

MYSTERY PICTURE

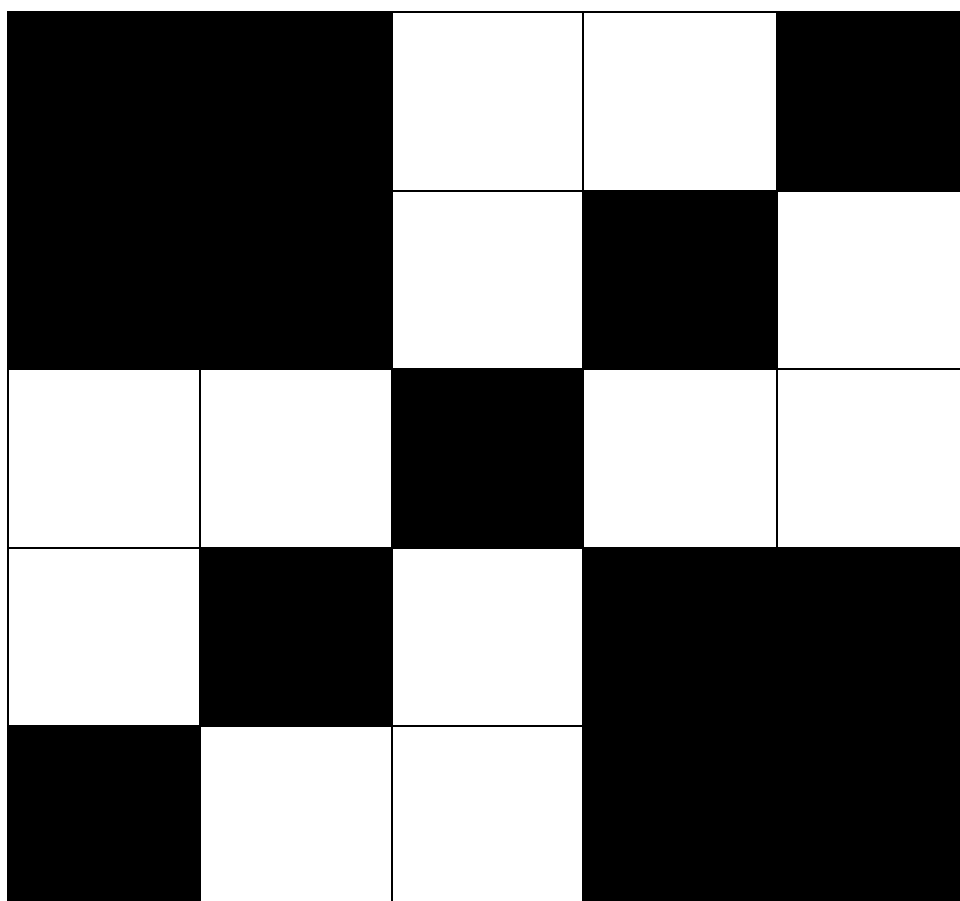


REFLECTIONS IN THE COORDINATE PLANE

Reflections: Did It Land in the Right Place?

25 points, 25 mirrors · change a sign, swap two numbers, never add · wrong answers show in the picture

FREE



1. **Hand out page 3**, one per student. Pencils. Nothing else.
2. **Say this once:** *“Each square has its own mirror line. Read which line it is before you start. Is the point shown the correct image? If yes, fill the square with slanted lines. If no, leave it white.”*
3. **When you finish, look at the picture.** If part of it is missing, or one square does not fit, check that square again.

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 finished picture and the reason for every square.

Thirteen squares are filled and twelve are white. The finished picture is a percent sign (%). Each white square shows a common way of mixing up the four rules. In three, the student uses the rule of the other axis, for example reading $y = 0$ as the y -axis. In four, both signs are changed, which is a half turn and not a reflection. In three, $y = x$ and $y = -x$ are mixed up. In one, a slanted line is treated as an axis. In one, a point that lies on its mirror is moved. Two filled squares show a point on its own mirror, which stays where it is.

Thirteen of the 25 mirror lines are slanted, because the slanted lines are the main work of the lesson. The mirror lines are named in eight different ways. Nothing is drawn in the squares, so students must use the rule, not a picture.

Half a method is not enough. A student who checks only whether the numbers swap gets ten squares wrong. A student who checks only the signs gets two wrong. **Guessing does not work either.** Every simple guessing rule, such as filling every square where the numbers are swapped, gets at least nine squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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Mystery Picture

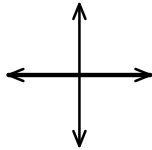
Did it land in the right place?

Name _____

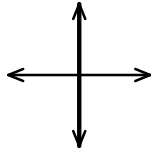
Period _____

Date _____

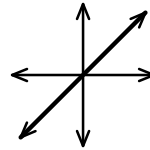
Each square shows a point reflected in its own mirror line. Is the point shown the correct image? If yes, fill the square with slanted lines. If no, leave it white. The midpoint between a point and its image always sits on the mirror line. When you finish, look at the picture. If part of it is missing, or one square does not fit, that square is wrong.



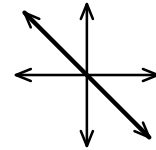
the x-axis · $y = 0$
the horizontal axis · $(x, 0)$ stays put



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 $(-3, 5)$ in the line $y = -x$ $\rightarrow (-5, 3)$	2 $(4, -2)$ in the x-axis $\rightarrow (4, 2)$	3 $(-6, 1)$ in the line $x = 0$ $\rightarrow (-6, -1)$	4 $(2, -5)$ in the line $y = x$ $\rightarrow (5, -2)$	5 $(-3, -4)$ in the vertical axis $\rightarrow (3, -4)$
6 $(-1, 4)$ in the line $y = x$ $\rightarrow (4, -1)$	7 $(3, -3)$ in the line $y = -x$ $\rightarrow (3, -3)$	8 $(5, -1)$ in the y-axis $\rightarrow (-5, 1)$	9 $(-2, -6)$ in the line $y = 0$ $\rightarrow (-2, 6)$	10 $(-4, 1)$ in the line $y = -x$ $\rightarrow (1, -4)$
11 $(-5, 2)$ in the x-axis $\rightarrow (5, 2)$	12 $(6, -1)$ in the line $y = x$ $\rightarrow (6, 1)$	13 $(2, 6)$ in the line $y = -x$ $\rightarrow (-6, -2)$	14 $(-5, -2)$ in the line $y = -x$ $\rightarrow (5, 2)$	15 $(4, 0)$ in the horizontal axis $\rightarrow (-4, 0)$
16 $(-2, 3)$ in the x-axis $\rightarrow (2, -3)$	17 $(-6, -3)$ in the line $y = x$ $\rightarrow (-3, -6)$	18 $(3, 5)$ in the line $y = 0$ $\rightarrow (-3, 5)$	19 $(0, -4)$ in the y-axis $\rightarrow (0, -4)$	20 $(1, -5)$ in the line $x = 0$ $\rightarrow (-1, -5)$
21 $(6, -2)$ in the line $y = -x$ $\rightarrow (2, -6)$	22 $(-3, 1)$ in the line $y = x$ $\rightarrow (-1, 3)$	23 $(4, 3)$ in the line $y = -x$ $\rightarrow (-4, -3)$	24 $(-1, 6)$ in the x-axis $\rightarrow (-1, -6)$	25 $(5, -3)$ in the line $y = x$ $\rightarrow (-3, 5)$

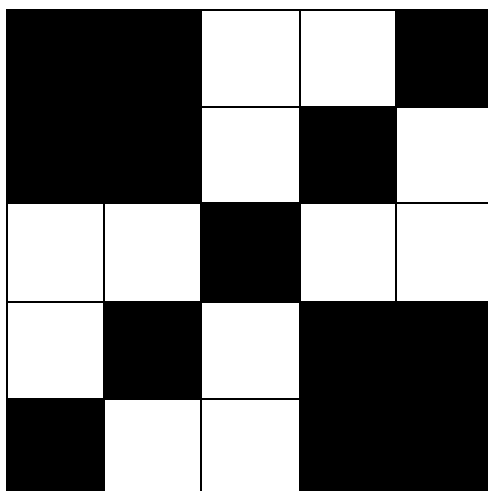


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Mystery Picture — answers

For the teacher

The finished picture is a **percent sign (%)**. The table reads left to right, as the sheet does.



1–5	FILL · the image	FILL · the image	white · used the other axis's rule	white · mixed up $y = x$ and $y = -x$	FILL · the image
6–10	FILL · the image	FILL · on the mirror, so it does not move	white · changed both signs (a half turn)	FILL · the image	white · mixed up $y = x$ and $y = -x$
11–15	white · used the other axis's rule	white · used the x -axis rule on a slanted line	FILL · the image	white · changed the signs but did not swap	white · moved a point that is on the mirror
16–20	white · changed both signs (a half turn)	FILL · the image	white · used the other axis's rule	FILL · on the mirror, so it does not move	FILL · the image
21–25	FILL · the image	white · mixed up $y = x$ and $y = -x$	white · changed the signs but did not swap	FILL · the image	FILL · the image

The four rules, to help you mark. Reflection in $y = 0$ (the x -axis): $(x, y) \rightarrow (x, -y)$. Reflection in $x = 0$ (the y -axis): $(x, y) \rightarrow (-x, y)$. Reflection in $y = x$: $(x, y) \rightarrow (y, x)$. Reflection in $y = -x$: $(x, y) \rightarrow (-y, -x)$.

A square is filled only when the point shown is the image of the given point in the mirror named in that square.