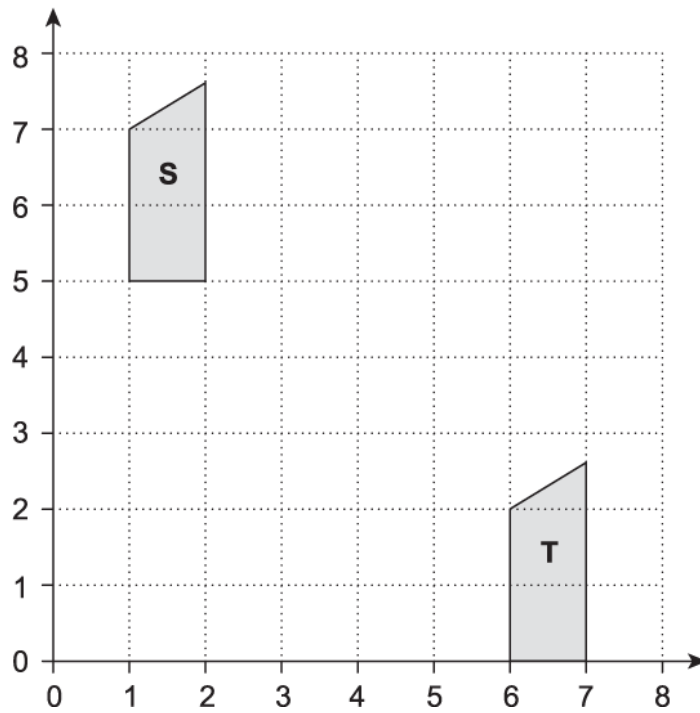1. Here is a coordinate grid.
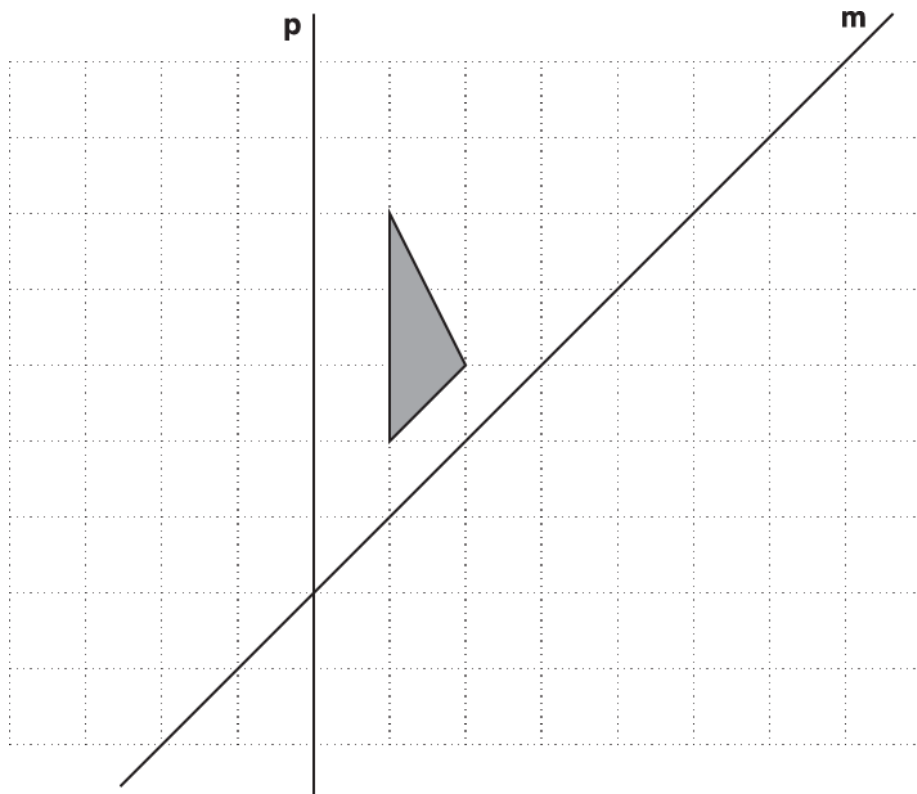

Shape S is translated to Shape T using vector $\begin{pmatrix} p \\ q \end{pmatrix}$.

Write down the values of p and q.

$p =$ _____

$q =$ _____ [2]

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2(a). This is a triangle drawn on a grid.

Reflect the triangle in line **p** on the grid.

[1]

(b). Reflect the triangle in line **m** on the grid.

[2]

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3(a). Triangle **P** is drawn on a grid.
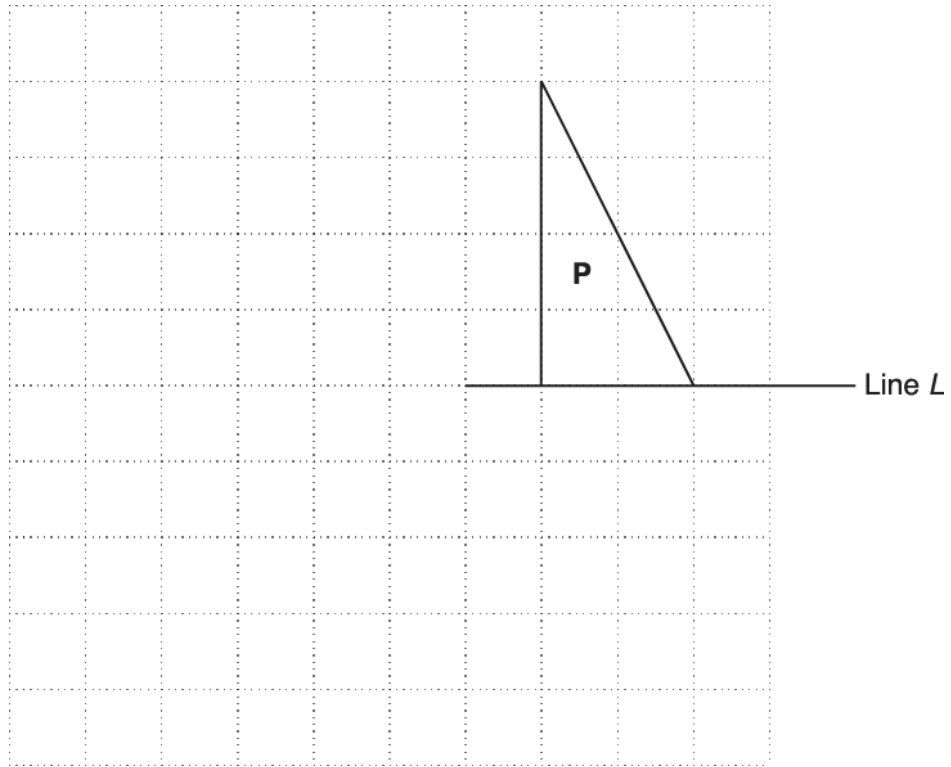
On the grid, draw the reflection of triangle **P** in the line *L*.

[1]

(b). Put a ring around the **one** property of triangle **P** that stays the same

- when triangle **P** is reflected in the line *L* **and also**
- when triangle **P** is enlarged with scale factor 2.
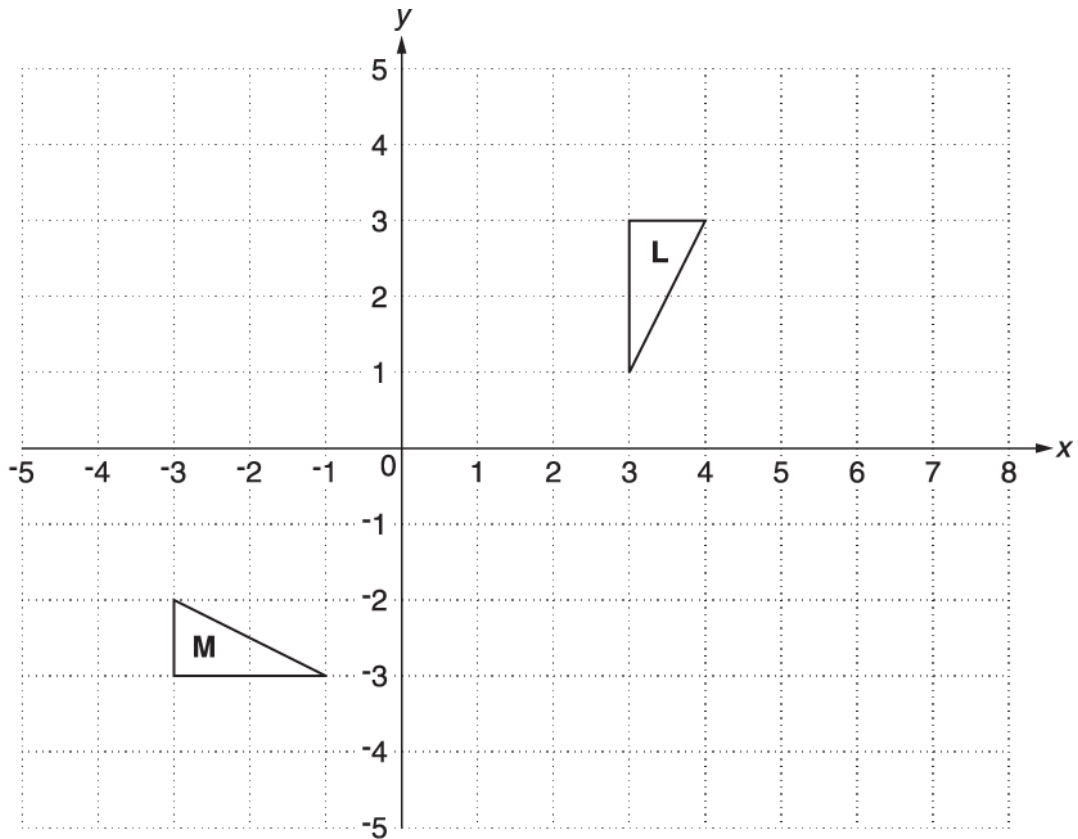
Lengths   Angles   Areas   Perimeters

[1]

4(a). Triangles **L** and **M** are drawn on the grid below.

Describe fully the **single** transformation that maps triangle **L** onto triangle **M**.

_____

_____ **[3]**

(b).
Translate triangle **L** using the vector $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$. Label your image **T**.
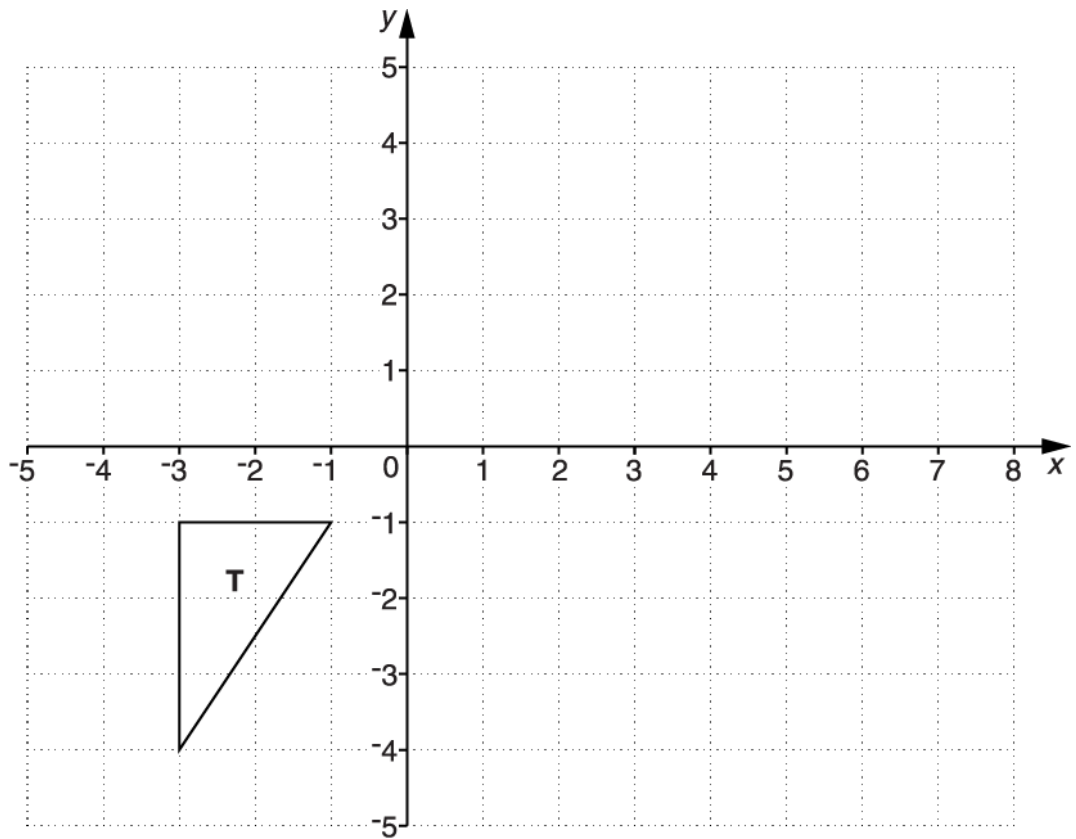
[2]

(c). With the transformations in **(a)** and **(b)** both the lengths *and* the angles in the image are the same as in the original shape.

Describe what would happen to the lengths and angles in triangle **L** after an enlargement of scale factor 4.

_____

_____

_____ **[2]**

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5(a). The grid shows triangle **T**.

Reflect triangle **T** in the *x*-axis.

Label the image **A**.

[2]

(b). Rotate triangle **T** 180° about the point (0, 0).
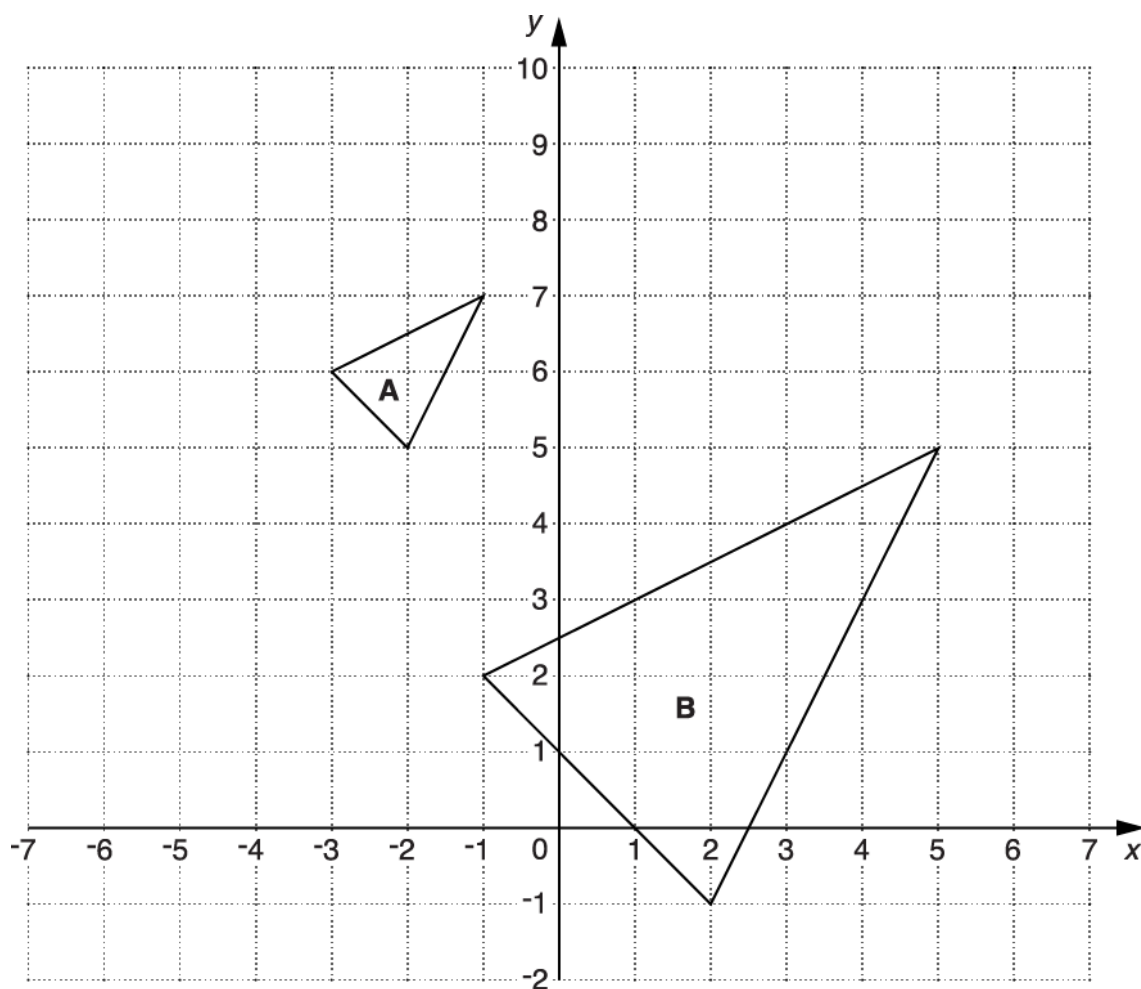
Label the image **B**.

[2]

(c).
Translate triangle **T** by $\begin{pmatrix} 7 \\ 3 \end{pmatrix}$.

Label the image **C**.

[2]

6. Triangles **A** and **B** are drawn on the grid.

Translate triangle **A** by $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$.

Label the image **C**.

[2]

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7(a). Triangle **T** is drawn on the grid below.
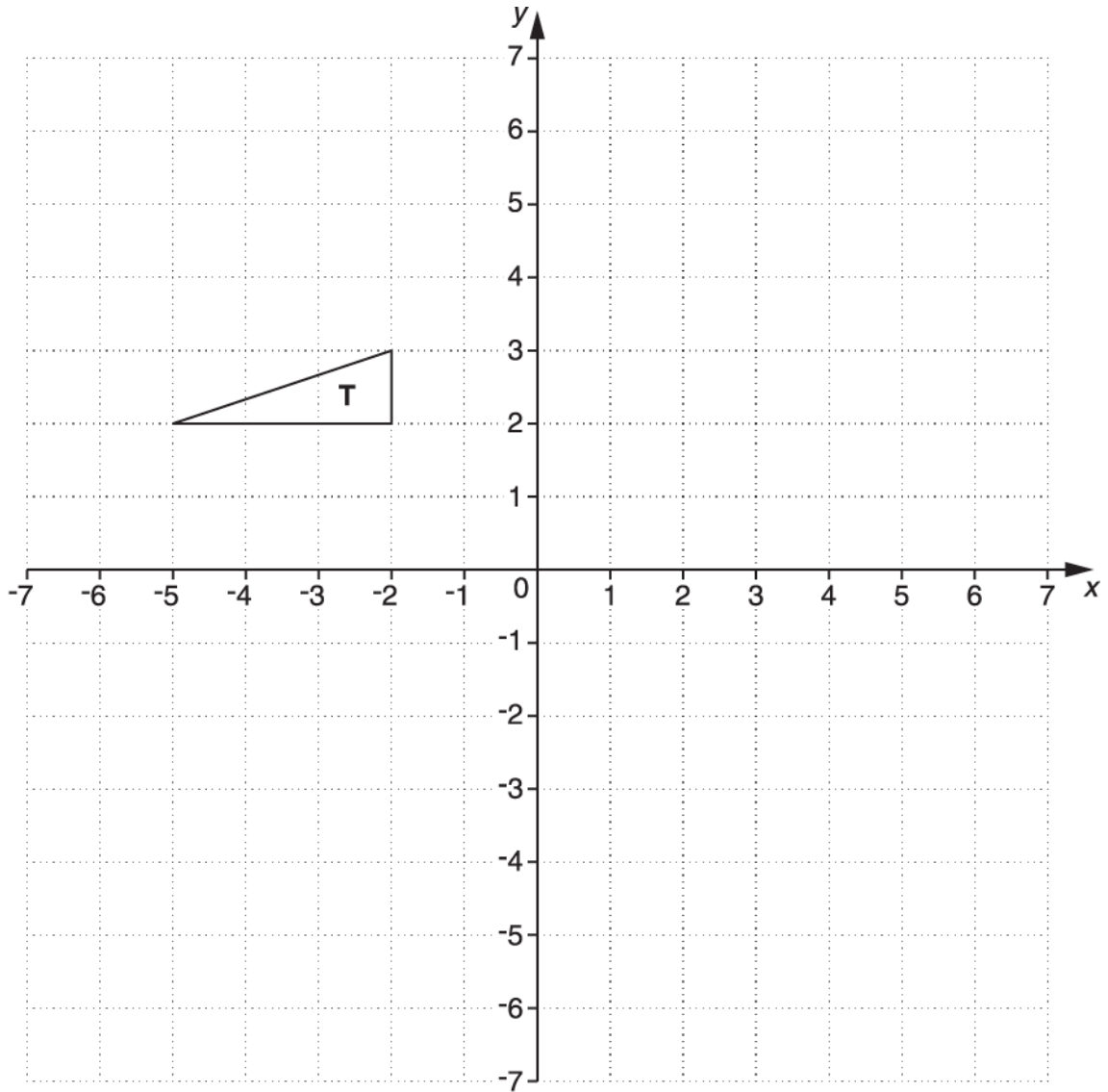
Translate triangle **T** by $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.

Label the image **A**.

[1]

(b). Reflect triangle **T** in the line $y = 4$.

Label the image **B**.

[2]

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8(a). In the diagram below, reflect the quadrilateral in the line **m**.

[1]

(b). In the diagram below, reflect the quadrilateral in the line **n**.

[1]

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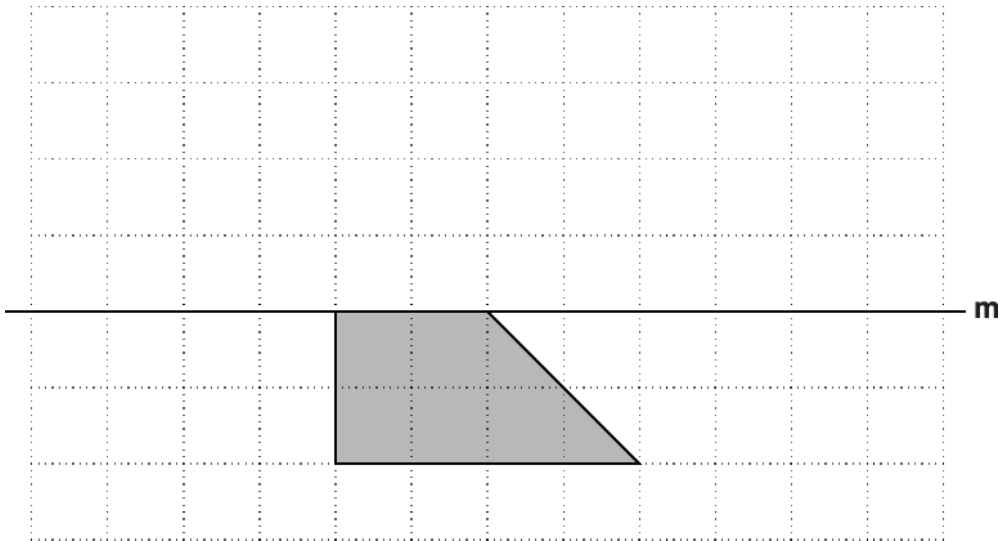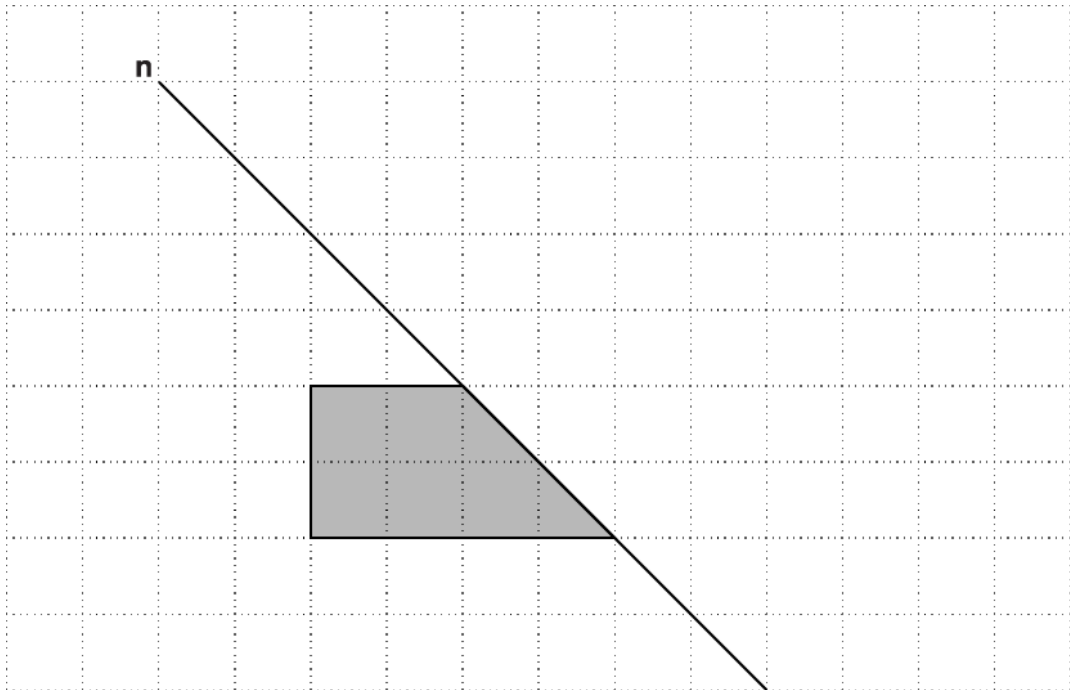
9. Reflect the shape in the line *m*.

[2]

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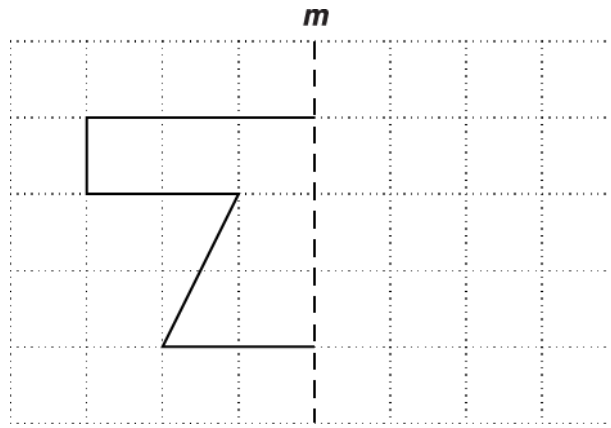
10(a) Triangle **A** and triangle **B** are drawn on the coordinate grid.
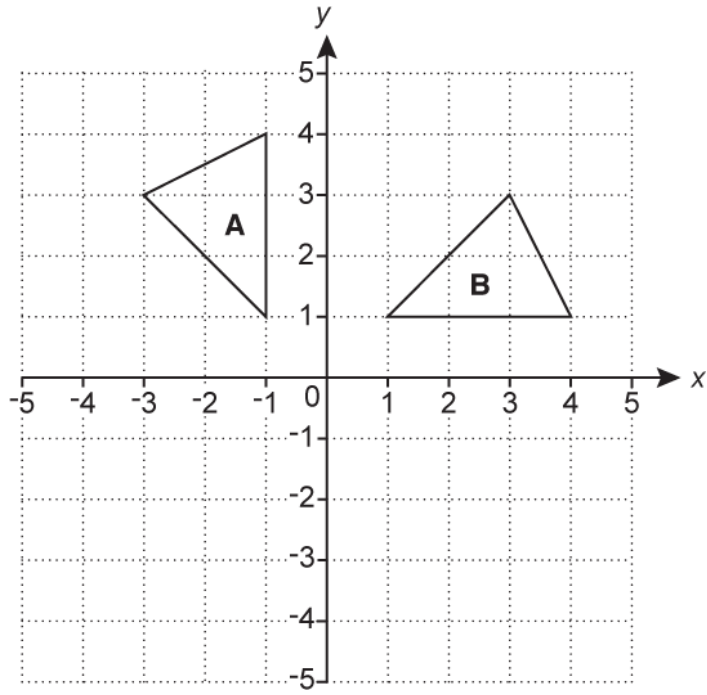
Translate triangle **A** by vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$.

[2]

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

-- [3]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1			[*p* =] 5 [*q* =] –5	2	**B1** for each	
			Total	2		
2	a		correct reflection	1		See overlay Condone freehand, mark clear intent **Examiner's Comments** This was successfully drawn by most.
	b		correct reflection	2	**B1** for one correct line or a translation of correct reflection	See overlay Condone freehand, mark clear intent **Examiner's Comments** Reflecting in a sloping line proved difficult with many not scoring full marks.
			Total	3		
3	a		Correct reflection	1	**Examiner's Comments** Part (a) was quite well done and many candidates used a ruler and pencil. A common error was to reflect in a vertical line even though line *L* was given.	Use overlay vertices within circles Lines should be ruled or very good freehand
	b		Angles only indicated	1	Accept any clear indication	
			Total	2		
4	a		Rotation 90° anticlockwise [Centre] (3, –3)	3	Allow **1** each line 0 if > one transformation given	Or rotate, rotates, rotated. Condone 'turn' Or 270° clockwise Allow 'about', 'point', origin etc

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b		Image at (5, –1), (6, –1), (5, –3)	2	Allow **1** if translated $\begin{pmatrix} 2 \\ p \end{pmatrix}$ or $\begin{pmatrix} q \\ -4 \end{pmatrix}$	Use overlay Condone freehand. Mark intention.
	c		Lengths × 4	1	Do not accept "The shape" or "measurements" for "lengths"	Condone "Lengths increase by 4" but not "Lengths increase by 4cm"
			Angles unchanged oe	1	**Examiner's Comments** This was the first common question with Higher Tier and many found it hard. The common error in part (a) was to describe a combination of transformations which scored no marks. Candidates need to appreciate the reason why **single** is emboldened in the question. Those who did answer with a single transformation often gave a partial description such as rotation, or turn, sometimes with 90°, but did not mention anticlockwise or the centre (3, –3). Part (c) revealed that many candidates thought that angles were enlarged under enlargement. Some gave poor descriptions such as "It will get bigger". A full description including "lengths multiplied by 4" or the equivalent was rarely seen.	Ignore comments about congruence or similarity etc **Exemplar Response** The size of L would increase by 4 × its original size (0) The lengths and angles will become 4 × bigger of triangle L. Also it will the image is not the same as the original shape (1 0) They would all increase and become 4 times larger (1 0) It will be 4 times bigger of triangle L from point (0, 0) (0) The angles will be the same after enlargement but the lengths will be different (0 1) Angles will stay the same, lengths would be divided by 4 (0 1) The angles would remain the same. The lengths would increase by 4 (1 1) The lengths would increase however the angles would stay the same (0 1) The sides would all multiply in size by 4 so it would be 8 high and wide (1 0) They would all increase by 4 times the size (1 0) The angles would be the same because the triangles would be congruent but the

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Question			Answer/Indicative content	Marks	Part marks and guidance
					sides would be 4 times larger (1 1) It will be 4 times as large as its original size (0) The lengths would double but the angles stay the same. (0 1) The angles would stay the same but the lengths would be increased by 4. You would have to multiply the existing lengths by 4 to obtain the new lengths. (1 1)
			Total	7	

Question			Answer/Indicative content	Marks	Part marks and guidance	
5	a		Correct reflection (–1, 3), (–3, 4), (–3, 1)	2	**B1** for reflection in *x* = 0 **Examiner's Comments** The work on transformations seemed better on this paper than in the past. Many used a ruler to good effect. However, untidy diagrams still appeared. The most common answer was the reflection in the wrong axis.	Use overlay
	b		Correct rotation (1, 1), (3, 1), (3, 4)	2	**B1** for rotation 90° or wrong centre **Examiner's Comments** Few gave the correct transformation but many gave a "correct" rotation about the wrong centre to score a mark.	
	c		Correct translation (4, 2), (–1, 1), (–3, 4)	2	**B1** for translation 7 right or 3 up **Examiner's Comments** The translation was the worst answered part with few giving the correct transformation. There was no pattern to the errors though it may have been to go one square too far in each direction. However, enlargements, rotations and reflections were all seen.	Use overlay
			Total	6		

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Question			Answer/Indicative content	Marks	Part marks and guidance	
6			Correct translation Vertices (–5,4), (–6,5), (–4,6)	2	**B1** for correct horizontal or vertical movement **SC1** for triangle with vertices (–4, 3), (–3, 2), (–2, 4) **Examiner's Comments** There were some correct responses to this translation. Many confused the translation vector with coordinates and moved the triangle so that one of its vertices had coordinates (⁻3,1). A few moved the triangle ⁻3 down and ⁻1 across for which they were awarded 1 mark.	Clear intention Use overlay
			Total	**2**		
7	a		Triangle A vertices (1, 1), (4, 1), (4, 2)	1	**Examiner's Comments** Translations were not understood by most candidates. Many positioned their triangle with a vertex at (6, –1) rather than moving the triangle 6 across and 1 down.	Accept freehand in both parts Does not need to be labelled
	b		Triangle B vertices (⁻2, 5), (⁻2, 6), (⁻5, 6)	2	**B1** for translation of correct B **Examiner's Comments** Few candidates gave a correct reflection. Some reflected their triangle in the *y* axis rather than the line *y* = 4. A small number reflected triangle **A** rather than triangle **T**, for which they were given some credit.	Does not need to be labelled
			Total	**3**		

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Question			Answer/Indicative content	Marks	Part marks and guidance	
8	a		Correct Reflection	1	**Examiner's Comments** Incorrect reflections were rare.	See overlay Accept freehand if **intention is clear**, does not need to be accurate
	b		Correct Reflection	1	**Examiner's Comments** There were, encouragingly, many correct responses, however some candidates attempted to do some sort of reflection in a vertical line and ended up with a rectangle.	See overlay Accept freehand if **intention is clear**, does not need to be accurate
			Total	2		
9			Correct reflection (±2 mm)	2	**B1** for 2 vertices correct **Examiner's Comments** The majority of candidates scored both marks. If anything was incorrect it was usually the bottom right vertex extending too far to the right.	excluding those on the mirror line see overlay condone freehand
			Total	2		

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Question			Answer/Indicative content	Marks	Part marks and guidance		
10	a		Correct triangle	2	**B1** for a correct horizontal or a correct vertical movement of **A**	Vertices in circles of overlay. Accept good freehand.	
					Examiner's Comment Many used a ruler to draw the triangle in this part, though by no means all. Most drawings that were correctly translated were in tolerance; the majority of triangles that were incorrect were translated 1 square too many to the right and/or down. Very few images were in the wrong quadrant.		

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Question			Answer/Indicative content	Marks	Part marks and guidance		
	b		Rotation	B1	Not turn	Second and third marks may still be scored if "Rotation" incorrect	
			[centre] (0,0) oe	B1	Accept origin or O but not vector		
			90 clockwise oe	B1	Accept –90 or 270 [anti-clockwise]	0 marks for evidence of a second transformation	
					Examiner's Comment In this part, some good answers were seen, but many lost one or two marks for incomplete descriptions such as "rotate 90°" or "rotate right about (0, 0)". "Turn" is not an acceptable term for "rotation". Candidates should understand that, if asked for a single transformation, they will not gain any marks if more than 1 is used.		
			Total	5			

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