

ANSWER MAZE



REFLECTIONS IN THE COORDINATE PLANE

Reflections: Which Mirror, Which Sign?

One page · 10–15 minutes · nothing to prepare

FREE

5

Reflect $(-4, -7)$ in the line $y = 0$. Where does it land?

$(4, -7) \rightarrow$ go to 6
 $(-4, 7) \rightarrow$ go to 2

Look at the mirror's equation: on which axis is every point of that line?

2

Reflect $(-3, 5)$ in the line $y = -x$. Where does it land?

$(-5, 3) \rightarrow$ go to 7
 $(5, -3) \rightarrow$ go to 4

Look at the sign in the mirror's equation as well as at the order of the numbers.

7

A reflection carries $(6, -2)$ to $(-6, -2)$. In which mirror?

the x-axis $\rightarrow$ go to 6
the y-axis $\rightarrow$ go to 3

Look at the coordinate that stays the same, and at the line along which it stays.

3

Reflect $(2, -6)$ in the line $y = x$. Where does it land?

$(-6, 2) \rightarrow$ go to 8
 $(6, -2) \rightarrow$ go to 4

Look at whether the mirror's equation carries a minus sign at all.

1. **Hand out page 3.** That is the whole preparation.
2. **Say this once:** *“Each box has its own mirror line. Read which line it is before you start. Then ask: does this mirror swap the numbers, and which signs does it change?”*
3. **Start at box 5.** Six boxes and you are out. **Write every box number in the row at the foot as you go.**

Student sheet	page 3, one per student. It shows the four mirror lines as pictures, with all their names and the points each one leaves where they are. It does not show their rules.
Answers	page 4.

The route is $5 \rightarrow 2 \rightarrow 7 \rightarrow 3 \rightarrow 8 \rightarrow 1 \rightarrow \text{out}$. Boxes 6 and 4 are not on it. **They look like every other box:** a question, two answers, two box numbers and a hint. Both of their answers lead back onto the route.

Every wrong answer is a common way of mixing up the four rules. The mistakes fall into two groups, and each box off the route catches one group. Three boxes send a wrong answer to box 6. These are mistakes about which coordinate an axis changes: reading $y = 0$ as the y -axis, naming the axis after the coordinate that changes, and changing both signs, which is a half turn and not a reflection. Three boxes send a wrong answer to box 4. These are mistakes on the slanted lines: using the plain swap for $y = -x$, using the swap with both signs changed for $y = x$, and seeing the swap but not checking the signs.

What the row at the foot tells you in one glance. A clean run is **six numbers**. A longer row shows where it went wrong: the number just before 6 or 4 is the box they got wrong. Box 6 means the student mixed up the axes. Box 4 means the student mixed up $y = x$ and $y = -x$.



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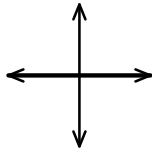
Answer Maze

Start at box 5 · which mirror, which sign

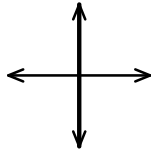
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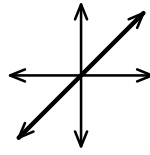
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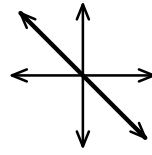
the x-axis · $y = 0$
the horizontal axis · $(x, 0)$ stays put



the y-axis · $x = 0$
the vertical axis · $(0, y)$ stays put



$y = x$
 (a, a) stays put



$y = -x$
 $(a, -a)$ stays put

1

A reflection carries $(4, -1)$ to $(1, -4)$. In which mirror?

the line $y = -x$ → you are out
the line $y = x$ → go to 4

Look at the midpoint of the two points, and at which line it lies on.

2

Reflect $(-3, 5)$ in the line $y = -x$. Where does it land?

$(-5, 3)$ → go to 7
 $(5, -3)$ → go to 4

Look at the sign in the mirror's equation as well as at the order of the numbers.

3

Reflect $(2, -6)$ in the line $y = x$. Where does it land?

$(-6, 2)$ → go to 8
 $(6, -2)$ → go to 4

Look at whether the mirror's equation carries a minus sign at all.

4

Which rule is the reflection in the line $y = -x$?

$(x, y) \rightarrow (y, x)$ → go to 2
 $(x, y) \rightarrow (-y, -x)$ → go to 7

Look at a point that lies on this mirror: the rule leaves it where it is.

5

Reflect $(-4, -7)$ in the line $y = 0$. Where does it land?

$(4, -7)$ → go to 6
 $(-4, 7)$ → go to 2

Look at the mirror's equation: on which axis is every point of that line?

6

Which points does the x-axis leave exactly where they are?

every point $(a, 0)$ → go to 2
every point $(0, a)$ → go to 5

Look at the line itself: what height is every point on it?

7

A reflection carries $(6, -2)$ to $(-6, -2)$. In which mirror?

the x-axis → go to 6
the y-axis → go to 3

Look at the coordinate that stays the same, and at the line along which it stays.

8

Reflect $(-5, 1)$ in the y-axis. Where does it land?

$(5, -1)$ → go to 6
 $(5, 1)$ → go to 1

Look at how many of the two coordinates cross the mirror.

Write every box number here as you go. It shows you the way back if you lose your place. **A clean run is six numbers.**

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Answer Maze — answers

For the teacher

The route, in order. Boxes 6 and 4 are not on the route. They come last in the table. A student reaches them only by a wrong answer.

5 → 2 → 7 → 3 → 8 → 1 → out

	Box	Right answer	Wrong answer and why it is wrong	Wrong goes to	Right goes to
1	Box 5	(-4, 7)	(4, -7): It changes the wrong coordinate. The line $y = 0$ is the x-axis, not the y-axis.	box 6	box 2
2	Box 2	(-5, 3)	(5, -3): It only swaps the numbers. That is the rule for $y = x$, not for $y = -x$.	box 4	box 7
3	Box 7	the y-axis	the x-axis: It names the axis after the coordinate that changes.	box 6	box 3
4	Box 3	(-6, 2)	(6, -2): It swaps and changes both signs. That is the rule for $y = -x$, not for $y = x$.	box 4	box 8
5	Box 8	(5, 1)	(5, -1): It changes both signs. That is a half turn, not a reflection.	box 6	box 1
6	Box 1	the line $y = -x$	the line $y = x$: It sees the swap but does not check the signs.	box 4	out
	Box 6	every point (a, o)	every point (o, a): It mixes up the x-axis with the line $x = 0$, which is the y-axis.	box 5	box 2
	Box 4	(x, y) → (-y, -x)	(x, y) → (y, x): That is the rule for $y = x$, not for $y = -x$.	box 2	box 7

Guessing does not get a student out. Every simple guessing rule, such as always taking the first answer, goes wrong within the first three boxes. One shortcut does work: a student can find the route by following the arrows backward from “you are out.” So ask a student with a clean row to explain one box.