Name	Date started	Target end date

WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack

Line and rotational symmetry; reflecting, rotating, translating and enlarging shapes on a grid; describing single transformations fully. Sourced from

REVISE
.wales

2.18 — Symmetry & transformations

Spec 3.8 — Unit 2 (no calculator)

Line and rotational symmetry; reflecting, rotating, translating and enlarging shapes on a grid; describing single transformations fully. Sourced from legacy WJEC GCSE Mathematics / Mathematics-Numeracy Higher non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~1 hours 34 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (63 marks across 26 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification. Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

*A calculator is **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

Symmetry & transformations — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Symmetry 3.8

- Identify lines of symmetry and rotational symmetry order.
- A regular n-gon has n lines of symmetry and rotational order n.

Reflection, rotation, translation 3.8

- Reflection: state the mirror line.
- Rotation: state centre, angle, direction.
- Translation: state the column vector $\begin{pmatrix} a \\ b \end{pmatrix}$.

Enlargement 3.8

- State centre and scale factor.
- Positive scale: image on the same side of the centre.
- Negative scale: image inverted on the opposite side.
- Fractional scale ($|k| < 1$): image is smaller.

Crib sheet »

Symmetry & transformations in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Symmetry

Line symmetry: a mirror line divides the shape into two matching halves.

Rotational symmetry of order n: the shape looks the same after rotating $360^\circ/n$.

Square: 4 lines of symmetry, rotational order 4.

Reflection

Reflect each vertex in the mirror line; the image is the same distance on the other side.

Common mirror lines: x-axis ($y = 0$), y-axis ($x = 0$), $y = x$, $y = -x$, $x = a$, $y = b$.

Describe fully: state 'reflection in $y = x$', etc.

Rotation

Three pieces of info: centre, angle, direction (clockwise / anticlockwise).

Use tracing paper: pin the centre, rotate, transfer.

E.g. 'rotation 90° anticlockwise about $(0, 0)$'.

Translation

$$\text{column vector } \begin{pmatrix} a \\ b \end{pmatrix}$$

a: units right (negative = left).

b: units up (negative = down).

Each vertex moves by the same column vector.

Enlargement

Three pieces of info: centre of enlargement, scale factor.

Scale factor 2: image is twice as big, vertices twice as far from the centre.

Fractional scale ($0 < k < 1$): image smaller.

Negative scale ($k < 0$): image is on the opposite side of the centre and inverted.

Describing a single transformation

Marks come from naming the transformation *and* giving its data.

Reflection: mirror line. Rotation: centre, angle, direction. Translation: vector. Enlargement: centre, scale factor.

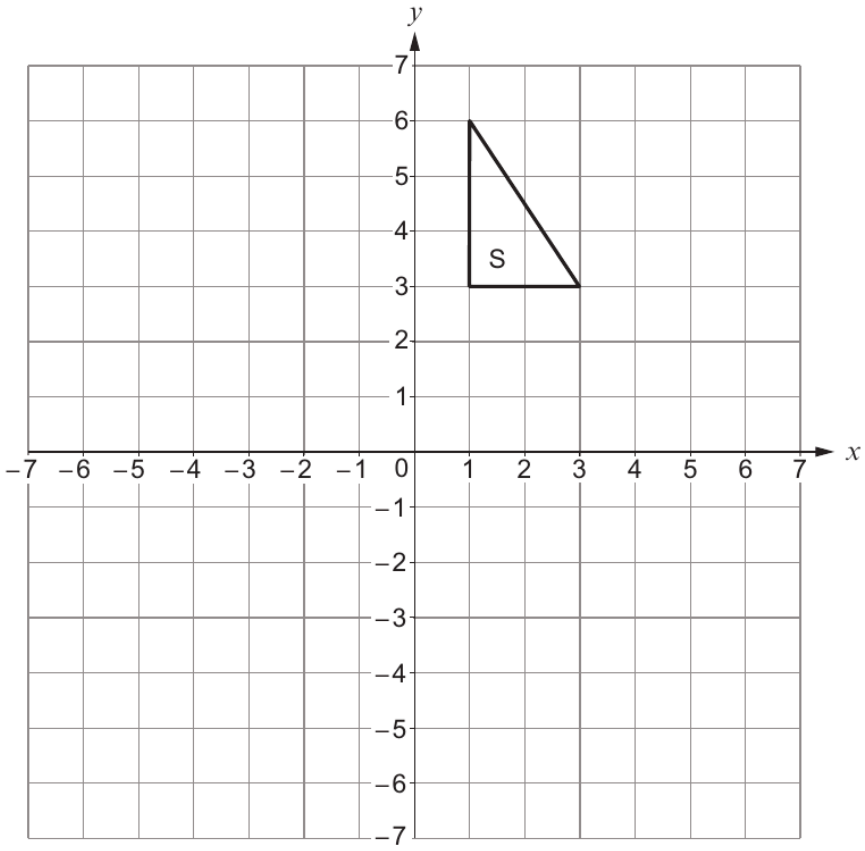
If multiple transformations are needed, the question almost always asks for a single one — check.

Common traps

- Rotating the wrong way — always check direction.
- Negative scale factor: forgetting the image flips through the centre.
- Listing more than one transformation when one is asked for.

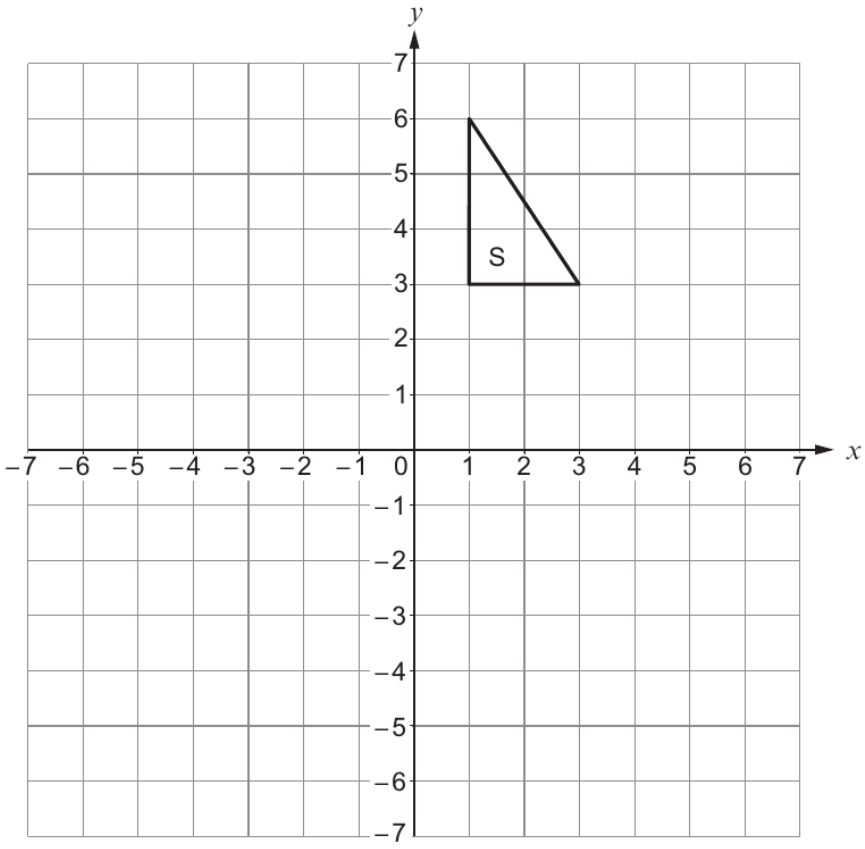
Examiner only

1. *(a)* Reflect the triangle S in the line $y = x$. [2]



Examiner only

(b) (i) Translate the triangle S using the column vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$. [1]



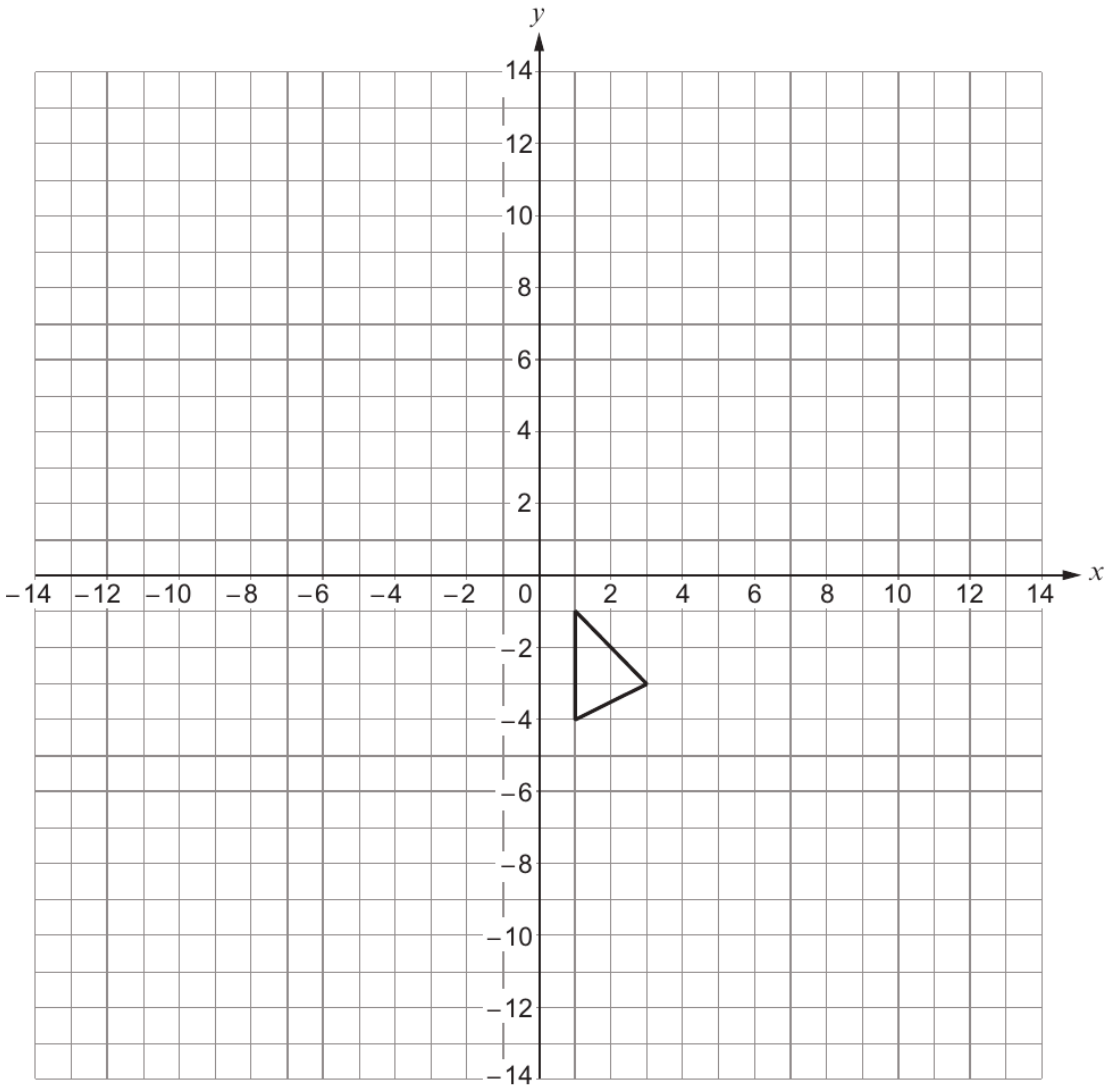
(ii) Write down the column vector that will reverse the translation in part (i). [1]

.....

Examiner only

10. Draw the enlargement of the given triangle, using

- a scale factor of -2,
- $(-2, 1)$ as the centre of enlargement. [3]



Examiner only

11. A company produces metal badges to be worn by its employees.
The badge is made up of two parts.
One part is in the shape of a sector of a circle as shown in the diagram.

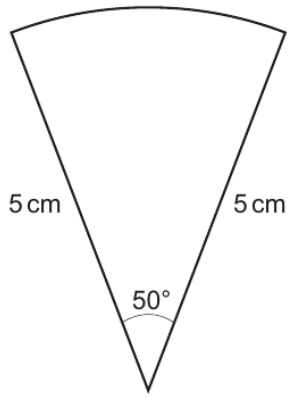


Diagram not drawn to scale

(a) The perimeter of the sector is decorated with a coloured edging strip.
Calculate the length of edging strip needed to decorate the sector. [3]

(b) The other part is in the shape of a quarter-circle of radius 3 cm.

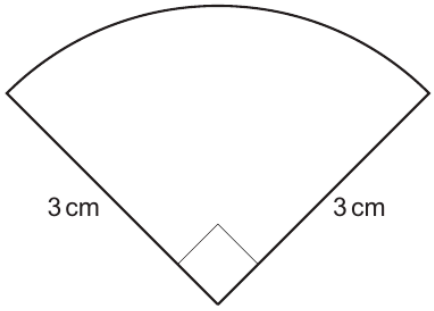


Diagram not drawn to scale

Examiner only

To make the badge, the two pieces are joined together with the sector in front of the quarter-circle, as shown in the diagram.
The badge has a vertical line of symmetry.

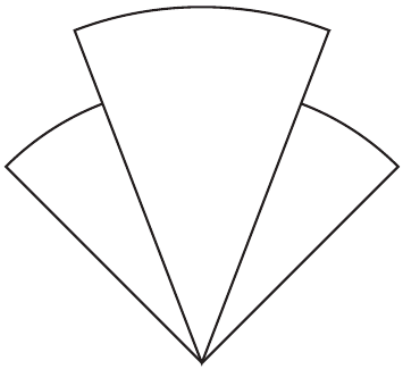
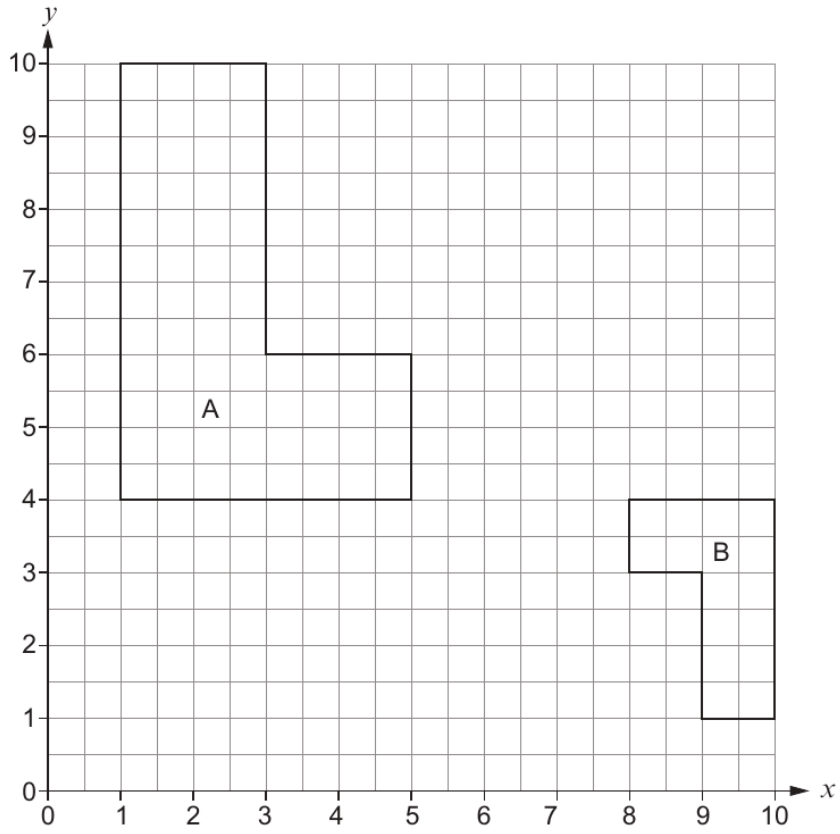


Diagram not drawn to scale

The visible surface of the front of the badge is painted.
Calculate the area that is painted. [5]

Examiner only

15. Describe fully a **single** transformation that transforms shape A onto shape B. [3]



Examiner only

1. Look at the following descriptions of special quadrilateral shapes.
Circle the correct name for each one.

(a) Its diagonals intersect at 90°.
Only one diagonal is a line of symmetry. [1]

Kite Rhombus Square Trapezium Rectangle

(b) Only one pair of sides are parallel. [1]

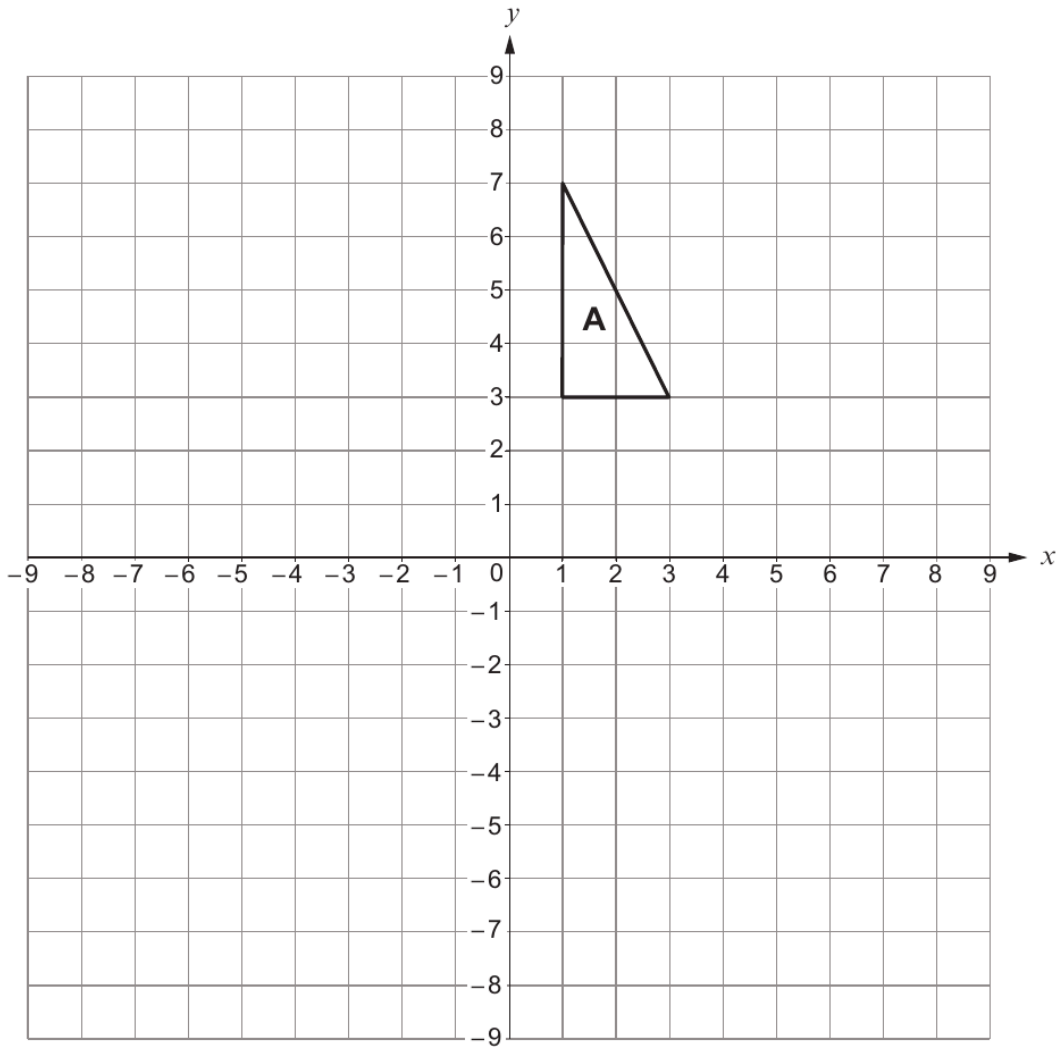
Kite Rhombus Square Trapezium Rectangle

(c) All four sides are equal.
Its diagonals are not equal in length. [1]

Kite Rhombus Square Trapezium Rectangle

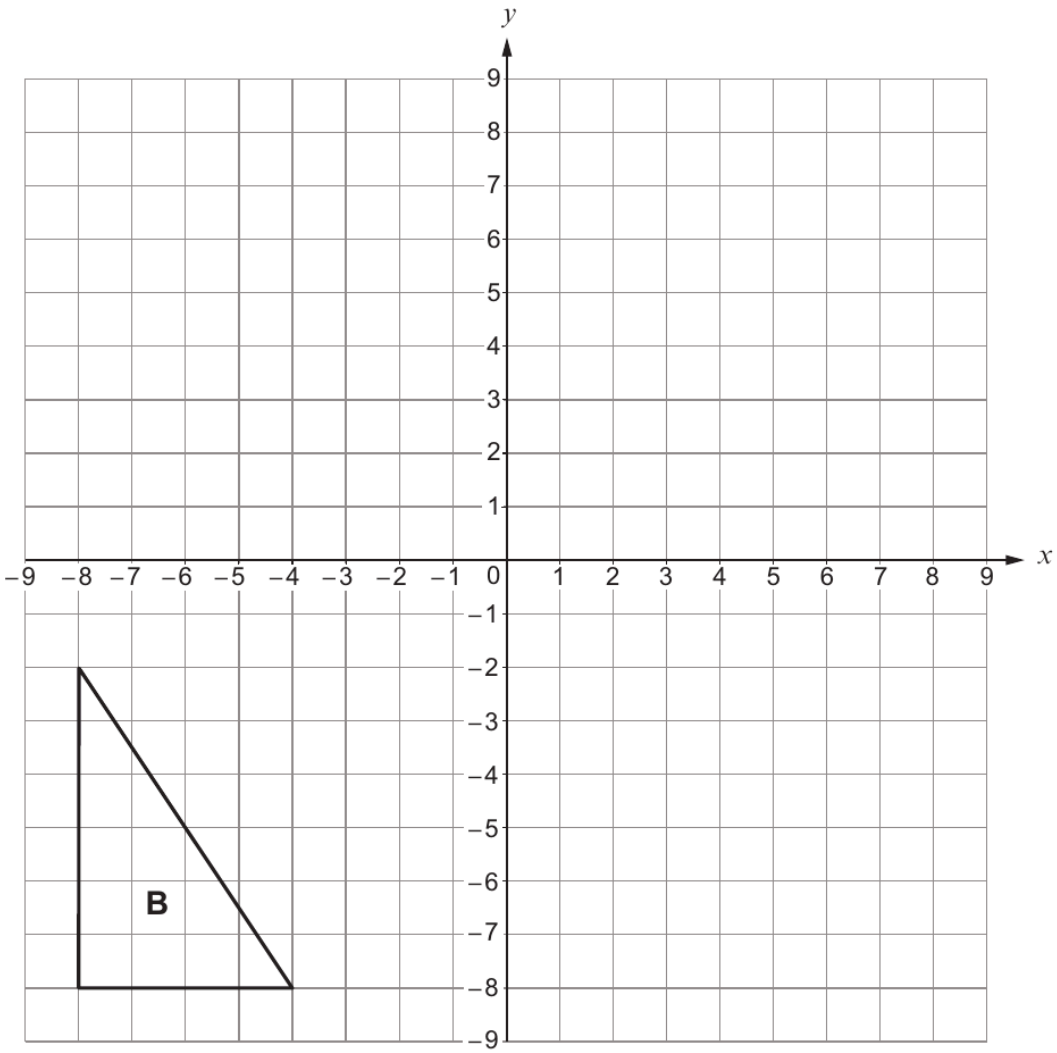
Examiner only

3. *(a)* Rotate triangle A through 90° anticlockwise, about the point (–2, 3). [2]



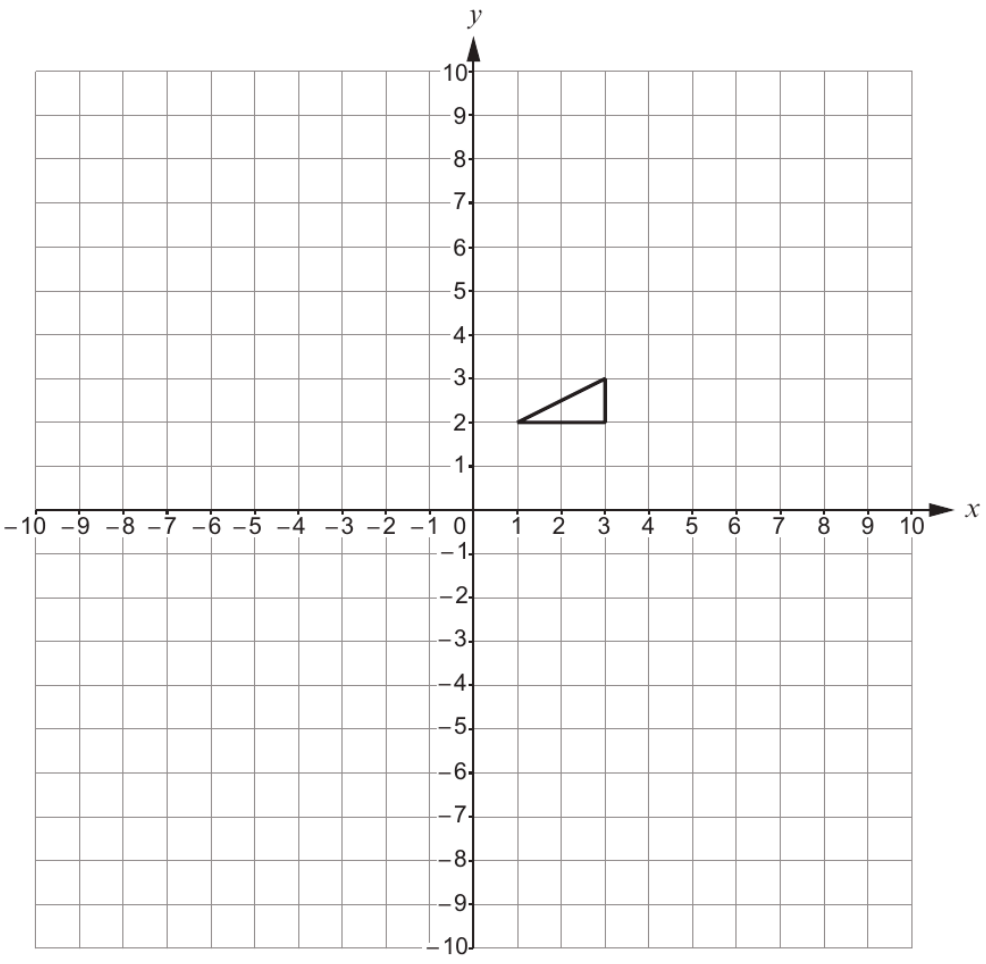
Examiner only

(b) Enlarge triangle B by a scale factor of $\frac{1}{2}$, using (0, 0) as the centre of enlargement. [2]



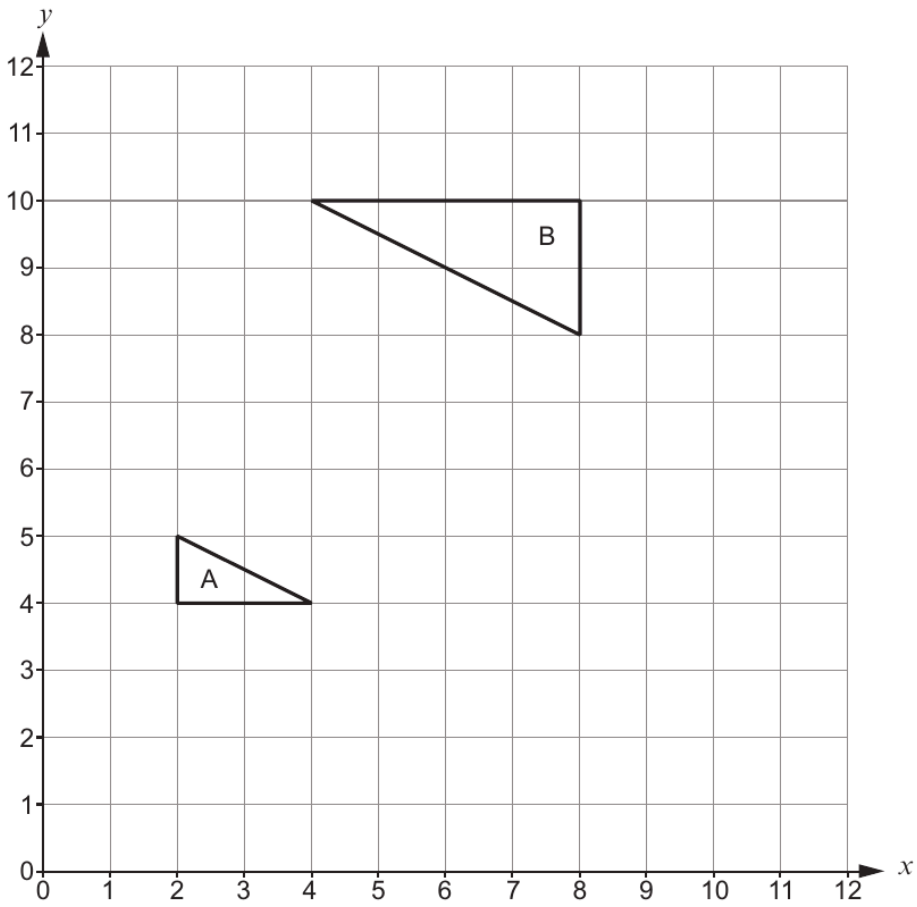
Examiner only

10. Enlarge the triangle below by a scale factor of –2. Use the origin as the centre of enlargement. [2]



Examiner only

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



.....

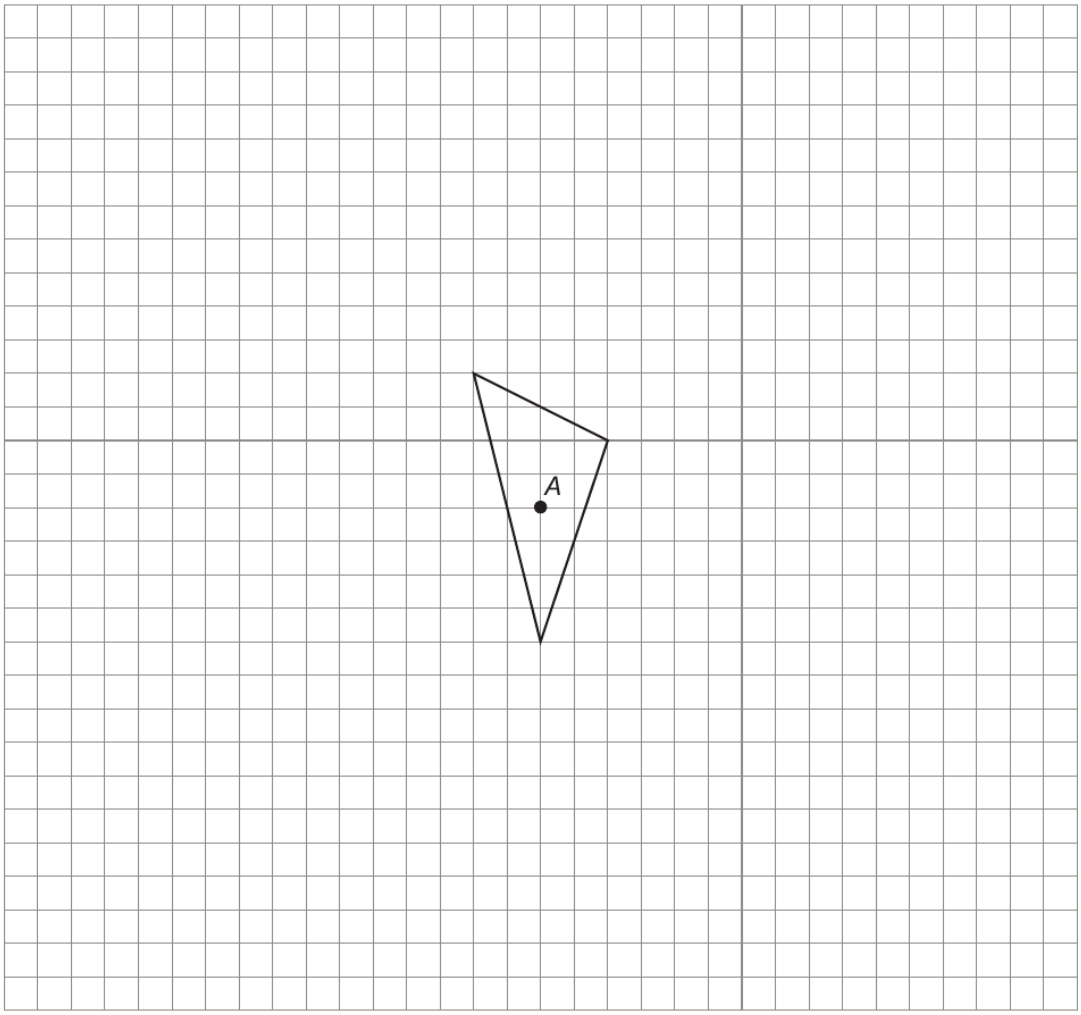
.....

.....

.....

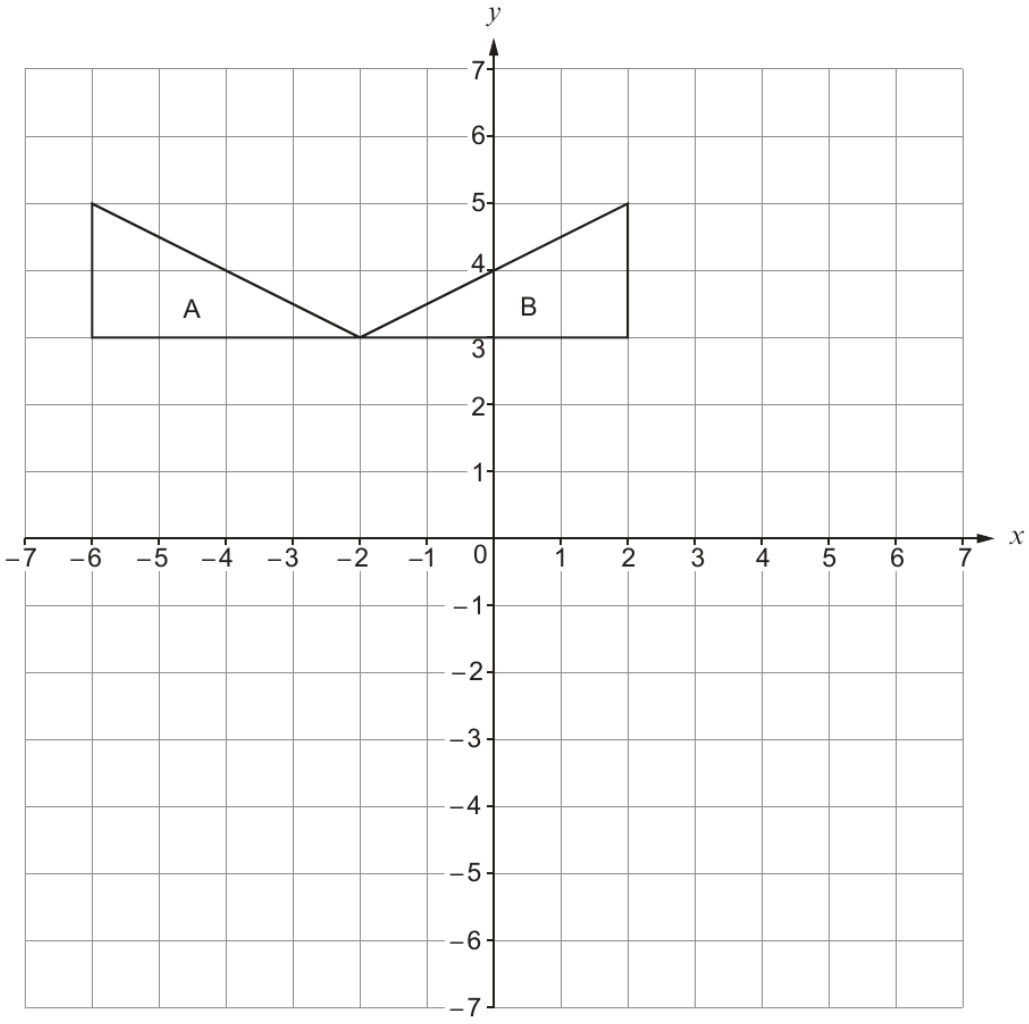
Examiner only

11. Enlarge the given triangle by a scale factor of –3 using point *A* as the centre of enlargement. [2]



Examiner only

2. *(a)* Describe fully the single transformation that transforms triangle A onto triangle B. [2]



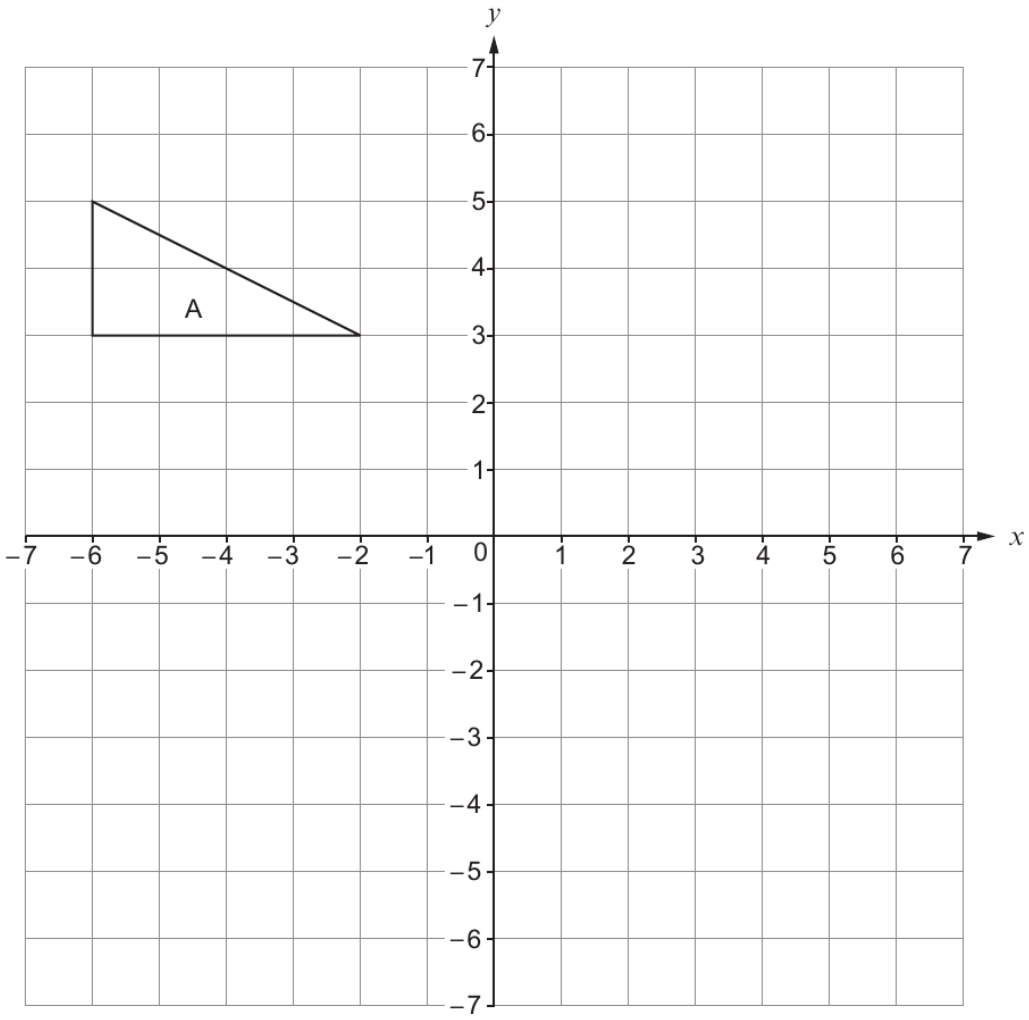
.....

.....

.....

Examiner only

(b) (i) Translate triangle A using the column vector $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$. [2]



(ii) Write down the column vector that will reverse the translation in part (i). [1]

.....

.....

.....

Examiner only

11. *(a)* The area of the trapezium $ABCD$ is $25\,\text{cm}^2$.

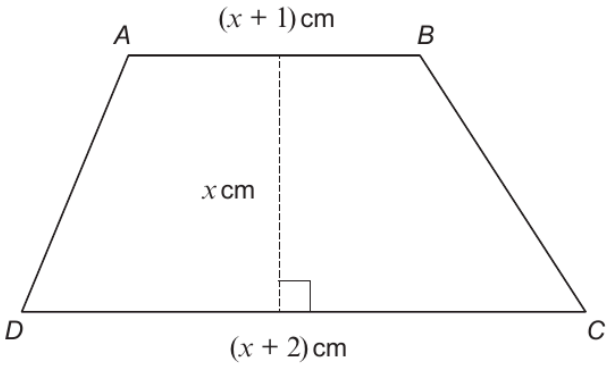


Diagram not drawn to scale

(i) Show that $2x^2 + 3x - 50 = 0$. [3]

(ii) Solve the equation $2x^2 + 3x - 50 = 0$ to calculate the lengths AB and DC. Give your answers correct to 1 decimal place. [4]

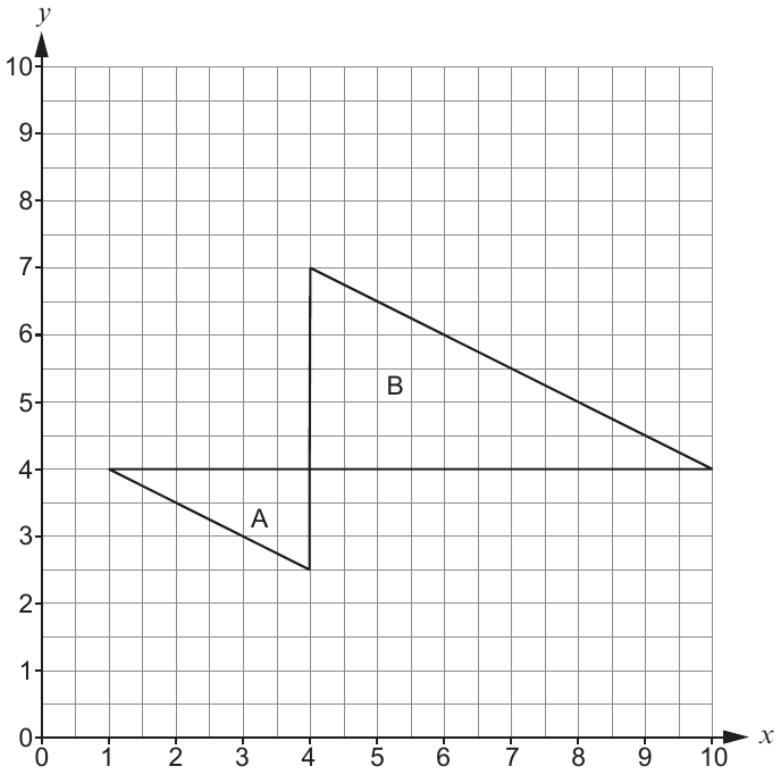
Length of AB = ... cm Length of DC = ... cm

Examiner only

(b) A rhombus has an area of 36·8 cm^2.
The rhombus is enlarged by a scale factor of 7.
Calculate the area of the enlarged rhombus. [2]

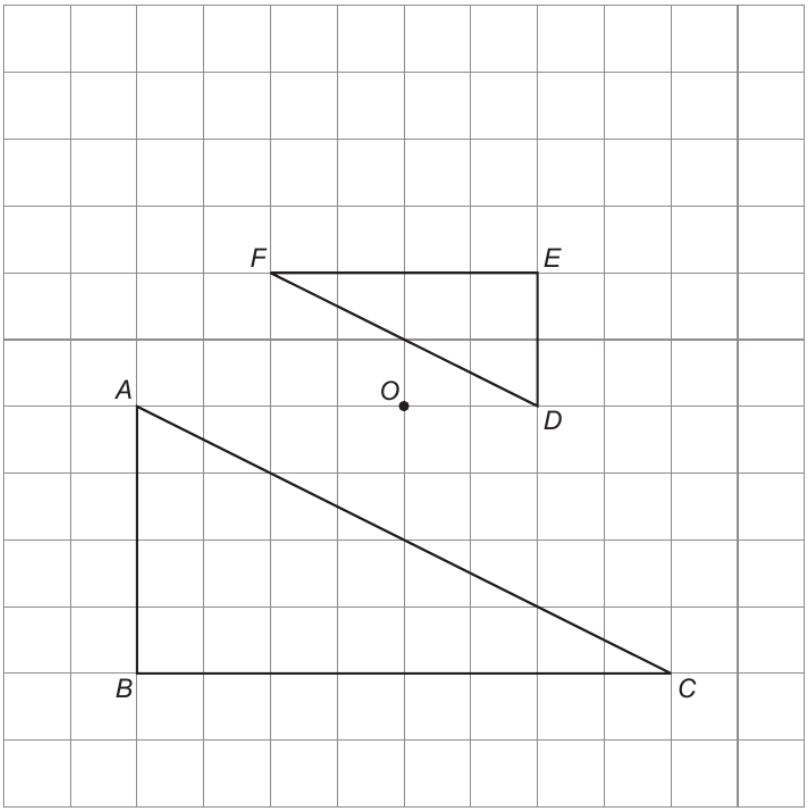
Examiner only

13. Describe fully a **single** transformation that transforms shape A onto shape B. [3]



Examiner only

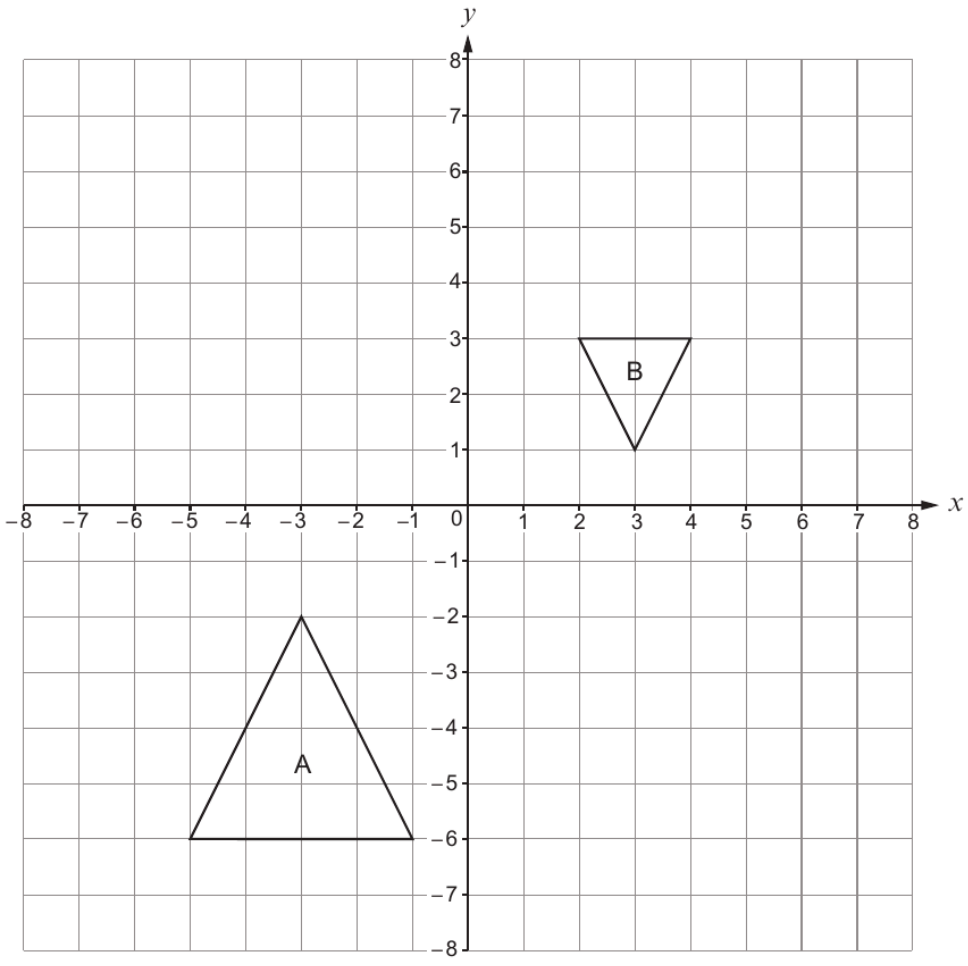
14. In the following diagram, triangle *ABC* has been enlarged to triangle *DEF*, with the centre of enlargement at *O*.
Write down the scale factor of the enlargement. [2]



Scale factor: .....

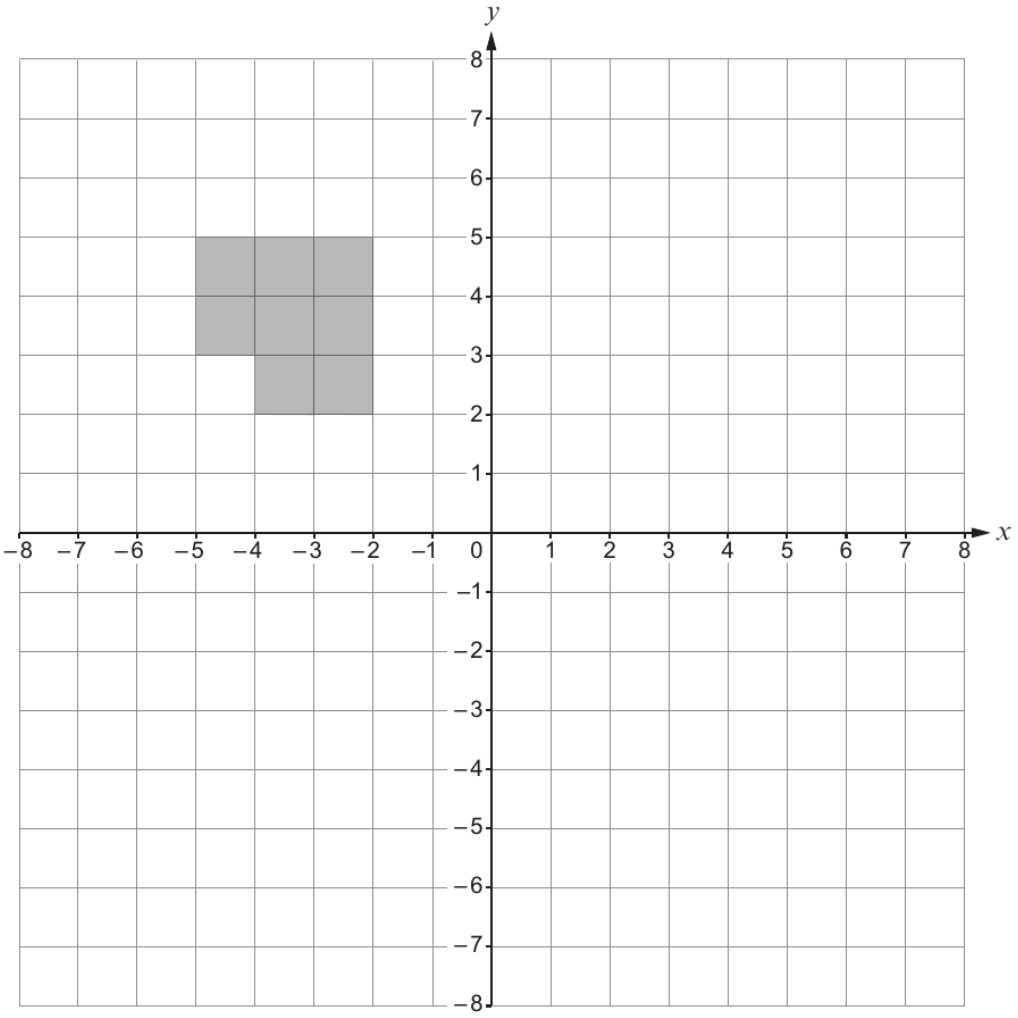
Examiner only

9. Describe fully the **single** transformation that transforms shape A onto shape B. [3]



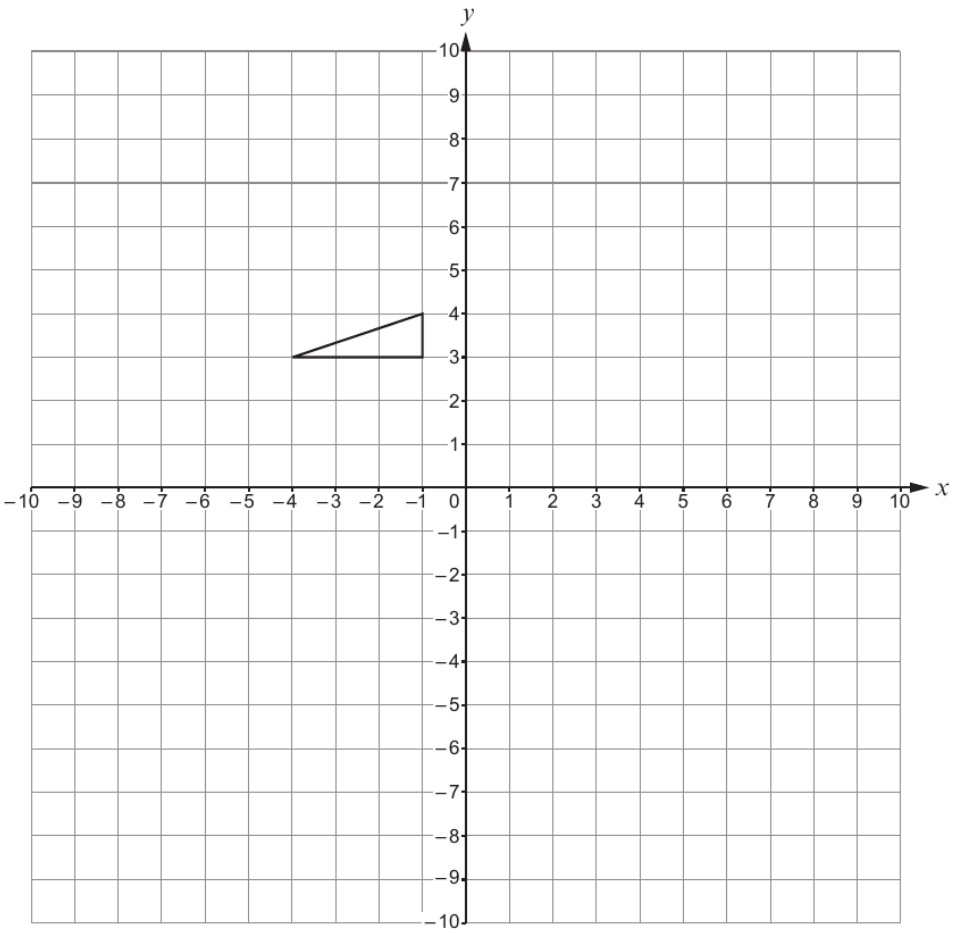
Examiner only

1. Rotate the shape below through 90° clockwise about the point (–1, 1). [2]



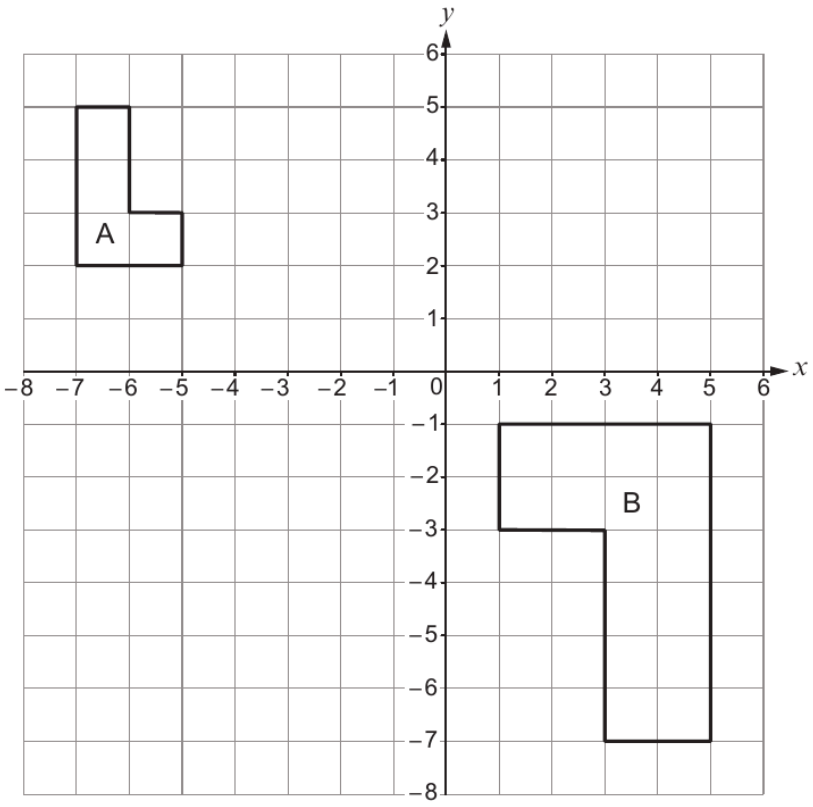
Examiner only

12. Enlarge the triangle below by a scale factor of –2.
Use the origin as the centre of enlargement. [2]



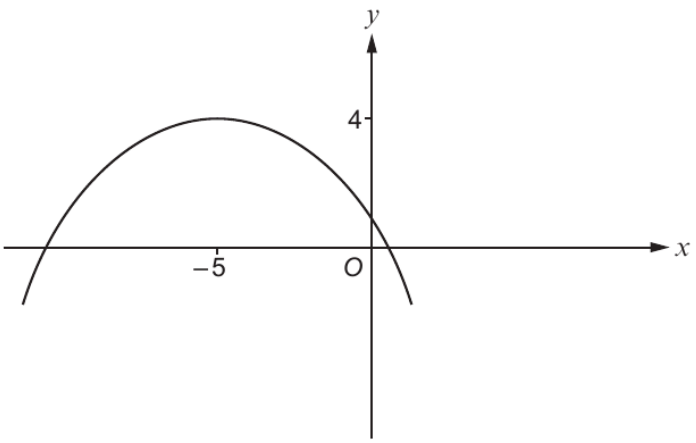
Examiner only

12. Describe fully the **single** transformation that transforms shape A onto shape B. [3]



Examiner only

19. The highest point of a curve is called a maximum point.
The diagram below shows a sketch of the curve with equation $y = f(x)$.
The maximum point of this curve has coordinates (–5, 4).



(a) For each of the following, write down the coordinates of the maximum point of the curve with the given equation.

(i) $y = 2f(x)$ [1]

The coordinates of the maximum point are (..... , ...).

(ii) $y = f(x-7)$ [1]

The coordinates of the maximum point are (..... , ...).

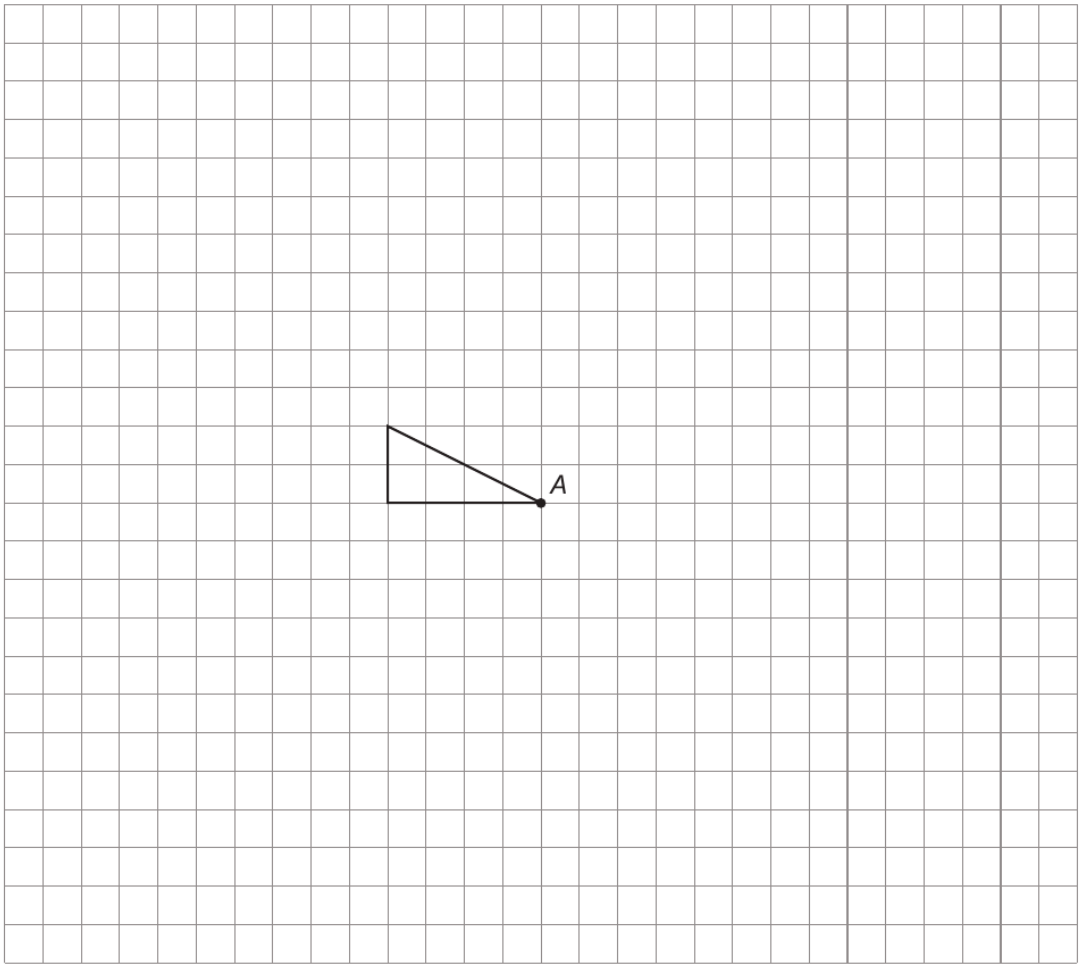
(b) The curve with equation $y = f(x)$ is reflected in the y-axis.
Write down the equation of the transformed curve.
You should use function notation. [1]

The equation of the transformed curve is

$y =$ .....

Examiner only

9. Enlarge the given triangle by a scale factor of –2, using point *A* as the centre of enlargement. [2]



Examiner only

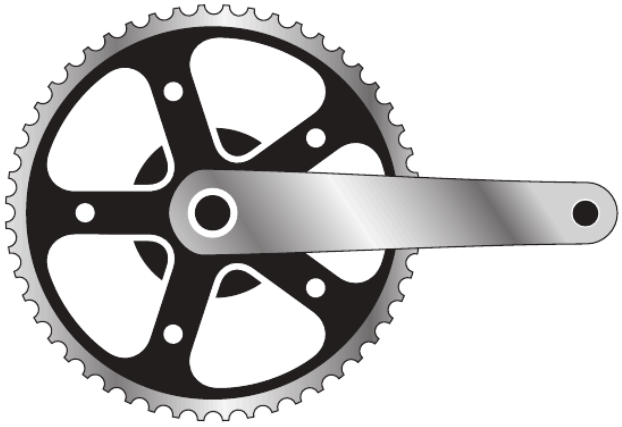
1. Treviso is a company that designs and builds bicycles.
Each wheel on Treviso's new bike has a diameter of 29 inches.

Remember:	1 foot = 12 inches

Ollie tests Treviso's new bike over a distance of 1000 feet.
How many times will a wheel rotate during the test? [4]

Examiner only

9. (a) Geraint has bought a new front cog for his bike.



The cog has a mass of 150 g, **correct to the nearest 10 g**.
The cog has been made from a metal that has a density of 3 g/cm^3, **correct to the nearest g/cm^3**.
Calculate the maximum possible volume of the cog. [3]

Examiner only

(b) This picture shows part of Geraint's bike.

A simplified diagram of the cogs and the chain is shown below.

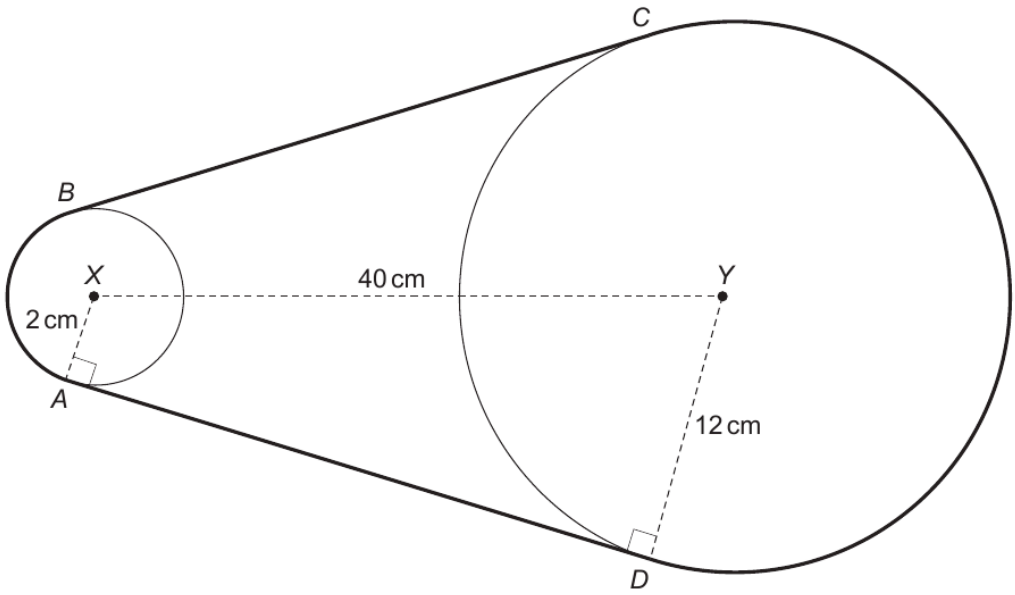


Diagram not drawn to scale

X and *Y* are the centres of the cogs and *XY* is a line of symmetry.
BC and *AD* are straight sections of the chain.

The larger cog has a radius of 12 cm.
The smaller cog has a radius of 2 cm.

(i) Use Pythagoras' theorem to show that the length of *AD* is $10\sqrt{15}$ cm.
You must show all your working. [3]

.....

.....

.....

.....

.....

Examiner only

(ii)

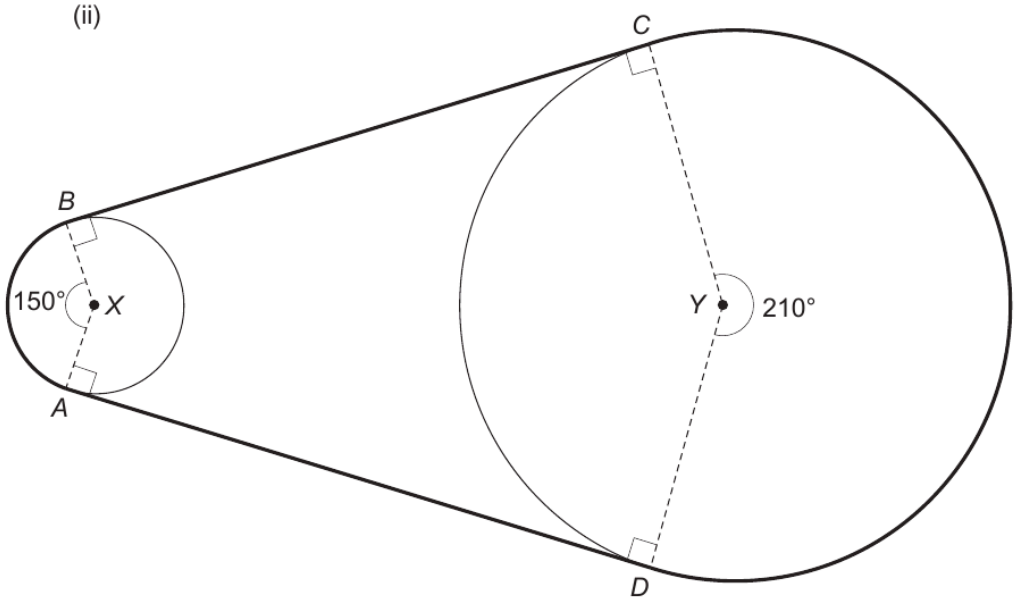


Diagram not drawn to scale

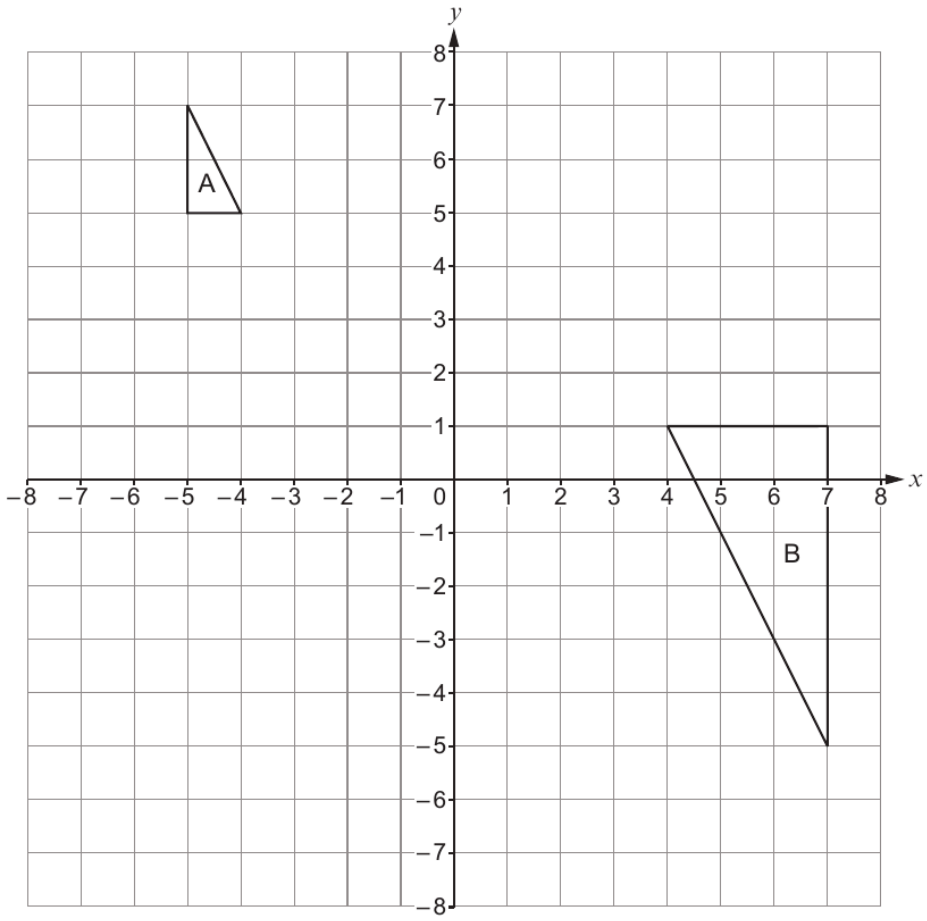
$A\hat{X}B$ = 150°, reflex $C\hat{Y}D$ = 210°, $BC = AD = 10\sqrt{15}$ cm.

Calculate the total length of the chain.

Give your answer in the form $a\sqrt{15} + b\pi$, where a and b are rational numbers. [5]

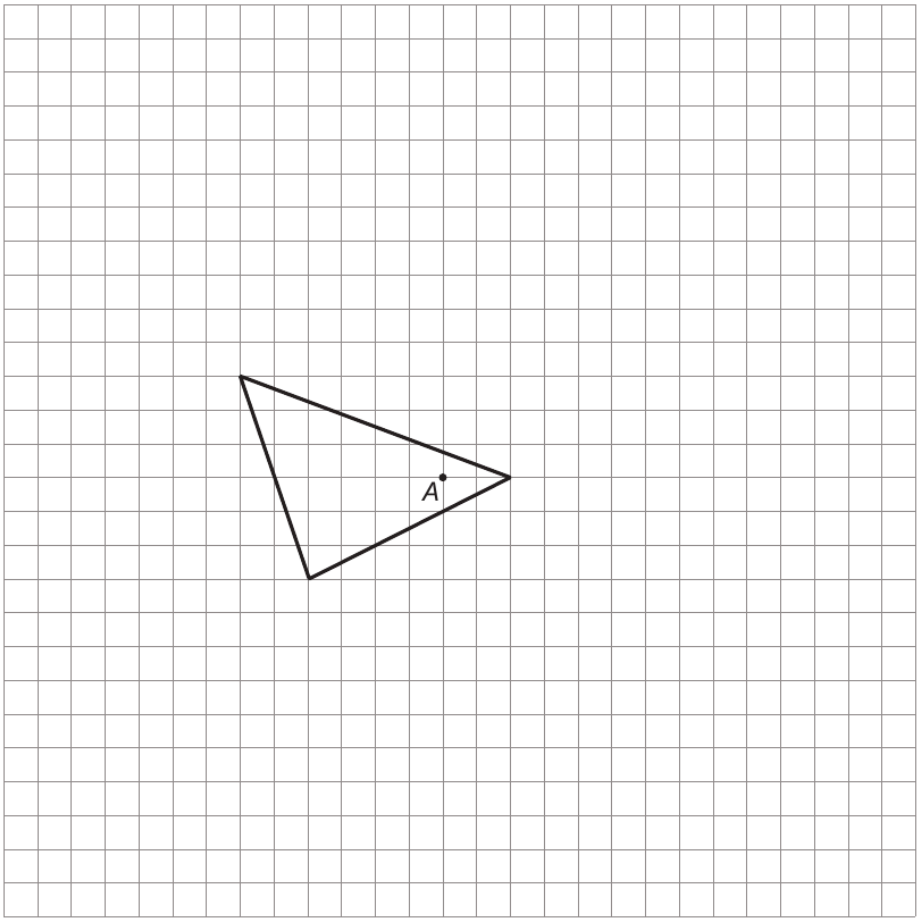
Examiner only

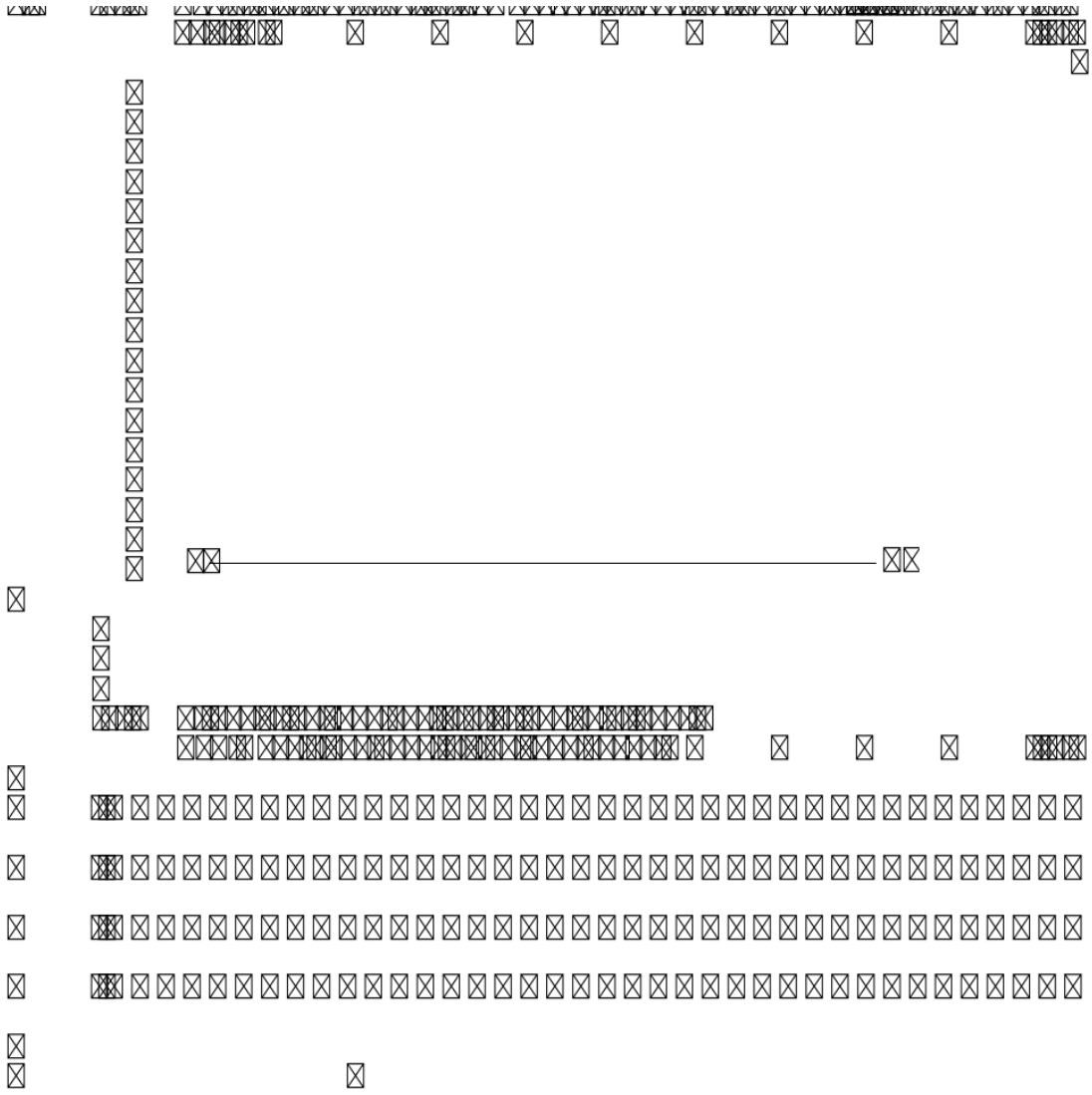
11. Describe fully the **single** transformation that transforms triangle A onto triangle B. [3]

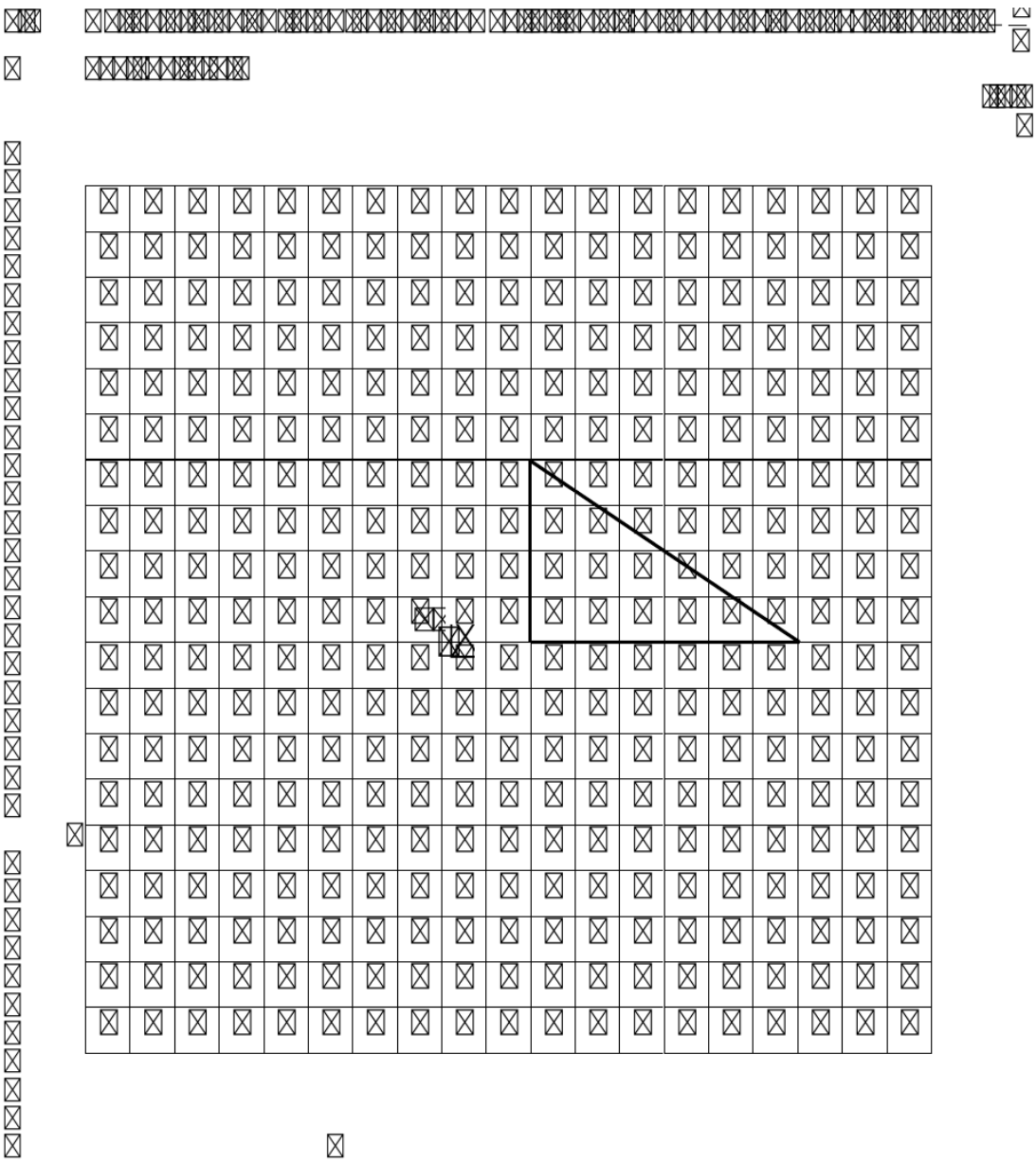


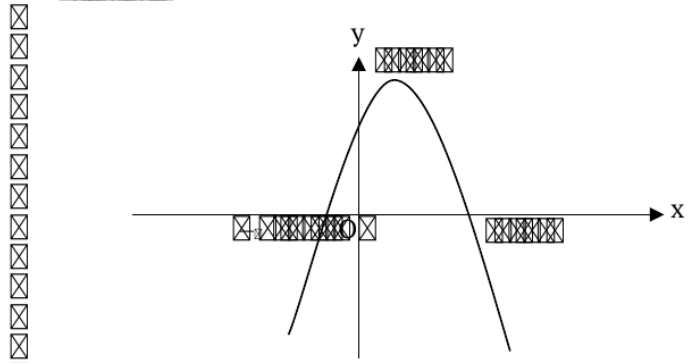
Examiner only

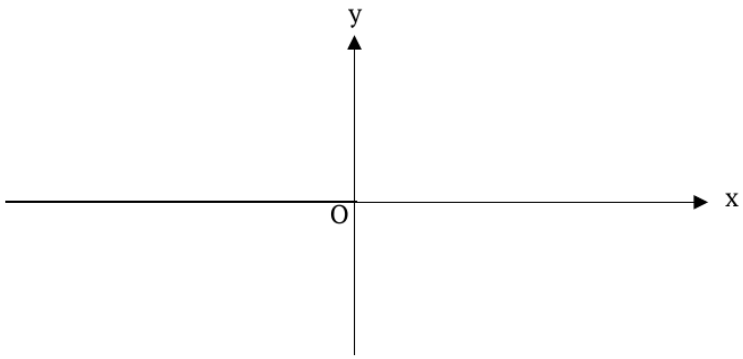
10. Enlarge the given triangle by a scale factor of –2, using point *A* as the centre of enlargement. [2]

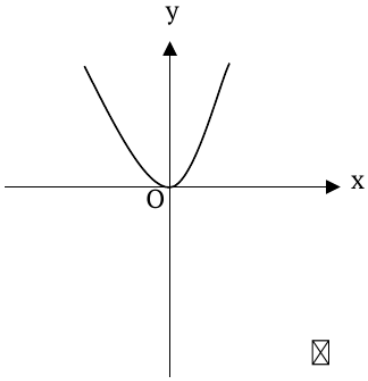


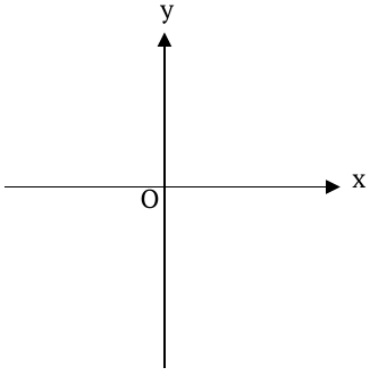





y
x
O


y
x
O


y
x
O


y
x
O

g(x)