

Reflections

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

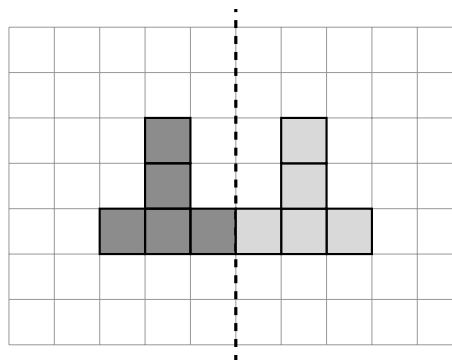
Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (1 mark)

Reflect the shaded shape in the mirror line.

Each square moves to the same distance on the other side of the mirror line.

Squares next to the mirror line stay next to it.



Answer: Correct reflection

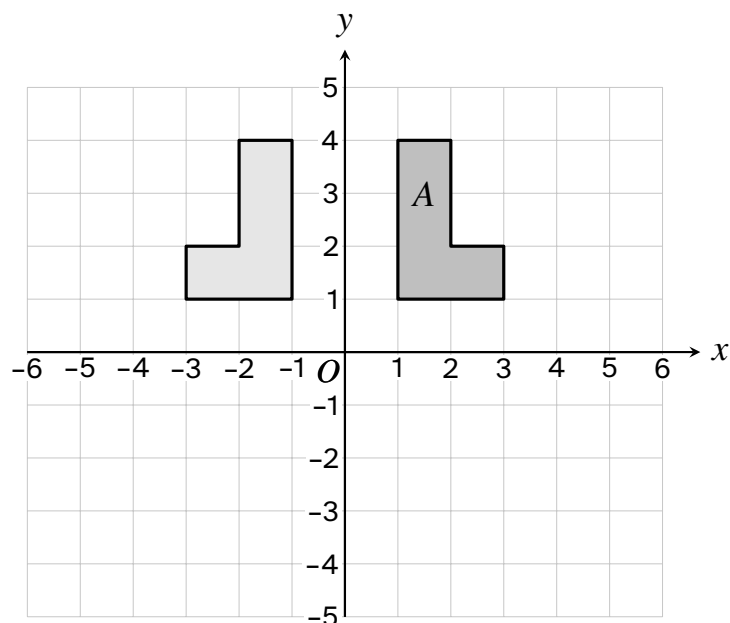
2 (2 marks)

Reflect shape *A* in the *y*-axis.

Each point moves to the same distance on the other side of the *y*-axis.

The *y*-coordinates stay the same. The *x*-coordinates change sign.

Image vertices: $(-1, 1)$, $(-3, 1)$, $(-3, 2)$, $(-2, 2)$, $(-2, 4)$, $(-1, 4)$



Answer: Correct reflection

Marks: 2 marks for a correct reflection. 1 mark for a reflection in a different vertical line, or 5 correct vertices.

3 (2 marks)

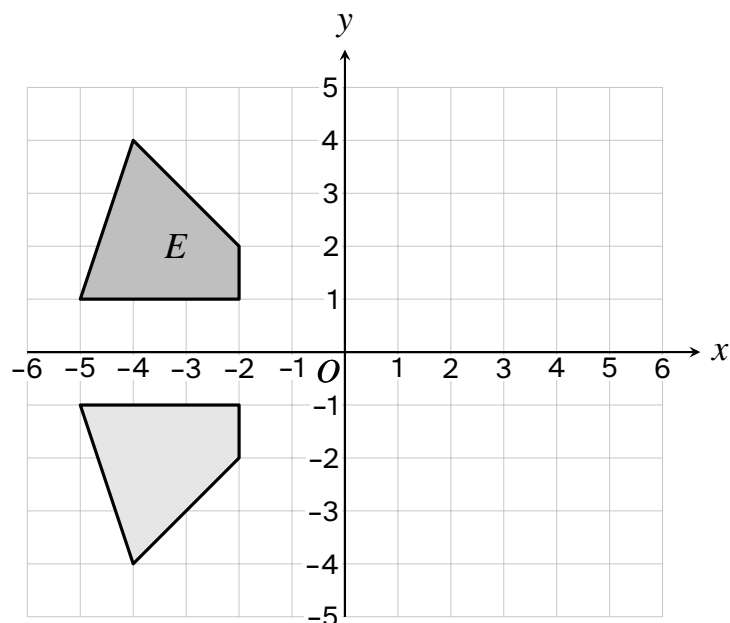
Reflect shape *E* in the *x*-axis.

The *x*-axis is the horizontal line $y = 0$.

Each point moves to the same distance on the other side of it.

The *x*-coordinates stay the same. The *y*-coordinates change sign.

Image vertices: $(-5, -1)$, $(-2, -1)$, $(-2, -2)$, $(-4, -4)$



Answer: Correct reflection

Tip: The x -axis is **horizontal**. Reflecting in the y -axis by mistake is very common.

Marks: 2 marks for a correct reflection. 1 mark for a reflection in any horizontal line, or 3 correct vertices.

4 (2 marks)

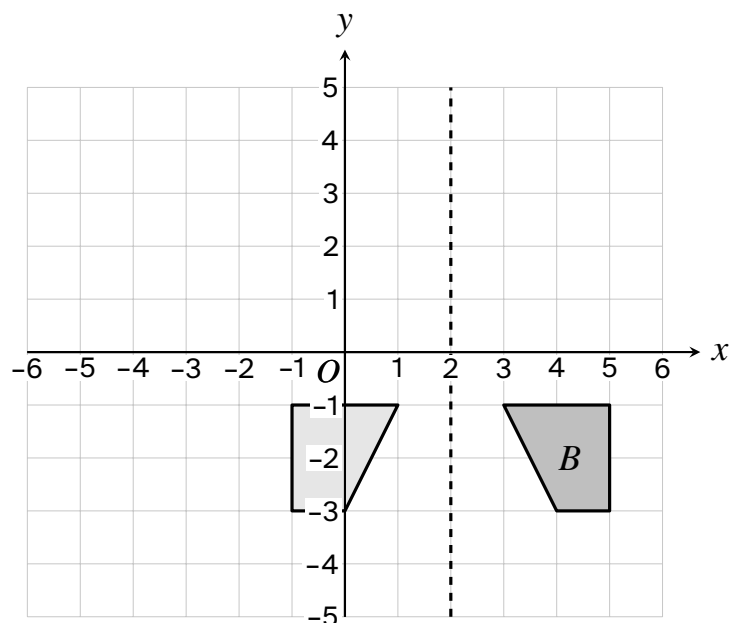
Reflect shape B in the line $x = 2$

$x = 2$ is the vertical line through 2 on the x -axis.

Take each vertex in turn. Count how far it is from the line, then count the same distance on the other side.

For example, $(5, -1)$ is 3 units right of the line, so its image is 3 units left: $(-1, -1)$.

Image vertices: $(1, -1)$, $(-1, -1)$, $(-1, -3)$, $(0, -3)$



Answer: Correct reflection

Marks: 2 marks for a correct reflection. 1 mark for a reflection in any vertical line.

5 (2 marks)

- (a) Triangle T has vertices $(1, 1)$, $(4, 1)$ and $(4, 3)$

T is reflected in the x -axis.

Write down the coordinates of the image of the vertex $(4, 3)$

Reflecting in the x -axis keeps the x -coordinate the same.

The y -coordinate changes sign: 3 becomes -3 .

Answer: $(4, -3)$

- (b) Point C has coordinates $(2, 5)$

C is reflected in the line $x = 6$ to point D .

Work out the coordinates of D .

$x = 6$ is a vertical line, so the y -coordinate stays as 5.

C is $6 - 2 = 4$ units to the left of the line.

So D is 4 units to the right of the line: $6 + 4 = 10$

Answer: (10, 5)

Tip: A quick sketch of the line $x = 6$ helps. (6, 5) is on the mirror line, not the image.

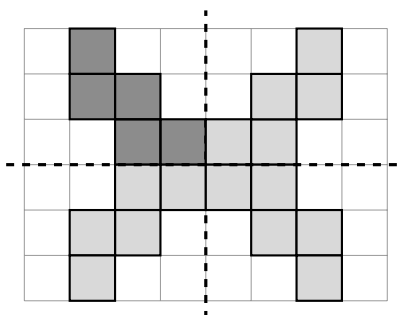
6 (2 marks)

The dashed lines are both mirror lines.
Shade squares to complete the pattern.

First reflect the shaded squares in the vertical mirror line.

Then reflect all of the shaded squares (the original ones and the new ones) in the horizontal mirror line.

The finished pattern has 20 shaded squares, 5 in each quarter.



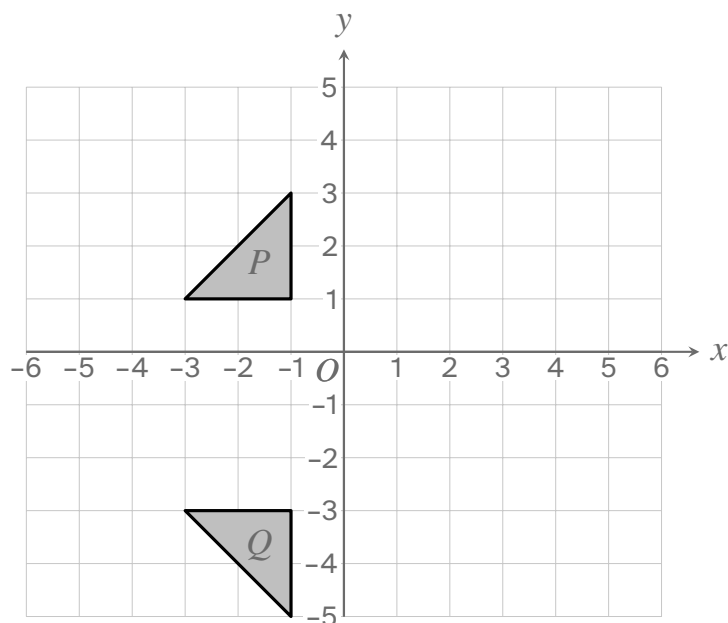
Answer: Pattern completed in all four quarters

Tip: Reflect in both lines. The bottom right quarter comes from reflecting the new squares as well, not just the ones you were given.

Marks: 1 mark for a correct reflection in one of the mirror lines. 1 mark for the complete pattern.

7 (2 marks)

Describe fully the single transformation that maps triangle P onto triangle Q .



Q is a mirror image of P , so the transformation is a reflection.

The mirror line is horizontal and halfway between the triangles.

For example, $(-1, 1)$ maps to $(-1, -3)$. Halfway between $y = 1$ and $y = -3$ is $y = -1$.

Answer: Reflection in the line $y = -1$

Tip: “Describe fully” means give the transformation **and** the equation of the mirror line. Give one transformation only.

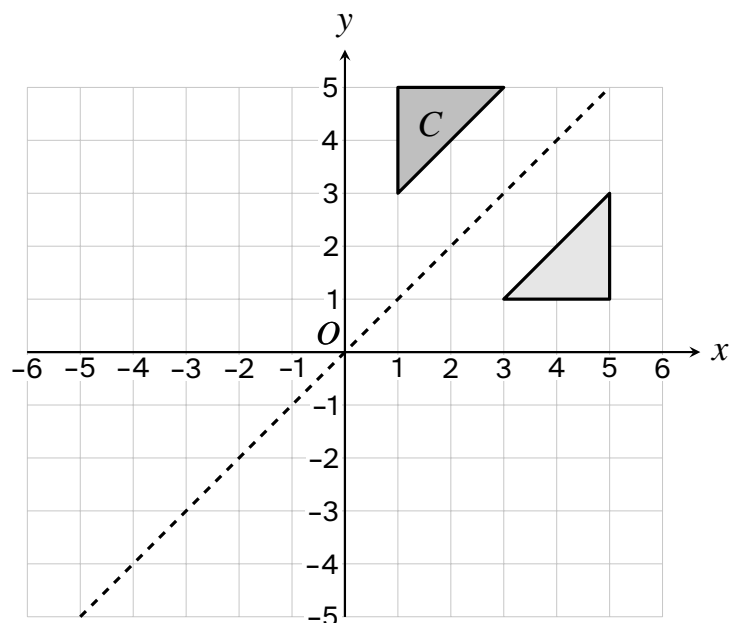
Marks: 1 mark for reflection. 1 mark for the line $y = -1$.

8 (2 marks)

Reflect triangle C in the line $y = x$

Reflecting in $y = x$ swaps the coordinates: (x, y) becomes (y, x) .

Image vertices: $(3, 1)$, $(5, 1)$, $(5, 3)$



Answer: (3, 1), (5, 1), (5, 3)

Marks: 2 marks for a correct reflection. 1 mark for two correct vertices.

9 (2 marks)

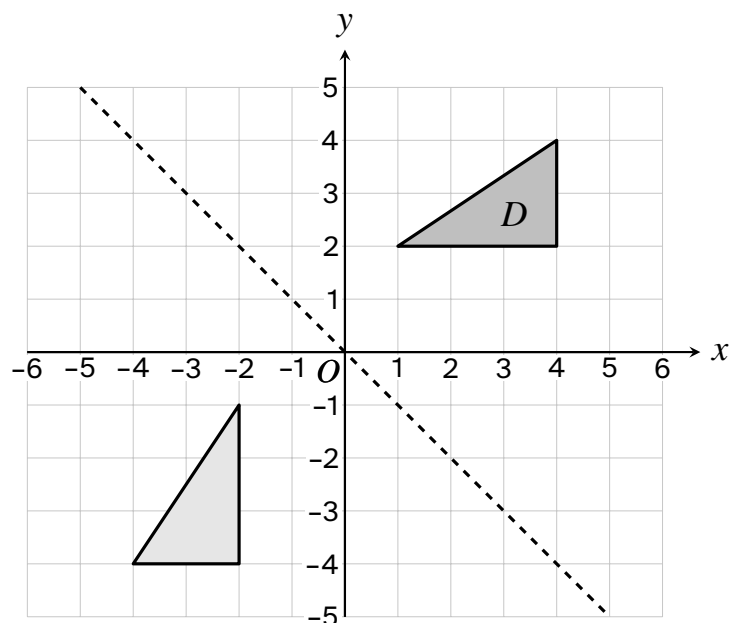
Reflect shape *D* in the line $y = -x$

Reflecting in $y = -x$ swaps the coordinates and changes both signs:

(x, y) becomes $(-y, -x)$.

For example, $(4, 2)$ becomes $(-2, -4)$.

Image vertices: $(-2, -1)$, $(-2, -4)$, $(-4, -4)$

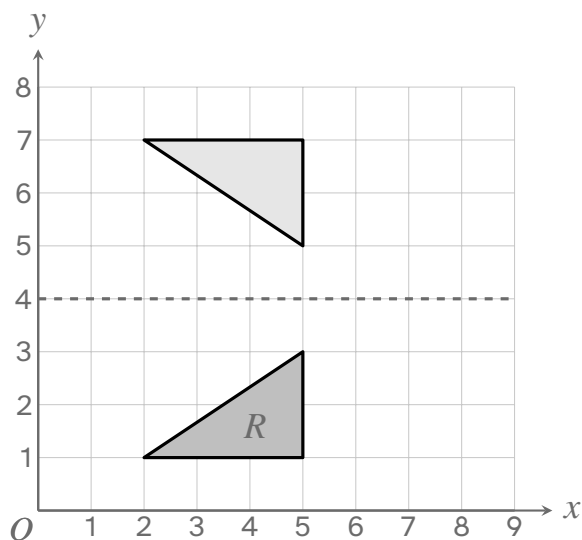


Answer: $(-2, -1)$, $(-2, -4)$, $(-4, -4)$

Marks: 2 marks for a correct reflection. 1 mark for two correct vertices.

10 (2 marks)

Triangle R is reflected in a horizontal mirror line. The image of the vertex $(2, 1)$ is $(2, 7)$



(a) What is the equation of the mirror line?

The vertex $(2, 1)$ maps to $(2, 7)$.

The mirror line is horizontal and halfway between them.

$(1 + 7) \div 2 = 4$, so the line is $y = 4$.

Answer: $y = 4$

Tip: A horizontal line has equation $y = \dots$, not $x = \dots$

(b) Work out the coordinates of the image of the vertex $(5, 3)$

The mirror line $y = 4$ is horizontal, so the x -coordinate stays as 5.

$(5, 3)$ is 1 unit below $y = 4$.

So its image is 1 unit above: $4 + 1 = 5$

Answer: $(5, 5)$

11 (1 mark)

Kai says,

‘To reflect a point in the line $y = x$, swap the coordinates and change both signs.’

Is Kai correct?

Give a reason for your answer.

Try a point, for example $(1, 4)$.

Reflecting in $y = x$ gives $(4, 1)$: the coordinates are swapped but the signs do not change.

Kai’s rule gives $(-4, -1)$, which is the reflection in the line $y = -x$.

Answer: No. For $y = x$ you only swap the coordinates, e.g. $(1, 4)$ goes to $(4, 1)$.
Swapping and changing signs is the rule for $y = -x$.

Tip: Test the rule on a point and sketch the line $y = x$. The point and its image must be the same distance from the line.

12 (2 marks)

A rectangle has lines of symmetry $x = 2$ and $y = 3$

One vertex of the rectangle is at $(-1, 5)$

Work out the coordinates of the other three vertices.

Reflect $(-1, 5)$ in $x = 2$: it is 3 units left of the line, so the image is 3 units right: $(5, 5)$

Reflect $(-1, 5)$ in $y = 3$: it is 2 units above the line, so the image is 2 units below: $(-1, 1)$

The fourth vertex is opposite $(-1, 5)$. Reflect $(5, 5)$ in $y = 3$: $(5, 1)$

Check: the rectangle has corners $(-1, 1)$, $(5, 1)$, $(5, 5)$ and $(-1, 5)$. Its centre is $(2, 3)$ ✓

Answer: $(5, 5)$, $(-1, 1)$ and $(5, 1)$

Tip: A quick sketch of the two lines helps. The centre of the rectangle is where the lines of symmetry cross, at $(2, 3)$.

Marks: 1 mark for one correct vertex. 1 mark for all three.
