

Name _____

Date _____

14.4 Reflection — worksheet

Reflect 2D shapes and points in a given mirror line on a coordinate grid, identify the mirror line, and recognise that the image is congruent to the object. · 66 questions · Show your working.

Remember

- A **reflection** flips a shape in a **mirror line**.
- Every point and its image are the **same distance** from the mirror, on opposite sides, measured **perpendicular** to it.
- Reflect in the **x-axis**: $(x, y) \rightarrow (x, -y)$.
- Reflect in the **y-axis**: $(x, y) \rightarrow (-x, y)$.
- Reflect in **y = x**: $(x, y) \rightarrow (y, x)$ — the coordinates swap.
- A point **on** the mirror line does not move. It is invariant.
- The image is **congruent**: every length and every angle is unchanged.
- But the shape is turned over, so the vertices run the other way round.
- To find an unknown mirror line, join a point to its image; the mirror cuts that join in half at right angles.

A · Fluency — Reflect in the axes, and name the mirror line.

- 1 Reflect the point (3, 2) in the **x-axis**.

- 2 Reflect the point (−1, 4) in the **x-axis**.

- 3 Reflect the point (5, −3) in the **x-axis**.

- 4 Reflect the point (−4, −2) in the **x-axis**.

- 5 Reflect the point (2, 6) in the **x-axis**.

- 6 Reflect the point (−6, 1) in the **x-axis**.

- 7 Reflect the point (0, 5) in the **x-axis**.

- 8 Reflect the point (4, 0) in the **x-axis**.

- 9 Reflect the point (−3, 3) in the **x-axis**.

- 10 Reflect the point (6, −5) in the **x-axis**.

- 11 Reflect the point (−5, −6) in the **x-axis**.

12 Reflect the point $(1, -1)$ in the **x-axis**.

13 Reflect the point $(3, 2)$ in the **y-axis**.

14 Reflect the point $(-1, 4)$ in the **y-axis**.

15 Reflect the point $(5, -3)$ in the **y-axis**.

16 Reflect the point $(-4, -2)$ in the **y-axis**.

17 Reflect the point $(2, 6)$ in the **y-axis**.

18 Reflect the point $(-6, 1)$ in the **y-axis**.

19 Reflect the point $(0, 5)$ in the **y-axis**.

20 Reflect the point $(4, 0)$ in the **y-axis**.

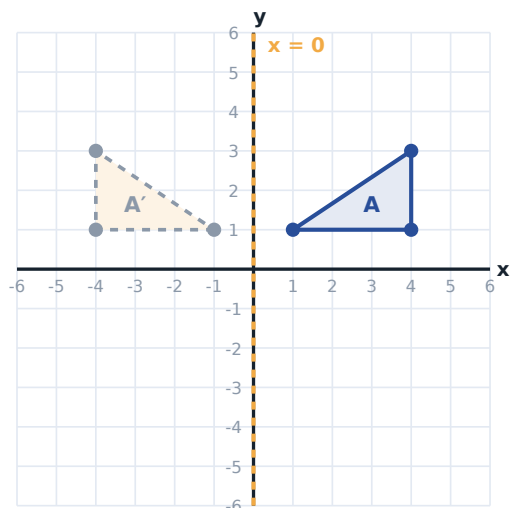
21 Reflect the point $(-3, 3)$ in the **y-axis**.

22 Reflect the point $(6, -5)$ in the **y-axis**.

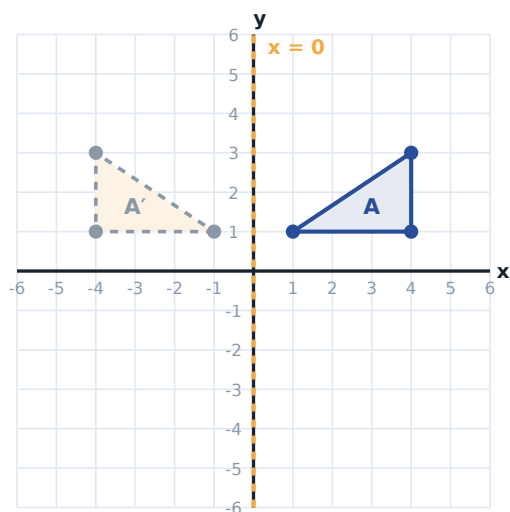
23 Reflect the point $(-5, -6)$ in the **y-axis**.

24 Reflect the point $(1, -1)$ in the **y-axis**.

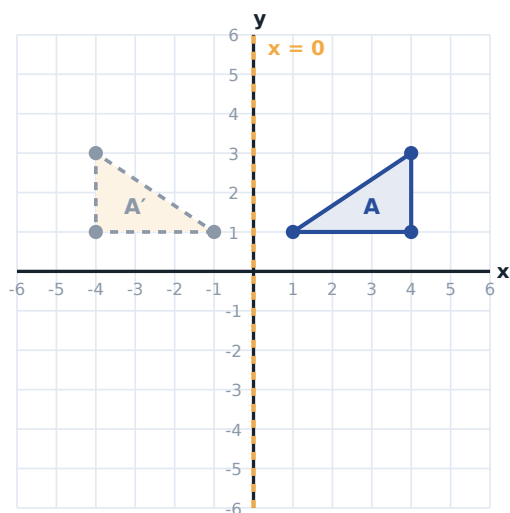
25 Triangle A has vertices $(1, 1)$, $(4, 1)$ and $(4, 3)$. It is reflected in the y-axis. Where does $(1, 1)$ go?



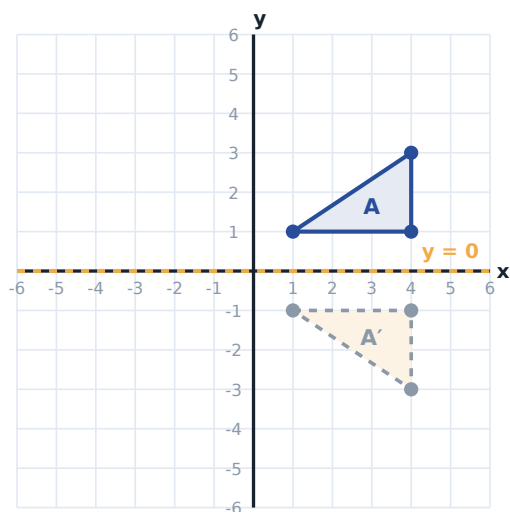
- 26** Triangle A has vertices (1, 1), (4, 1) and (4, 3). It is reflected in the y-axis. Where does (4, 1) go?



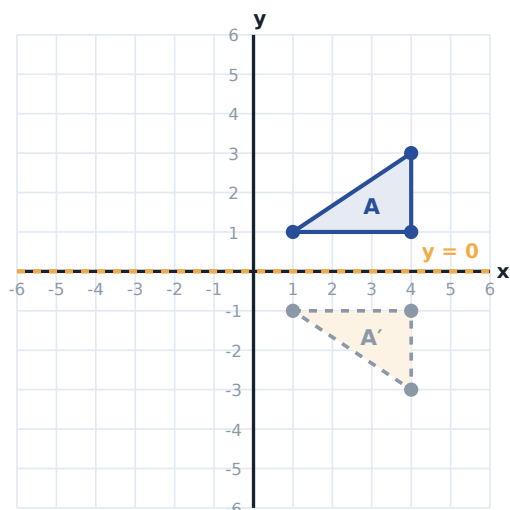
- 27** Triangle A has vertices (1, 1), (4, 1) and (4, 3). It is reflected in the y-axis. Where does (4, 3) go?



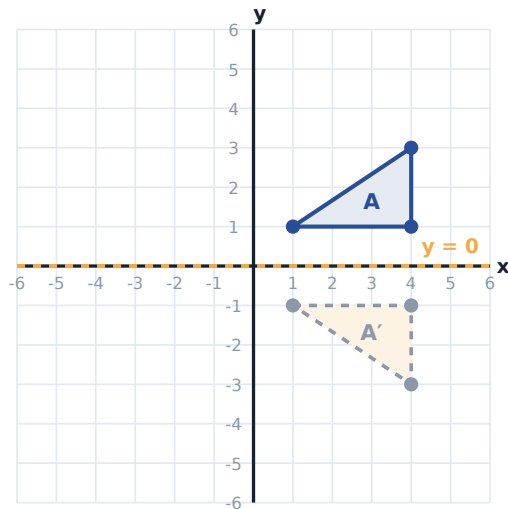
- 28** Triangle A has vertices $(1, 1)$, $(4, 1)$ and $(4, 3)$. It is reflected in the x -axis. Where does $(1, 1)$ go?



- 29** Triangle A has vertices $(1, 1)$, $(4, 1)$ and $(4, 3)$. It is reflected in the x -axis. Where does $(4, 1)$ go?



- 30** Triangle A has vertices (1, 1), (4, 1) and (4, 3). It is reflected in the x-axis. Where does (4, 3) go?



- 31** A point moves from (3, 4) to (3, -4). Which line is the mirror?
- ☐ the x-axis
 - ☐ the y-axis
 - ☐ the line $y = x$
 - ☐ the line $y = -x$
- 32** A point moves from (-2, 5) to (2, 5). Which line is the mirror?
- ☐ the x-axis
 - ☐ the y-axis
 - ☐ the line $y = x$
 - ☐ the line $y = -x$
- 33** A point moves from (6, -1) to (6, 1). Which line is the mirror?
- ☐ the x-axis
 - ☐ the y-axis
 - ☐ the line $y = x$
 - ☐ the line $y = -x$
- 34** A point moves from (-4, -3) to (4, -3). Which line is the mirror?
- ☐ the x-axis
 - ☐ the y-axis
 - ☐ the line $y = x$
 - ☐ the line $y = -x$
- 35** A point moves from (1, 7) to (1, -7). Which line is the mirror?
- ☐ the x-axis
 - ☐ the y-axis
 - ☐ the line $y = x$
 - ☐ the line $y = -x$

36 A point moves from $(-5, 2)$ to $(5, 2)$. Which line is the mirror?

- ☐ the x-axis
- ☐ the y-axis
- ☐ the line $y = x$
- ☐ the line $y = -x$

B · Reasoning — What a flip preserves, and what it reverses.

37 After a reflection, the image is ...

- ☐ larger than the object
- ☐ congruent to the object
- ☐ smaller than the object
- ☐ similar but not congruent

38 Reflecting in the x-axis does what to the coordinates?

- ☐ $(x, y) \rightarrow (-x, y)$
- ☐ $(x, y) \rightarrow (x, -y)$
- ☐ $(x, y) \rightarrow (y, x)$
- ☐ $(x, y) \rightarrow (-x, -y)$

39 Reflecting in the y-axis does what to the coordinates?

- ☐ $(x, y) \rightarrow (-x, y)$
- ☐ $(x, y) \rightarrow (x, -y)$
- ☐ $(x, y) \rightarrow (y, x)$
- ☐ $(x, y) \rightarrow (-x, -y)$

40 A point sits **on** the mirror line. Where is its image?

- ☐ Somewhere else on the line
- ☐ In exactly the same place
- ☐ On the other side
- ☐ It disappears

41 Is a reflection the same as a rotation of 180° ?

- ☐ Yes
- ☐ No

42 Why is the image the same distance from the mirror as the object?

- ☐ It looks better
- ☐ That is what reflecting means
- ☐ Because of the axes
- ☐ It is not

43 Does reflecting a shape twice in the same line return it to the start?

- ☐ Yes
- ☐ No

44 The point $(0, 4)$ is reflected in the y-axis. Where is the image?

- ☐ $(0, -4)$
- ☐ $(0, 4)$
- ☐ $(4, 0)$
- ☐ $(-4, 0)$

- 45** A shape and its image are drawn. How do you find the mirror line?
- ☐ Guess
 - ☐ Join matching points and find the halfway line perpendicular to them
 - ☐ Draw the x-axis
 - ☐ Measure the angles
- 46** Which of these is unchanged by a reflection?
- ☐ The position of every point
 - ☐ The lengths of the sides
 - ☐ Which way round the vertices run
 - ☐ Nothing

C · Challenge — Mirrors that are not axes, and pairs of reflections.

- 47** Reflect the point (3, 2) in the line $x = 1$.

- 48** Reflect the point (−2, 4) in the line $x = -1$.

- 49** Reflect the point (5, 1) in the line $y = 3$.

- 50** Reflect the point (0, −2) in the line $y = 1$.

- 51** Reflect the point (4, 6) in the line $x = 2$.

- 52** Reflect the point (−3, −1) in the line $y = -2$.

- 53** Reflect the point (3, 1) in the line $y = x$.

- 54** Reflect the point (−2, 4) in the line $y = x$.

- 55** Reflect the point (5, −3) in the line $y = x$.

- 56** Reflect the point (0, 6) in the line $y = x$.

- 57** A triangle with area 12 is reflected in the y-axis. What is the area of the image?

- 58** The point (4, −5) is reflected in the x-axis and then in the y-axis. Give the final position.

D · Word problems — Charts, logos, water and wallpaper.

- 59** A boat at $(5, 3)$ on a chart is reflected in the shoreline, which lies along the x -axis. Where is the reflection?

- 60** A logo has a mark at $(-2, 6)$. The design is mirrored in the y -axis. Where is the mark now?

- 61** A kite floats at $(3, 7)$ above still water along the x -axis. Where does its reflection appear?

- 62** A wallpaper pattern is made by reflecting a shape of area 9 cm^2 in a line, over and over, 8 times. What is the total area covered, in square centimetres?

- 63** A tile has a corner at $(-4, -1)$. It is flipped in the y -axis to make the next tile. Where is that corner now?

- 64** A point at $(6, 2)$ has an image at $(6, -2)$. Name the mirror line.

- 65** A shape has a perimeter of 30 cm. It is reflected. What is the perimeter of the image, in centimetres?

- 66** A pattern is built by reflecting the point $(2, 5)$ in the x -axis, then reflecting that image in the y -axis. Give the final point.
