

ANSWER MAZE



THE MIDPOINT ON A NUMBER LINE AND IN THE PLANE

Midpoints on a Number Line & in the Plane

One page · 10–15 minutes · nothing to prepare

FREE

1

A is $(-4, 5)$ and B is $(6, -1)$. **Find the midpoint of AB .** The answer is a pair.

$(5, 3) \rightarrow$ go to 4
 $(1, 2) \rightarrow$ go to 6

Each coordinate of the midpoint lies between the two endpoints.

2

$N(1, 0)$ is the midpoint of PQ , and P is $(3, -4)$. **Find Q .** The answer is a pair.

$(2, -2) \rightarrow$ go to 8
 $(-1, 4) \rightarrow$ go to 5

Check: average your answer with the endpoint you had. Is that the midpoint?

3

On a number line, A is at -9 and B is at -3 . **Where is the midpoint of AB ?**

$3 \rightarrow$ go to 4
 $-6 \rightarrow$ go to 7

Distance subtracts. The midpoint adds, then halves.

4

K is the midpoint of JL . On a number line J is at -2 and K is at 3 . **Where is L ?**

$8 \rightarrow$ go to 7
 $0.5 \rightarrow$ go to 3

Half the distance is a length, not a place: add the two, then halve.

1. **Hand out page 3.** That is the whole preparation.
2. **Say this once:** *“Distance subtracts. The midpoint adds, then halves. Going backwards, take the same step again from the midpoint. In the plane, work with x and x , then y and y .”*
3. **Start at box 3.** 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. The midpoint, the plane and going backwards are printed on it as pictures.
Answers	page 4.

The route is $3 \rightarrow 7 \rightarrow 1 \rightarrow 6 \rightarrow 2 \rightarrow 5 \rightarrow \text{out}$. Boxes 4 and 8 are not on it. **They look like every other box.** Each has a task, two answers, two box numbers and a hint. No box has a drawing. Both of their answers lead back onto the route.

Each box off the route catches one kind of mistake. Three boxes send a wrong answer to box 4. A student there subtracted and halved. That gives half the distance, which is a length and not a place. Three boxes send a wrong answer to box 8. A student there averaged the wrong two numbers. Either they averaged the endpoint with the midpoint, which lands a quarter of the way along, or they averaged an x with a y . Both mistakes appear on a number line and in the plane.

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 4 or 8 is the box they got wrong. Which of the two boxes it is tells you which mistake they made.



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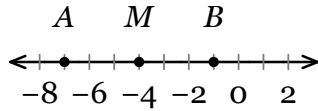
Answer Maze

Start at box 3 · a pair in the plane, a number on a line

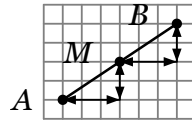
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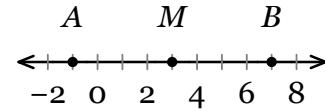
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The midpoint
add, then halve: $(-7 + (-1)) \div 2 = -4$



In the plane
x with x, y with y: the answer is a pair



The other endpoint
the same step again: $2 \times 3 - (-1) = 7$

1

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(1, 2) → go to 6

Each coordinate of the midpoint lies between the two endpoints.

2

N $(1, 0)$ is the midpoint of PQ, and P is $(3, -4)$. **Find Q.** The answer is a pair.

(2, -2) → go to 8
(-1, 4) → go to 5

Check: average your answer with the endpoint you had. Is that the midpoint?

3

On a number line, A is at -9 and B is at -3 . **Where is the midpoint of AB?**

3 → go to 4
-6 → go to 7

Distance subtracts. The midpoint adds, then halves.

4

K is the midpoint of JL. On a number line J is at -2 and K is at 3 . **Where is L?**

8 → go to 7
0.5 → go to 3

Half the distance is a length, not a place: add the two, then halve.

5

On a number line, G is at -7 and H is at 4 . **Where is the midpoint of GH?**

-1.5 → you are out
5.5 → go to 4

A half is a fine answer. Is it between the two endpoints?

6

C is $(-6, 2)$ and D is $(4, 8)$. **Find the midpoint of CD.** The answer is a pair.

(-1, 5) → go to 2
(-2, 6) → go to 8

Match x with x and y with y. Work on two separate lines.

7

M is the midpoint of RS. On a number line R is at 4 and M is at -2 . **Where is S?**

-8 → go to 1
1 → go to 8

Going backwards, take the same step again from the midpoint.

8

E is $(-5, -3)$ and F is $(3, 1)$. **Find the midpoint of EF.** The answer is a pair.

(4, 2) → go to 7
(-1, -1) → go to 1

Average the right two numbers. Never the endpoint with the midpoint. Never an x with a y.

Write every box number here as you go. If you get lost, this row shows where you have been. **A clean run is six numbers.**

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Answer Maze — answers

For the teacher

The route, in order, is below. Boxes 4 and 8 are not on it. They are at the bottom of the table. A student reaches them only by giving a wrong answer.

3 → 7 → 1 → 6 → 2 → 5 → out

	Box	Working	Answer	Wrong answer	Right answer goes to
1	Box 3	$(-9 + (-3)) \div 2$	-6	3. This is half the distance. It is a length, not a place. It goes to box 4.	box 7
2	Box 7	$2 \times (-2) - 4$	-8	1. The student averaged the endpoint with the midpoint. That is a quarter of the way along. It goes to box 8.	box 1
3	Box 1	x: $(-4 + 6) \div 2$; y: $(5 + (-1)) \div 2$	(1, 2)	(5, 3). This is half the steps across and half the steps up. It is a distance, not a place. It goes to box 4.	box 6
4	Box 6	x: $(-6 + 4) \div 2$; y: $(2 + 8) \div 2$	(-1, 5)	(-2, 6). The student averaged each point's x with its own y. It goes to box 8.	box 2
5	Box 2	x: $2 \times 1 - 3$; y: $2 \times 0 - (-4)$	(-1, 4)	(2, -2). The student averaged the endpoint with the midpoint. That is a quarter of the way along. It goes to box 8.	box 5
6	Box 5	$(-7 + 4) \div 2$	-1.5	5.5. This is half the distance. It is a length, not a place. It goes to box 4.	out
	Box 4	$2 \times 3 - (-2)$	8	0.5. The student averaged the endpoint with the midpoint. That is a quarter of the way along. It goes to box 3.	box 7
	Box 8	x: $(-5 + 3) \div 2$; y: $(-3 + 1) \div 2$	(-1, -1)	(4, 2). This is half the steps across and half the steps up. It is a distance, not a place. It goes to box 7.	box 1

Each wrong answer comes from a common mistake about midpoints, not from an arithmetic slip. These checks are worth saying aloud. The coordinates of a midpoint lie between those of the endpoints. Going backwards, the answer is past the midpoint. Average it with the endpoint you had, and you get the midpoint back.

Guessing does not get a student out. Every simple guessing rule, such as always taking the first answer, goes wrong within the first four boxes. A student could find the route by working backwards from the end, but would still have written no answers.