Name: _____ Class: _____

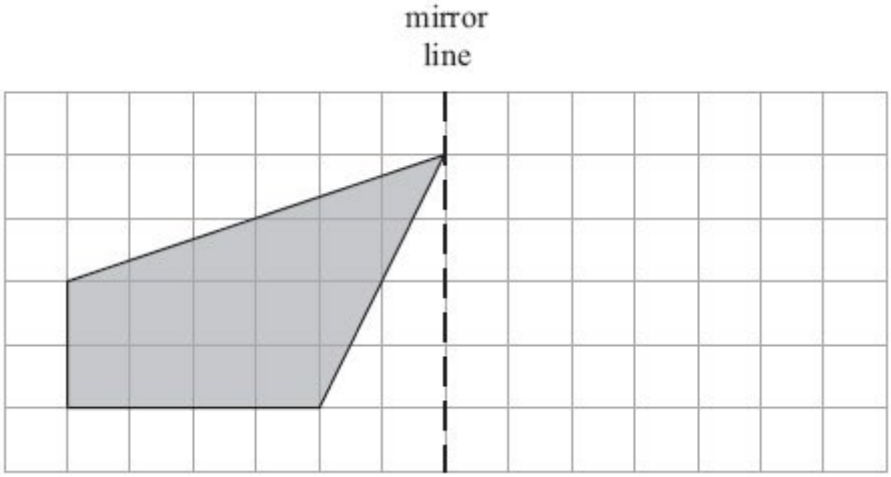
Assessment on Transformations and Vertices (Foundation)

Question	Topic	Score	Possible Score
Q1a	Reflection in a mirror line		2
Q1b	Enlargement on a grid		2
Q1c	Angles in a Quadrilateral		2
Q2	Rotation		2
Q3a	Translate a shape		1
Q3b	Describe a transformation		3
Q4	Adding Vectors		2
Q5a	Describe a transformation		2
Q5b	Draw a rotation		2
Q6a	Perimeter of a shape		1
Q6b	Area of a shape		1
Q6c	Reflect the shape		2
Q7a	Name a quadrilateral		1
Q7b	Calculate the area of the quadrilateral		2
Q7c	Draw a reflection of the shape		2
Q7d	Draw an enlargement		2
Q8	Draw and label column vectors		3

Which area do you need to practise the most?

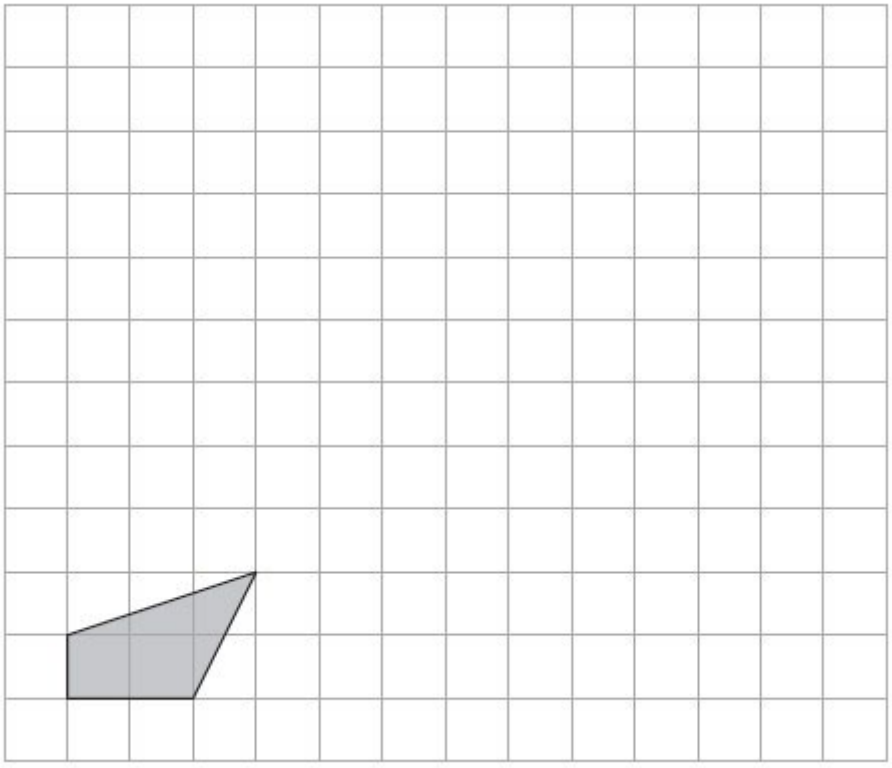
Questions

Q1.



(a) Reflect the shaded shape in the mirror line.

(2)



(b) On the grid, enlarge the shaded shape using a scale factor of 3

(2)

Here is a different shape.

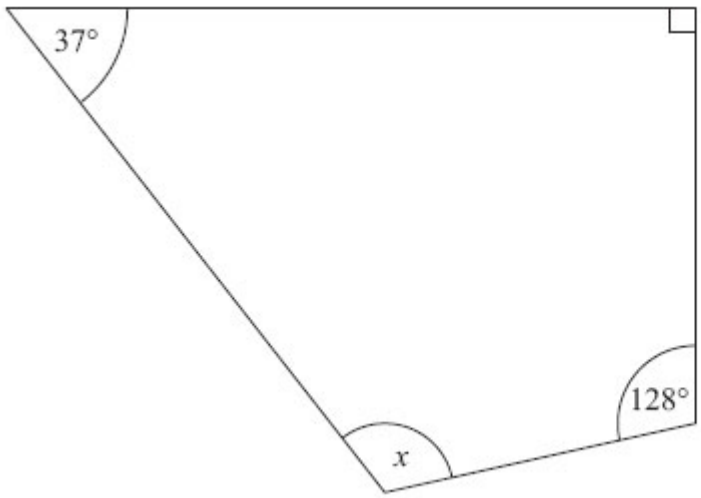


Diagram **NOT** accurately drawn

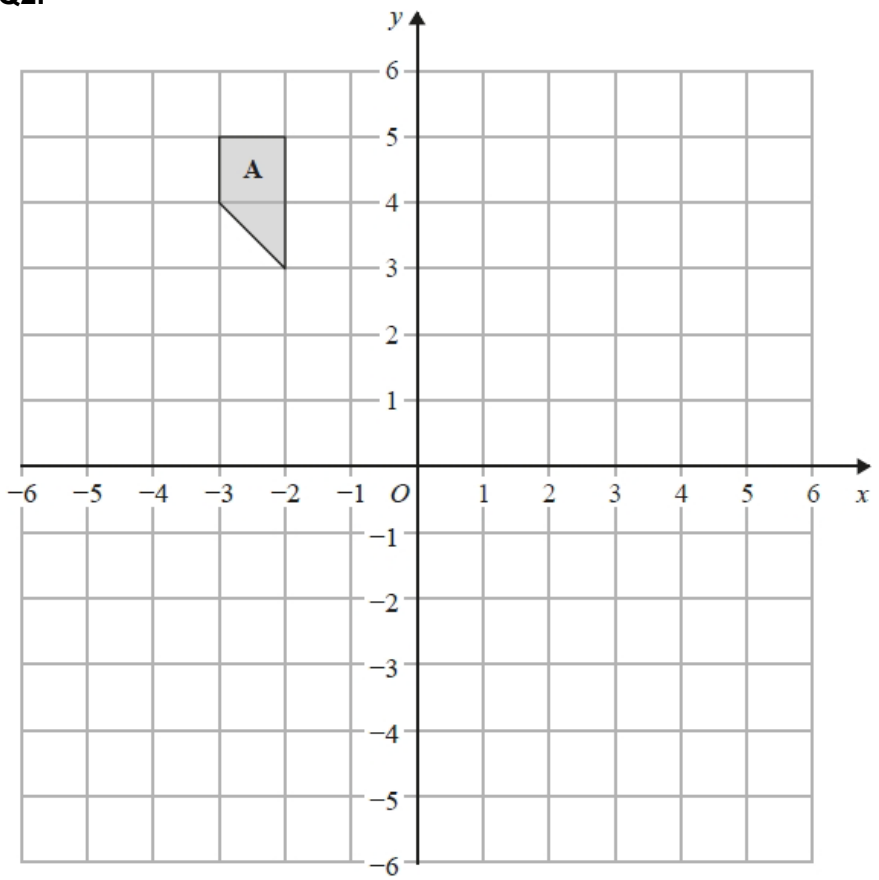
(c) Work out the size of angle *x*.

.....

(2)

(Total for Question is 6 marks)

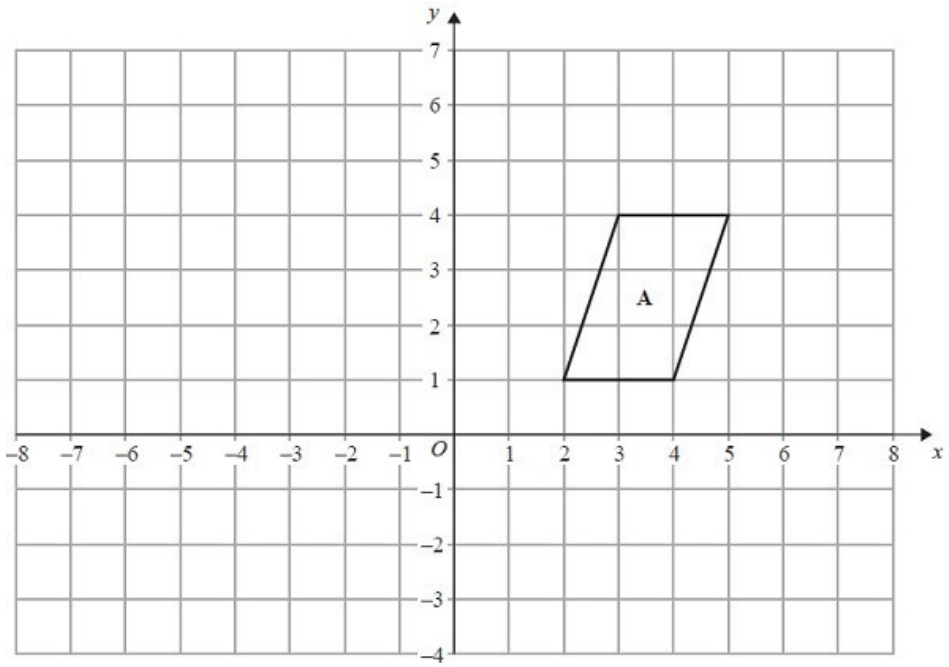
Q2.



Rotate shape **A** 180° about (1, 0)

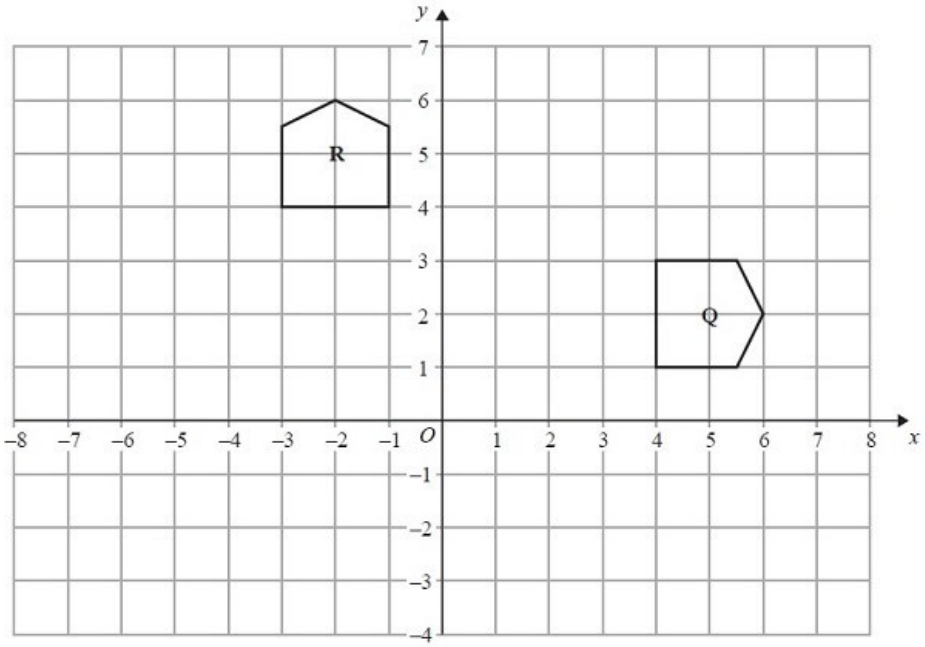
(Total for question = 2 marks)

Q3.



(a) Translate shape **A** by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$.

(1)



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

.....

.....

.....

.....

(3)

(Total for Question is 4 marks)

Q4.

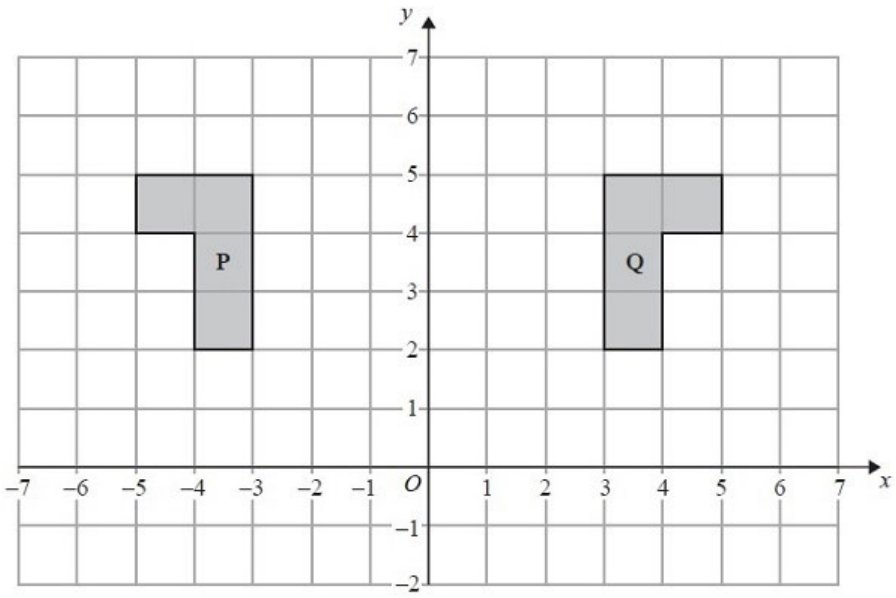
$\mathbf{a} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 7 \end{pmatrix}$

Work out 2**a** + **b** as a column vector.

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

(Total for question = 2 marks)

Q5.
Two shapes are shown on the grid.



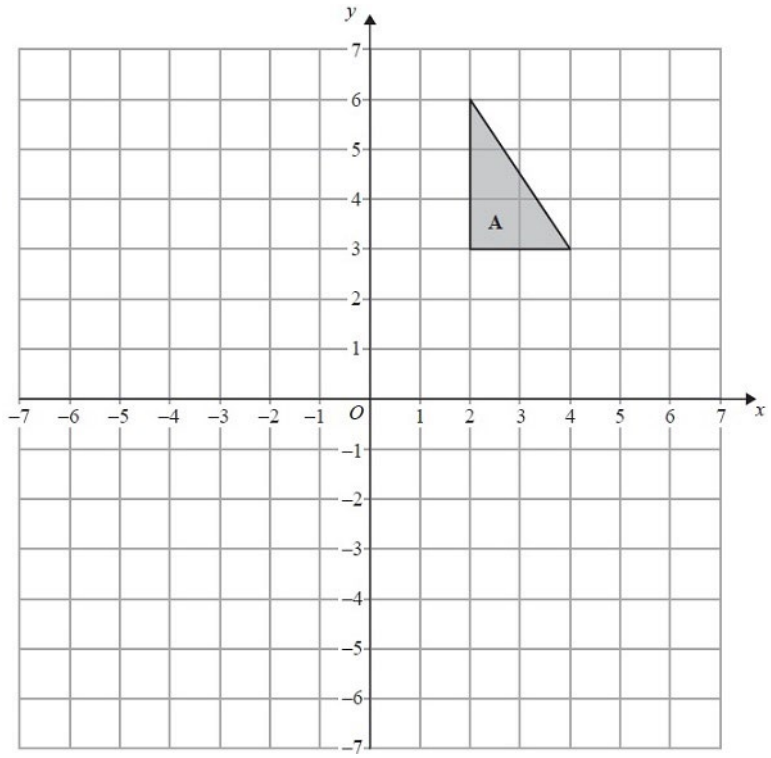
(a) Describe fully the single transformation that maps shape **P** onto shape **Q**.

.....

.....

.....

(2)

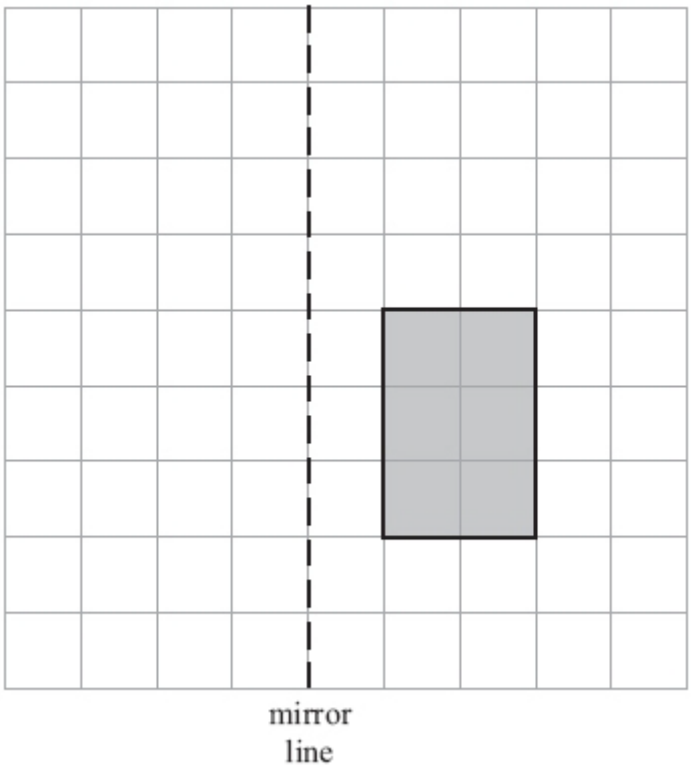


(b) Rotate triangle **A** 90° clockwise about the point (0, 2).
Label the new triangle **B**.

(2)

(Total for Question is 4 marks)

Q6.
Here is a shaded shape on a grid of centimetre squares.



(a) Find the perimeter of the shaded shape.

.....

(1)

(b) Find the area of the shaded shape.

. . . . . cm^2

(1)

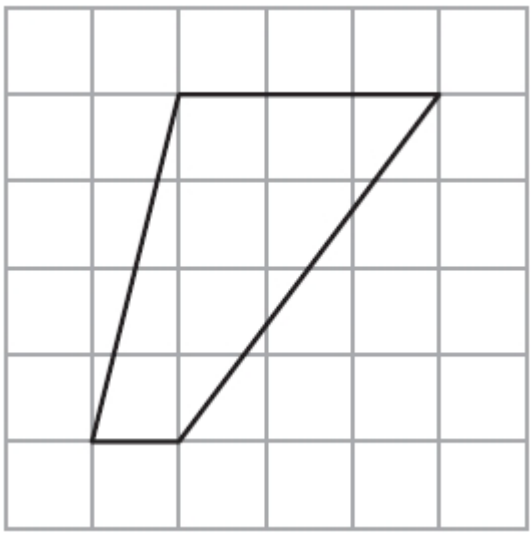
(c) Reflect the shaded shape in the mirror line.

(2)

(Total for Question is 4 marks)

Q7.

A quadrilateral has been drawn on a centimetre grid.



(a) Write down the mathematical name of this quadrilateral.

.....

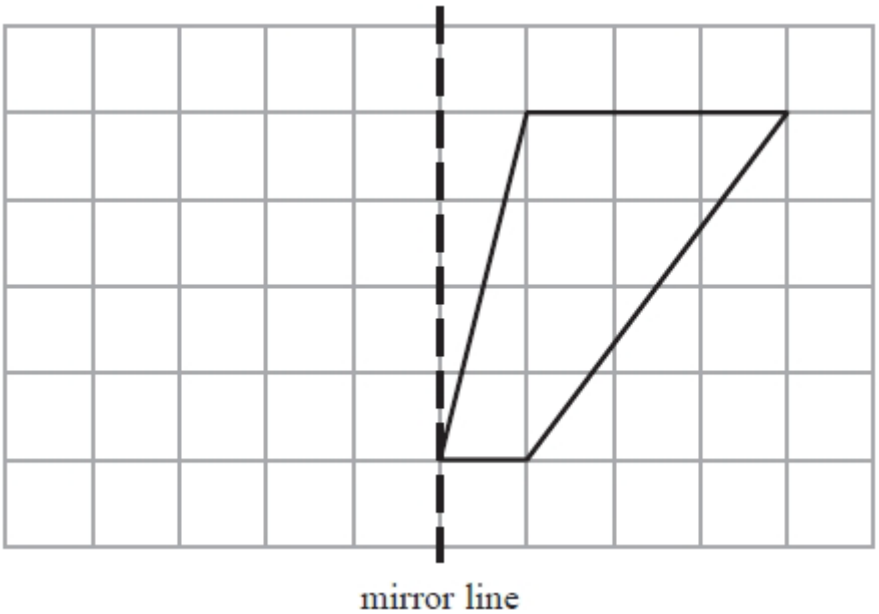
(1)

(b) Work out the area of the quadrilateral.

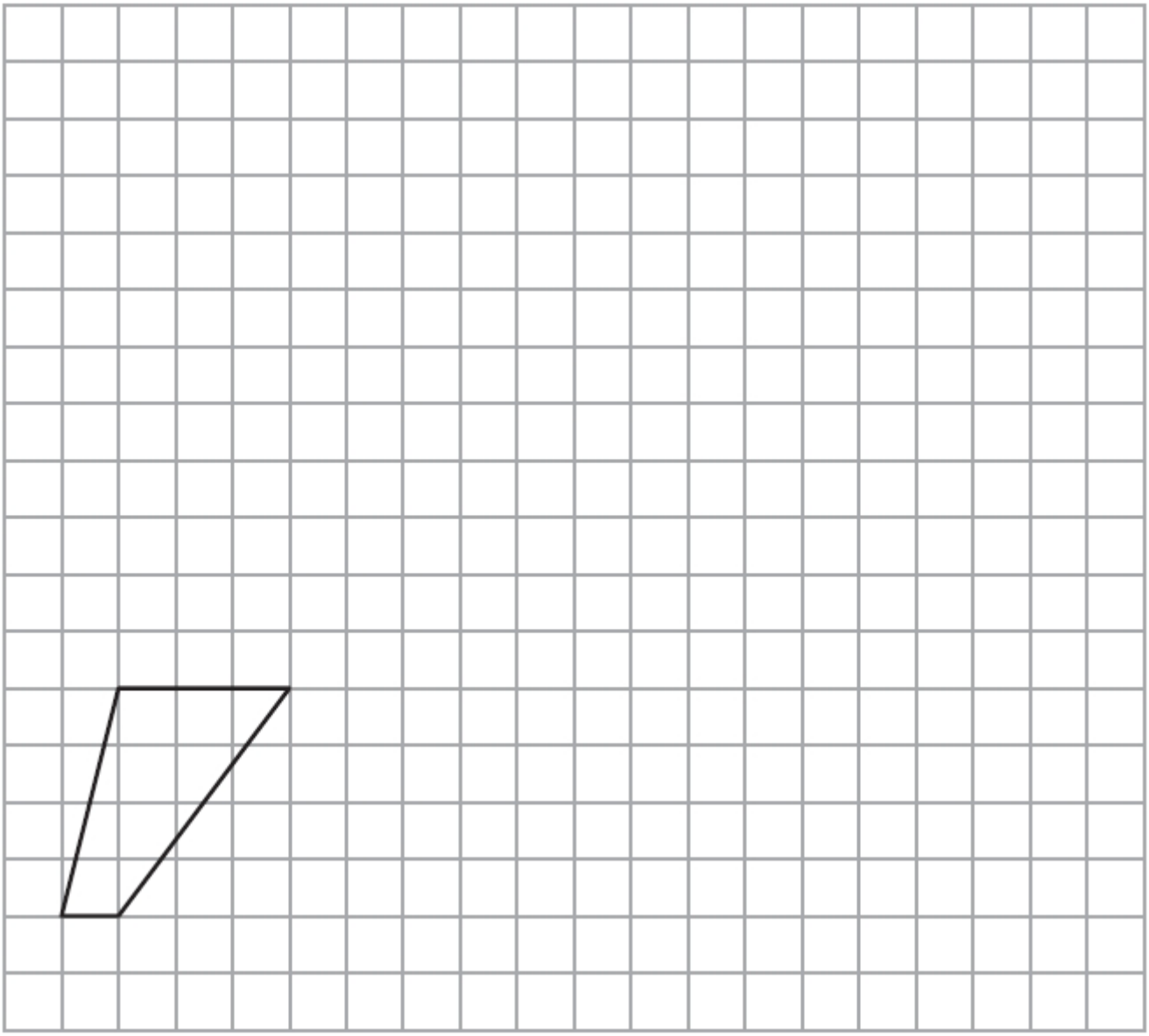
..... cm^2

(2)

(c) On the grid below, reflect the quadrilateral in the mirror line.



(2)



(d) On the grid, draw an enlargement of the quadrilateral with a scale factor of 3

(2)

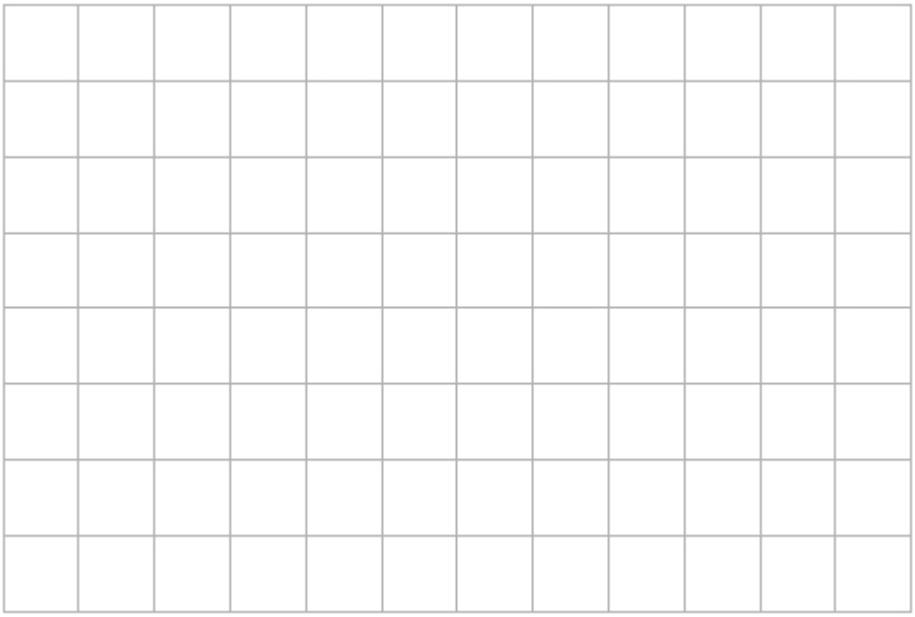
(Total for question = 7 marks)

Q8.

Here are two column vectors.

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

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



(Total for question = 3 marks)

Examiner's Report

Q1.
Part (a) was well answered, with the majority of candidates scoring both marks.
Many candidates scored some marks on part (b). However, fully correct answers were less common in this part of the question.
In part (c), candidates who chose to show working out scored well, although a good proportion thought there are 380° in a quadrilateral. All too often candidates lost all marks, although their answers were close, because there was no working out to mark.

Q2.
This question proved to be a good discriminator between more able students sitting this paper and each of the 0, 1 or 2 marks available was scored by a substantial number of students. The majority of students scored one mark for a rotation of 180 degrees, demonstrated by the correct orientation of the shape, while being unable to place their image in the correct place on the grid. Of those students not able to score any marks, many had rotated the shape by 90 degrees. Students are reminded that tracing paper may be used in the examination to help them with this type of question.

Q3.
Errors in part (a) involved transposing the *x* and *y* parts of the vector or moving the shape to a position where one vertex was at (−3, 2). Others used the vector incorrectly to move the top right (5,3) vertex to (0, 6), the position that top left (3,4) vertex should have after translation.

Incorrect mathematical language and lack of detail spoiled many descriptions in part (b) with "turn" often given instead of rotation and errors or omissions with the direction or centre. Students need to be clear about which of the 2 diagrams is being rotated to prevent errors with direction. All marks were lost when a candidate introduced a second transformation, usually a translation.

Q4.
For the final question on this examination paper, this was answered quite well with about half of all students gaining at least one mark. The correct doubling of vector a was often seen although sometimes written as a fraction $\frac{10}{4}$ occasionally, only the 5 was doubled. Answers of $\begin{pmatrix}-11\\11\end{pmatrix}, \begin{pmatrix}11\\11\end{pmatrix}, \begin{pmatrix}9\\9\end{pmatrix}$ and $\begin{pmatrix}4\\9\end{pmatrix}$ were the most common incorrect offerings.

Q5.
In part (a), the majority of candidates scored at least one mark, usually for identifying the transformation as a reflection. Whilst the correct line was often quoted, many were confused or contradicted themselves with incorrect alternatives. For example, "a reflection in the y -axis (y = 0)" was quite common. In part (b), the correct answer was the modal answer. However many correctly rotated the given shape through 90° clockwise but not about the given point. Some candidates offered 'correct' rotations of either 90° anticlockwise or 180°.

Q6.
This question was very well answered with few candidates getting confused between perimeter and area.

A number of candidates gave the correct perimeter with a similar proportion of candidates gaining the mark for the area in part (b). The reflection was carried out correctly by the majority of the candidates.

Q7.
In part (a) there was a variety of answers, including rhombus, parallelogram, quadrilateral, but less frequently trapezium. In part (b) any method to count squares proved fruitless since the part squares were

too difficult to judge.
Greater success was demonstrated by those who divided the shape into triangles and/or rectangles. Part (c) was very well answered. In part (d) students usually gave correct lengths for the top and bottom of the shape, but producing correct sloping sides was more problematic.

Q8.
This question was answered poorly with relatively few students showing an understanding of vector arithmetic. Some students scored the first method mark for 5 – 2 × 3 or 2 – 2 × – 1. When $\begin{pmatrix}5\\2\end{pmatrix}-\begin{pmatrix}6\\-2\end{pmatrix}$ was seen it was often not simplified correctly with errors usually occurring in the *y* component. Students that scored the second mark for simplifying to $\begin{pmatrix}-1\\4\end{pmatrix}$ were rarely able to achieve the final mark for drawing the vector. Some students attempted to find the vector **a** – 2**b** by drawing but most could not manage even the first step. At all stages of the question the drawing of vectors was extremely poor and very few students drew any kind of correct vector.

Mark Scheme

Q1.

		Working	Answer	Mark	Notes
	(a)		reflection	2	B2 for correct reflection in correct position (B1 for at least 2 vertices in the correct position)
	(b)		enlargement	2	B2 for correct enlargement scale factor 3 (B1 for at least 2 lines correctly enlarged or any enlargement using an incorrect scale factor, sf ≠ 1)
	(c)		105	2	M1 for 360 – (90 + 128 + 37) oe or *x* + 90 + 128 + 37 = 360 A1 cao

Q2.

Question	Answer	Mark	Mark scheme	Additional guidance
	Shape drawn	B2	for shape with vertices at (4, –3), (5, –4), (5, –5), (4, –5)	Shape does not have to be shaded. Allow some tolerance on vertices as long as they are nearest to the desired points.
		(B1	for rotation of 180° about wrong centre)	This is shown by the orientation of the shape.

Q3.

PAPER: 1MA0_1F					
Question		Working	Answer	Mark	Notes
	(a)		Shape with vertices at (–1, 3), (0, 6), (2, 6), (1, 3)	1	B1 for correct shape in correct position
	(b)		Rotation centre (0,0) 90° anticlockwise	3	B1 Rotation B1 (centre) (0,0) or *O* or origin B1 90° anticlockwise or 270° clockwise Note: award no marks if more than one transformation is given

Q4.

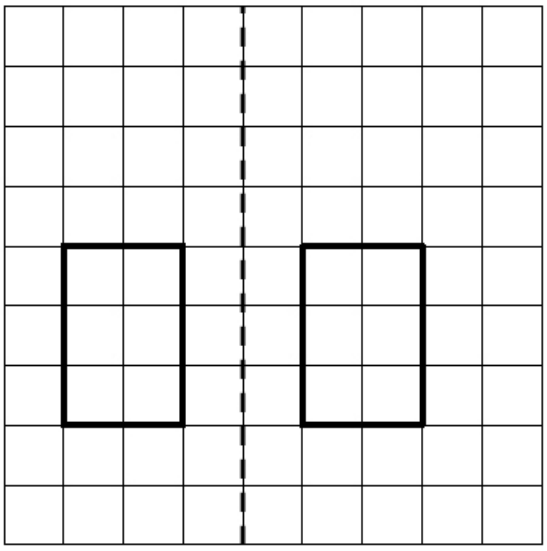
Question	Answer	Mark	Mark scheme	Additional guidance
	$\begin{pmatrix}9\\11\end{pmatrix}$	M1	for $\binom{2\times5}{2\times2}$ [= $\binom{10}{4}$] or $2 \times 5 - 1$ (= 9) or $2 \times 2 + 7$ (= 11)	
		A1	cao	

Q5.

PAPER: 5MB3H 01				
Question	Working	Answer	Mark	Notes
(a)		Reflection in $x = 0$ or y-axis	2	B1 for reflection B1 for $x = 0$ or y-axis (NB: a combination of transformations gets B0)
(b)		Triangle (1, 0)(4, 0)(1, –2)	2	M1 for any correct rotation of 90° clockwise OR for any correct rotation about the point (0, 2) A1 for a triangle with vertices at (1, 0), (4, 0) and (1, –2)

Q6.

Question		Working	Answer	Mark	Notes
	(a)		10	1	B1 cao
	(b)		6	1	B1 cao
	(c)		Correct image	2	B2 cao (B1 for reflection in a line parallel to the given line)



Q7.

Question	Working	Answer	Mark	Notes
(a)		trapezium	1	B1 cao
(b)		8	2	M1 for a strategy to find the area, eg splitting the shape into two triangles or drawing a rectangle around it or using the formula for the area of a trapezium A1 cao
(c)		Shape reflected	2	B2 for correct reflection drawn (B1 for 3 vertices correct or correct orientation, incorrect position)
(d)		Enlargement sf 3 drawn	2	B2 correct enlargement drawn (B1 for any two sides correct or a correct enlargement with scale factor other than 3)

Q8.

Question	Answer	Mark	Mark scheme	Additional guidance
	Vector drawn	M1	for $5-2\times3$ (= –1) **or** $2-2\times-1$ (= 4) seen as a calculation **OR** for $\begin{pmatrix}5\\2\end{pmatrix}-\begin{pmatrix}2\times3\\2\times-1\end{pmatrix}$ **OR** for $\begin{pmatrix}-1\\b\end{pmatrix}$ **or** $\begin{pmatrix}a\\4\end{pmatrix}$ **OR** for $\begin{pmatrix}5\\2\end{pmatrix}$ **or** $\begin{pmatrix}-3\\1\end{pmatrix}$ **or** $\begin{pmatrix}-6\\2\end{pmatrix}$ drawn	May be in a column vector Condone missing arrows
		M1	for $\begin{pmatrix}-1\\4\end{pmatrix}$ **OR** for $\begin{pmatrix}-1\\4\end{pmatrix}$ drawn with no arrow or incorrect arrow **OR** for $\begin{pmatrix}-1\\b\end{pmatrix}$ **or** $\begin{pmatrix}a\\4\end{pmatrix}$ drawn with arrow, where $b\neq4$ and $a\neq-1$	
		A1	cao	For this mark the drawn vector must include an arrow showing direction.