

ANSWER MAZE



ROTATIONS IN THE COORDINATE PLANE

Rotations: Which Way, and About What?

One page · 10–15 minutes · nothing to prepare

FREE

4

Turn $(-3, 7)$ a quarter turn
counterclockwise about the origin.
Where does it land?

$(7, 3) \rightarrow$ go to 3

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

*Look at where a point on the positive x -axis goes
under this turn, and at the quadrant it ends in.*

7

Turn $(5, -2)$ a half turn about $K(1, 3)$.
Where does it land?

$(-3, 8) \rightarrow$ go to 2

$(-5, 2) \rightarrow$ go to 8

*Look at where the center is, and at what lies
halfway between a point and its image.*

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 4. Before you choose, say which way the turn goes and where its center is. Write every box number in the row at the foot as you go.”*
3. **Mark a sheet in a glance.** A clean run is **4 7 2 6 1 5**: six boxes, then out.

Student sheet	page 3, one per student. The four turns and all their names are printed on it as pictures. Their rules are not printed.
Answers	page 4.

The wrong answers come from two kinds of mistake, and each kind has its own box off the route. The first kind is about which way a quarter turn goes. A student turns the wrong way, uses the counterclockwise rule for the clockwise turn, or reads a three-quarter turn as one quarter. Each of these sends the student to box 3. The second kind is about half turns. A student uses the origin's rule for a turn about K , mixes up the half turn with the reflection in $y = -x$, or takes the origin as the center. Each of these sends the student to box 8. Both of those boxes send the student back onto the route.

The row at the foot is the check. A clean run is six numbers. A wrong answer adds one or more. The hint in each box says what to look at. It never says which answer is right.



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.
chooseyourlesson.com — 135 free geometry lessons.

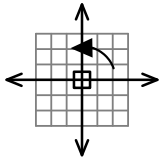
Answer Maze

Start at box 4 · which way, and about what

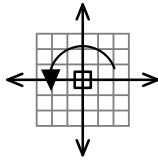
Name _____

Period _____

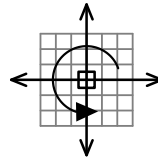
Date _____



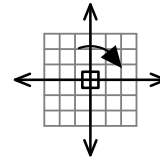
quarter turn counterclockwise
+90° · the center stays put



half turn · 180°, either way
also: the point reflection in the center



three-quarter turn counterclockwise
+270° · the same turn as -90°



quarter turn clockwise
-90° · the same turn as +270°

1

Turn (4, -5) a three-quarter turn counterclockwise about the origin. Where does it land?

(-5, -4) → go to 5
(5, 4) → go to 3

Look at how many quarter turns this is, and at which way round they go.

2

Which rule is the quarter turn clockwise about the origin?

(x, y) → (-y, x) → go to 3
(x, y) → (y, -x) → go to 6

Look at which way the turn goes, and test each rule on a point of an axis.

3

Which turn about the origin is the same map as a quarter turn clockwise about the origin?

a quarter turn counterclockwise → go to 4
a three-quarter turn counterclockwise → go to 7

Look at where each turn ends after going round, and at which way it goes.

4

Turn (-3, 7) a quarter turn counterclockwise about the origin. Where does it land?

(7, 3) → go to 3
(-7, -3) → go to 7

Look at where a point on the positive x-axis goes under this turn, and at the quadrant it ends in.

5

A half turn carries (-4, 6) to (6, -2). About which center?

(0, 0) → go to 8
(1, 2) → you are out

Look at what lies halfway between a point and its image under a half turn.

6

Which rule is the half turn about the origin?

(x, y) → (-x, -y) → go to 1
(x, y) → (-y, -x) → go to 8

Look at the order of the two numbers as well as at their signs.

7

Turn (5, -2) a half turn about K(1, 3). Where does it land?

(-3, 8) → go to 2
(-5, 2) → go to 8

Look at where the center is, and at what lies halfway between a point and its image.

8

Which point does a half turn about K(2, -1) leave where it is?

(2, -1) → go to 2
(0, 0) → go to 7

Look at the one point that a turn never moves.

Write each box number as you reach it:

--	--	--	--	--	--	--	--	--



135 free geometry lessons — worksheets, worked answers and lesson plans.
chooseyourlesson.com

Answer Maze — answers

For the teacher

The route, in order. Boxes 3 and 8 are not on it. They come last in the table. A student reaches them only after a wrong answer.

4 → 7 → 2 → 6 → 1 → 5 → out

	Box	Right	Wrong answer: the mistake, and where it goes
1	Box 4	$(-7, -3)$	$(7, 3)$: turned clockwise instead → box 3
2	Box 7	$(-3, 8)$	$(-5, 2)$: the half-turn rule for the origin, used about K → box 8
3	Box 2	$(x, y) \rightarrow (y, -x)$	$(x, y) \rightarrow (-y, x)$: the counterclockwise rule → box 3
4	Box 6	$(x, y) \rightarrow (-x, -y)$	$(x, y) \rightarrow (-y, -x)$: the reflection in $y = -x$, which also swaps the numbers → box 8
5	Box 1	$(-5, -4)$	$(5, 4)$: one quarter turn counterclockwise instead of three → box 3
6	Box 5	$(1, 2)$	$(0, 0)$: the origin taken as the center of every turn → box 8
	Box 3	a three-quarter turn counterclockwise	a quarter turn counterclockwise: the right direction word, but the wrong size of turn → box 4
	Box 8	$(2, -1)$	$(0, 0)$: the origin taken as the point that never moves → box 7

Why each answer is right. Box 4: A quarter turn counterclockwise about the origin is $(x, y) \rightarrow (-y, x)$, so $(-3, 7)$ goes to $(-7, -3)$. Box 7: K is the midpoint of a point and its image. Twice $(1, 3)$ is $(2, 6)$, and $(2, 6)$ take away $(5, -2)$ is $(-3, 8)$. Box 2: Test $(1, 0)$. A quarter turn clockwise takes it to $(0, -1)$, and only the rule $(y, -x)$ gives $(0, -1)$. Box 6: A half turn about the origin changes both signs and keeps the order. For example, $(1, 2)$ goes to $(-1, -2)$. Box 1: A three-quarter turn counterclockwise is the same as a quarter turn clockwise, $(x, y) \rightarrow (y, -x)$. So $(4, -5)$ goes to $(-5, -4)$. Box 5: The center of a half turn is the midpoint of a point and its image. The midpoint of $(-4, 6)$ and $(6, -2)$ is $(1, 2)$. Box 3: Three quarter turns counterclockwise end in the same place as one quarter turn clockwise. Box 8: The center of a turn is the one point that does not move. This half turn is about K $(2, -1)$, so $(2, -1)$ stays where it is.

The rules, for turns about the origin only. A quarter turn counterclockwise is $(x, y) \rightarrow (-y, x)$. A quarter turn clockwise, which is also a three-quarter turn counterclockwise, is $(x, y) \rightarrow (y, -x)$. A half turn is $(x, y) \rightarrow (-x, -y)$. A half turn about any center leaves that center where it is. The center is the midpoint of every point and its image.

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.