

MYSTERY PICTURE

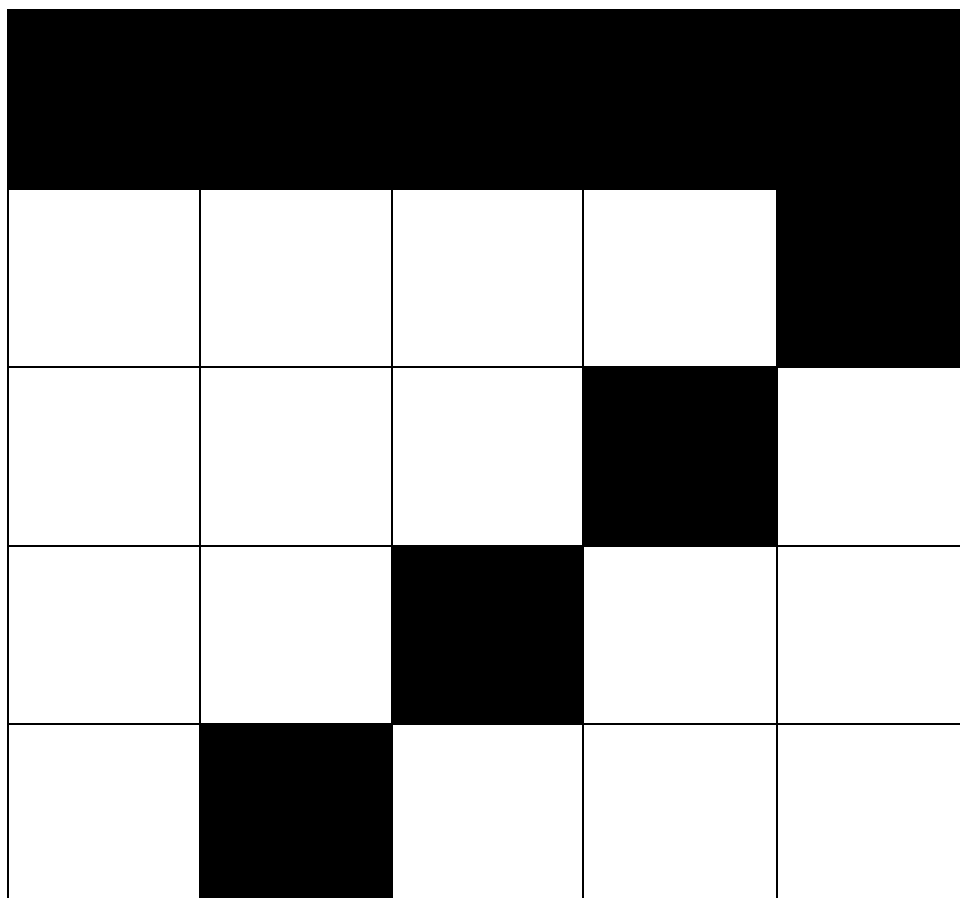


THE MIDPOINT ON A NUMBER LINE AND IN THE PLANE

Is M the Midpoint? Count the Steps

25 squares of squared paper · no coordinates · the picture checks the answers

FREE



1. **Hand out page 3.** That is the whole preparation.
2. **Say this once:** *“Count, don't look. From A to M, how many across and how many up? From M to B? The same two numbers, the same way round and in the same direction. Then M is the midpoint.”*
3. **Fill a square with slanted lines if M is the midpoint of AB. Leave it white if it is not.** A picture appears. 9 of the 25 are filled.

Student sheet	page 3, one per student. The midpoint, the plane and going backwards are printed on it as pictures.
Answers	page 4 — the finished picture and the reason for every square.

No square has a number on it. There are no axes and no coordinates. Once coordinates are printed, many students stop looking at the figure. Here the grid is the scale, and every dot is where it really is. To decide, students count the steps across and up from each end to M.

The white squares show the common mistakes. In three, M is one step short of the middle. In five, AB is an odd number of squares across or up. So its middle is halfway along a square, and M is half a step off. In three, the steps are swapped, such as 3 across and 2 up, then 2 across and 3 up. In three, the counts match, but one of them goes the other way. In one, M is a quarter of the way along. In one, M is past the end, and B is the midpoint. A student who fills every square where M looks halfway gets six squares wrong. A student who only checks that the two walks have the same number of steps gets six wrong, and the picture shows the holes.

The filled squares change things that do not matter. AB runs in different directions, and A can be at either end. In two filled squares, the middle is halfway along a square, because a half is a right answer too. Three of the 25 segments are horizontal and two are vertical. The rest slant at twelve different slopes.



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

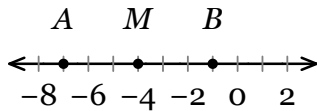
Count the steps — don't trust your eye

Name _____

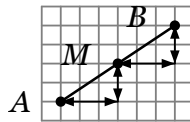
Period _____

Date _____

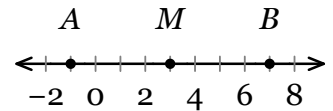
Is M the midpoint of AB ? Count the squares across and up from A to M . Then count from M to B . If the two counts are the same, and go the same direction, fill the square with slanted lines. If not, leave it white. When you finish, look at the picture. If it does not look right, check your squares again.



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 	2 	3 	4 	5
6 	7 	8 	9 	10
11 	12 	13 	14 	15
16 	17 	18 	19 	20
21 	22 	23 	24 	25

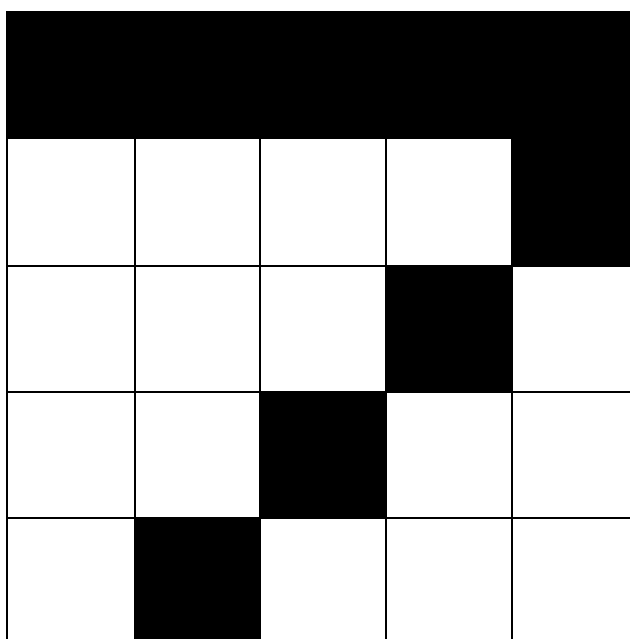


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Mystery Picture — answers

For the teacher

The finished picture is **the figure 7**. The table reads left to right, the way the sheet is read. The squares are numbered on the student's sheet.



1–5	FILL A to M and M to B are the same walk.	FILL The segment is horizontal: 4 across, twice.	FILL The segment is vertical: 3 up, twice.	FILL The middle is halfway along a square, and M is there.	FILL A to M and M to B are the same walk.
6–10	white M is one step short of the middle.	white The count is odd, so M is half a step off the middle.	white The steps across and up are swapped.	white The counts match, but one goes the other way.	FILL The middle is halfway along a square, and M is there.
11–15	white M is only a quarter of the way along.	white M is past B. B is the midpoint of AM.	white M is one step short of the middle.	FILL A to M and M to B are the same walk.	white The count is odd, so M is half a step off the middle.
16–20	white The steps across and up are swapped.	white The counts match, but one goes the other way.	FILL A to M and M to B are the same walk.	white M is one step short of the middle.	white The count is odd, so M is half a step off the middle.
21–25	white The steps across and up are swapped.	FILL A to M and M to B are the same walk.	white The counts match, but one goes the other way.	white The count is odd, so M is half a step off the middle.	white The count is odd, so M is half a step off the middle.