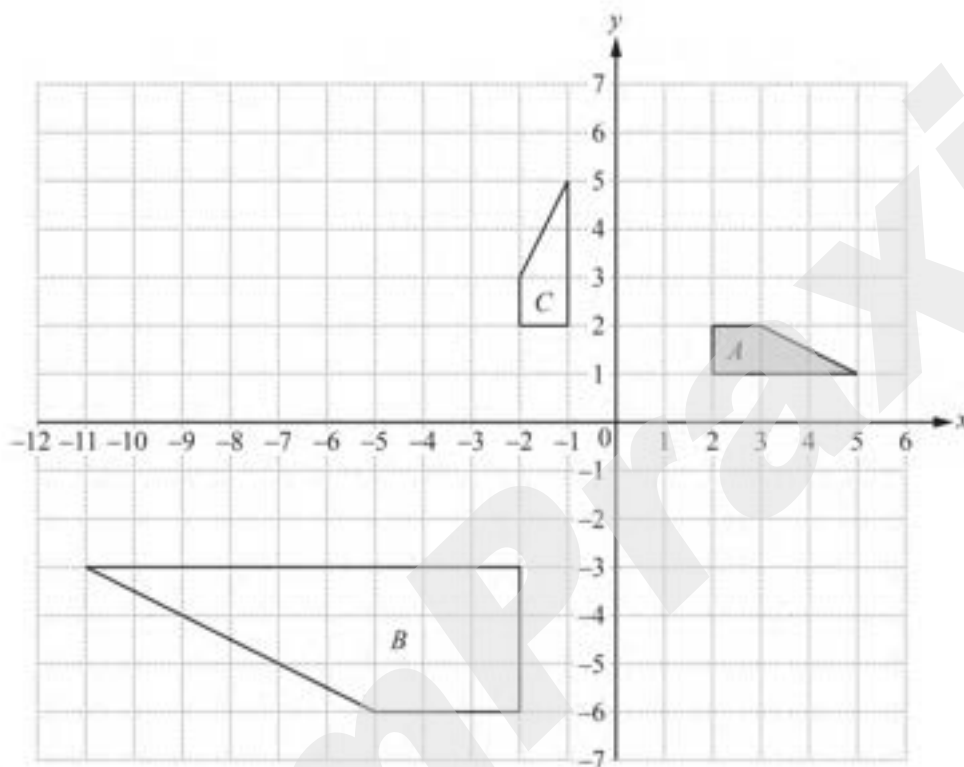
Answer(a)(ii) [3]

(b) Draw the image of flag *A* after a translation by the vector $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$. [2]

(c) Draw the image of flag *A* after a reflection in the line $x = 1$. [2]

May/June 2015 (41)

3



(a) Draw the image of

(i) shape *A* after a translation by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$, [2]

(ii) shape *A* after a rotation through 180° about the point $(0, 0)$, [2]

(b) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

Answer(b)

..... [3]

May/June 2015 (42)

10 (a) $\vec{PQ} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$

(i) Find the value of $|\vec{PQ}|$.

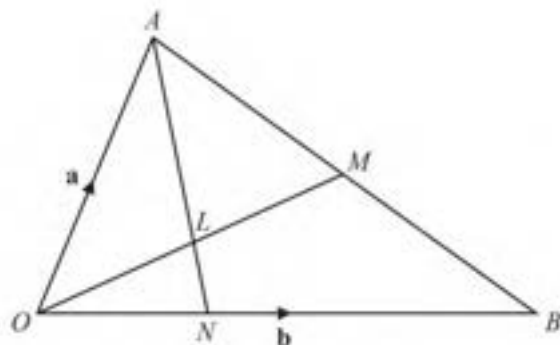
Answer(a)(i) $|\vec{PQ}| = \dots\dots\dots$ [2]

(ii) Q is the point $(2, -3)$.

Find the co-ordinates of the point P .

Answer(a)(ii) $(\dots\dots\dots, \dots\dots\dots)$ [1]

(b)



In the diagram, M is the midpoint of AB and L is the midpoint of OM .
 The lines OM and AN intersect at L and $ON = \frac{1}{2}OB$.
 $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$.

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

 (a) \vec{OM} ,

 Answer(b)(i)(a) $\vec{OM} = \dots\dots\dots$ [2]

 (b) \vec{OL} ,

 Answer(b)(i)(b) $\vec{OL} = \dots\dots\dots$ [1]

 (c) \vec{AL} ,

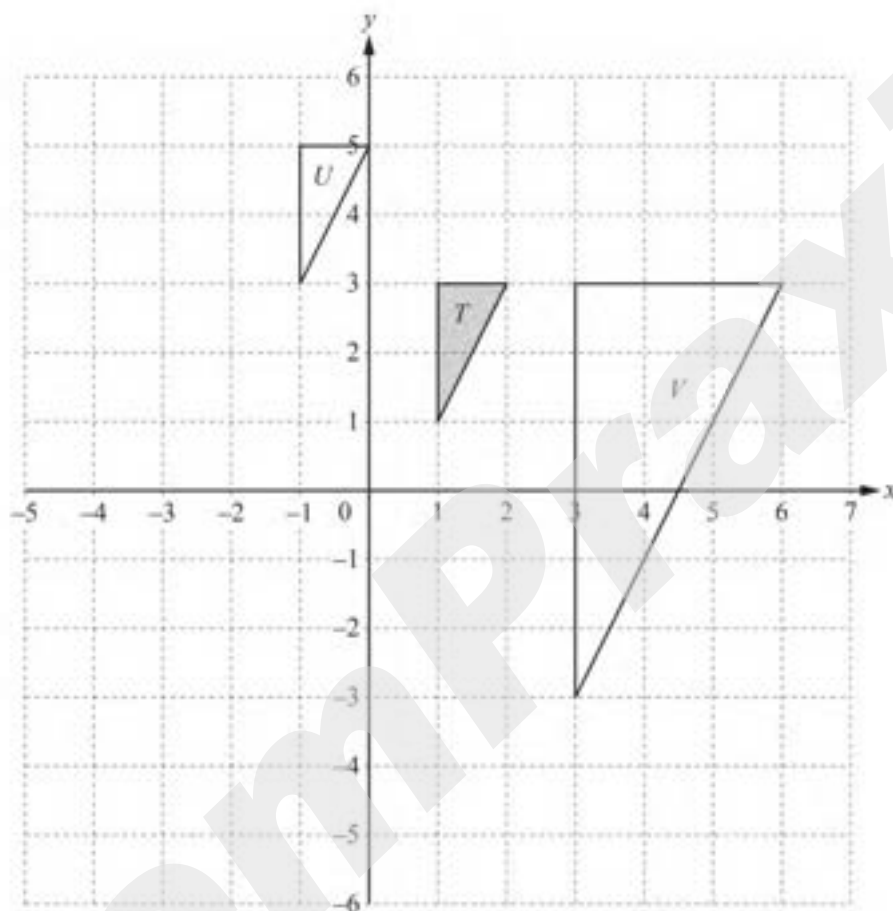
 Answer(b)(i)(c) $\vec{AL} = \dots\dots\dots$ [2]

 (ii) Find the ratio $AL:AN$ in its simplest form.

 Answer(b)(ii) $\dots\dots\dots : \dots\dots\dots$ [3]

May/June 2015 (43)

1



(a) On the grid, draw the image of

(i) triangle T after a reflection in the line $x = -1$,

[2]

(ii) triangle T after a rotation through 180° about $(0, 0)$.

[2]

(b) Describe fully the **single** transformation that maps

(i) triangle T onto triangle U ,

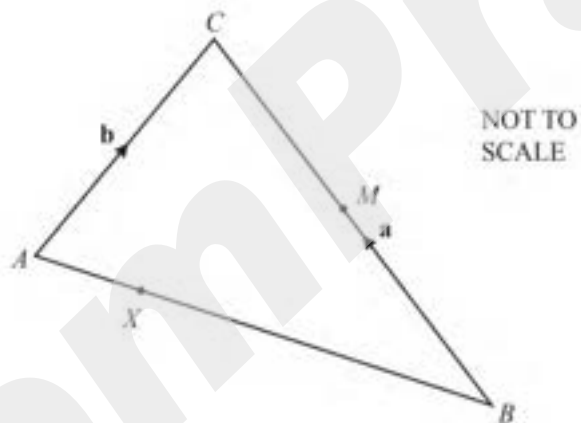
Answer(b)(i) [2]

(ii) triangle T onto triangle V .

Answer(b)(ii) [3]

October/November 2015 (41)

10



$\vec{BC} = \mathbf{a}$ and $\vec{AC} = \mathbf{b}$.

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

Answer(a) $\vec{AB} = \dots\dots\dots$ [1]

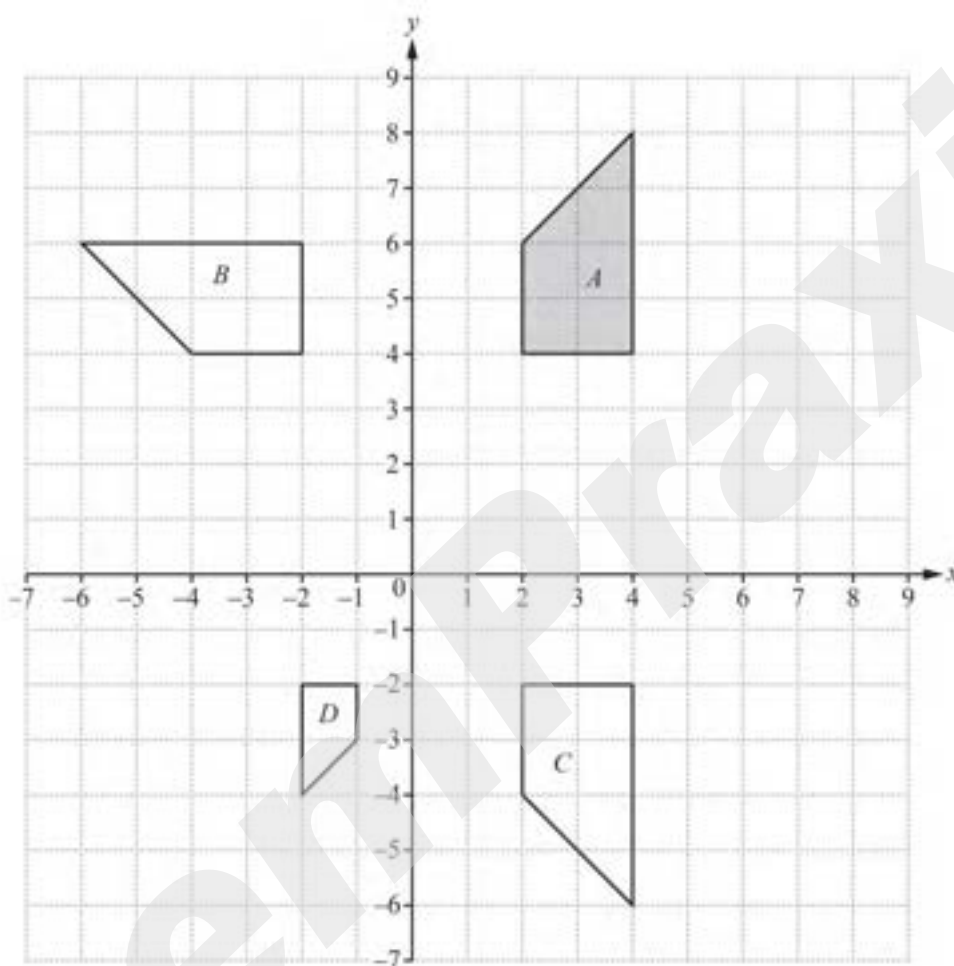
- (b) M is the midpoint of BC .
 X divides AB in the ratio $1:4$.

Find \overrightarrow{XM} in terms of \mathbf{a} and \mathbf{b} .
Show all your working and write your answer in its simplest form.

Answer(b) $\overrightarrow{XM} = \dots\dots\dots$ [4]

October/November 2015 (42)

7



(a) Describe fully the **single** transformation that maps

(i) shape A onto shape B ,

Answer(a)(i) [3]

(ii) shape A onto shape C ,

Answer(a)(ii) [2]

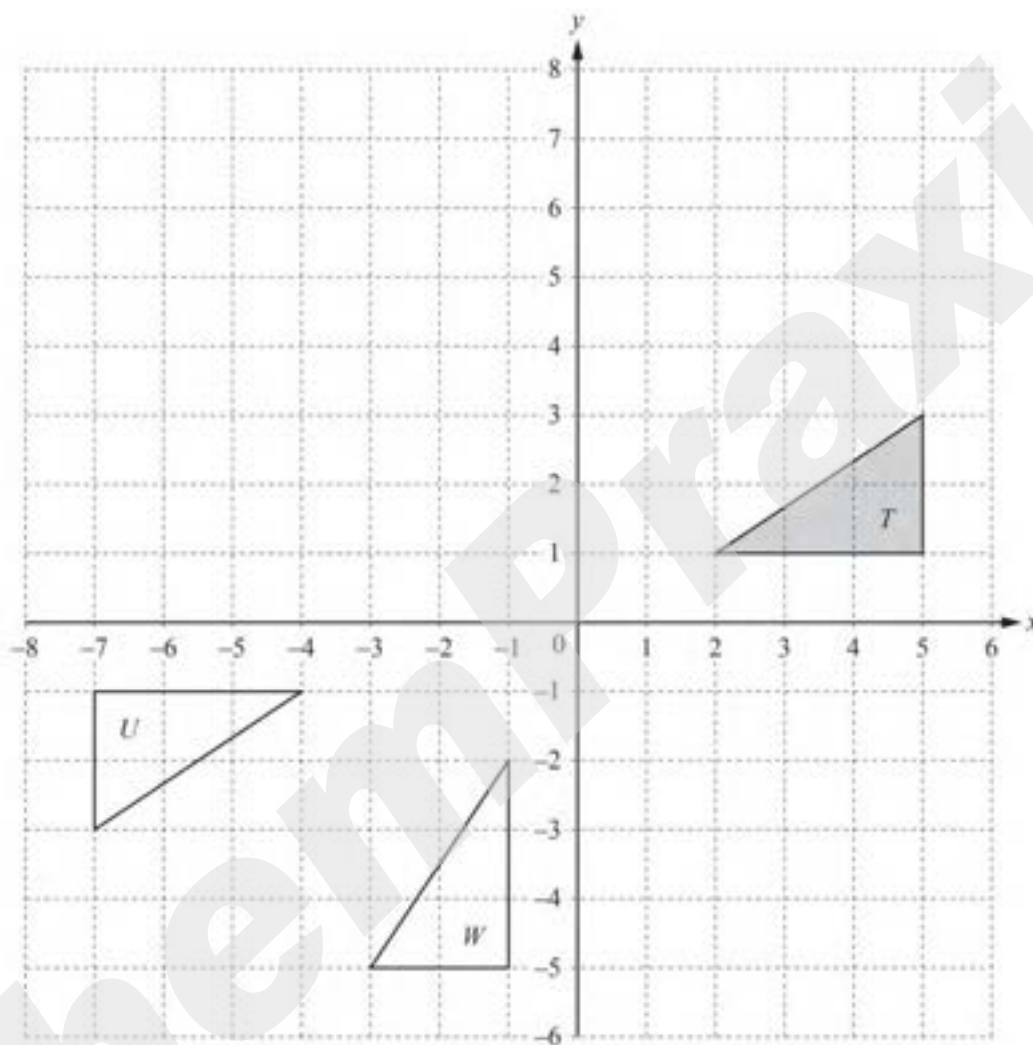
(iii) shape A onto shape D .

Answer(a)(iii) [3]

(c) On the grid, draw the image of shape A after a translation by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$. [2]

October/November 2015 (43)

2



(a) On the grid, draw the image of

(i) triangle T after a translation by the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$. [2]

(ii) triangle T after a reflection in the line $y = -1$. [2]

(b) Describe fully the **single** transformation that maps triangle T onto triangle U .

Answer(b)

..... [3]

(c) (i) Describe fully the **single** transformation that maps triangle T onto triangle W .

Answer(c)(i)

..... [2]