

MYSTERY PICTURE



PERIMETER AND AREA ON THE COORDINATE PLANE

Area on the Grid: Is It Set Up Right?

25 setups · base and height · no calculator · a picture appears

FREE

1 Area = 5×3	2 Area = $\frac{1}{2} \times 4 \times 3$	3 Area = $\frac{1}{2} \times 6 \times 4$	4 Area = $\frac{1}{2} \times 5 \times 4$	5 Area = $\frac{1}{2} \times 6 \times 5$
6 Area = $\frac{1}{2} \times 4 \times 5$	7 Area = $\frac{1}{2} \times 6 \times 4$	8 Area = 4×5	9 Area = $\frac{1}{2} \times 3 \times 5$	10 Area = 5×3
11 Area = $\frac{1}{2} \times 7 \times 5$	12 Area = $\frac{1}{2} \times 4 \times 6$	13 Area = $\frac{1}{2} \times 7 \times 3$	14 Area = 6×3	15 Area = $\frac{1}{2} \times 4 \times \sqrt{10}$
16 Area = $\frac{1}{2} \times 8 \times 3$	17 Area = 3×4	18 Area = $\frac{1}{2} \times 4 \times 5$	19 Area = 5×4	20 Area = $\frac{1}{2} \times 6 \times 3$
21 Area = $\frac{1}{2} \times 5 \times 4$	22 Area = $\frac{1}{2} \times 4 \times 5$	23 Area = 7×2	24 Area = $\frac{1}{2} \times 4 \times 4$	25 Area = $\frac{1}{2} \times 4 \times 3$

Mystery Picture — how to run it

25–35 minutes

1. **Give each student page 3** and a pencil. No calculator is needed.
2. **Say this once:** *“Do not work out the area. Count the base and the height on the grid, and check the setup. If it is correct, fill the square with slanted lines. If not, leave it white.”*
3. **Let them work.** The picture shows when they are right. Nothing else is needed.

Student sheet page 3, one per student. A box at the top shows a base, its height and a slant side.
Answers pages 4–5, for you.

Each square shows a rectangle or a triangle on squared paper and one setup for its area, such as $\text{Area} = \frac{1}{2} \times 6 \times 4$. The student does not compute anything. A correct setup uses a base along a grid line and the height counted straight up (or straight across) from that base line, with $\frac{1}{2}$ for a triangle. Some triangles have their top corner past the end of the base, and some have an upright base. Sixteen squares are filled.

Each white square has one common mistake. In four squares a slant side is used as the height. In three of them the slant side is 5 long, so no square root shows. In three a length was counted by the grid lines instead of the spaces between them, so it is one too long. In two the $\frac{1}{2}$ is missing for a triangle.

If part of a student’s picture looks wrong, the mistake is in that square. Ask: *“Which side is the base? Count the height straight up from the base line. Did you count spaces or lines?”* Guessing does not work. Every simple guessing rule, such as filling every square with no square root, gets at least six 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.
chooseyourlesson.com — 135 free geometry lessons.

Mystery Picture — is the area set up right?

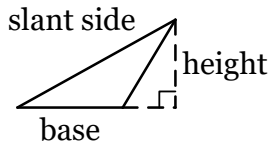
Area from the grid

Name _____

Period _____

Date _____

Each square shows a figure on squared paper and a setup for its area. Do not work it out. Count the base and the height on the grid. **If the setup is correct, fill the square with slanted lines. If not, leave it white.** A picture appears. If part of it is missing, or one square does not fit, check that square again.



Area is the space inside, in square units. Rectangle: $\text{base} \times \text{height}$. Triangle: $\frac{1}{2} \times \text{base} \times \text{height}$. The height goes straight up, down or across from the base line to the opposite corner. A slant side is never the height. An area never needs a square root here. Count the spaces between grid lines, not the lines.

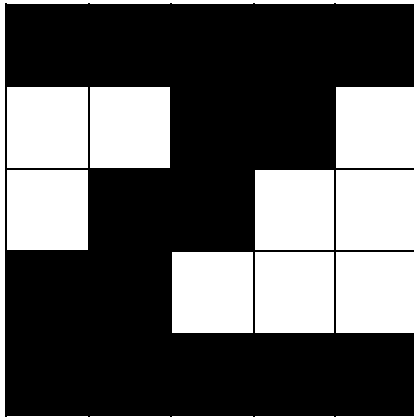
1 Area = 5×3	2 Area = $\frac{1}{2} \times 4 \times 3$	3 Area = $\frac{1}{2} \times 6 \times 4$	4 Area = $\frac{1}{2} \times 5 \times 4$	5 Area = $\frac{1}{2} \times 6 \times 5$
6 Area = $\frac{1}{2} \times 4 \times 5$	7 Area = $\frac{1}{2} \times 6 \times 4$	8 Area = 4×5	9 Area = $\frac{1}{2} \times 3 \times 5$	10 Area = 5×3
11 Area = $\frac{1}{2} \times 7 \times 5$	12 Area = $\frac{1}{2} \times 4 \times 6$	13 Area = $\frac{1}{2} \times 7 \times 3$	14 Area = 6×3	15 Area = $\frac{1}{2} \times 4 \times \sqrt{10}$
16 Area = $\frac{1}{2} \times 8 \times 3$	17 Area = 3×4	18 Area = $\frac{1}{2} \times 4 \times 5$	19 Area = 5×4	20 Area = $\frac{1}{2} \times 6 \times 3$
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Mystery Picture — answers

For the teacher



The finished picture is **the letter Z**. Sixteen squares are filled.

A setup is correct when it uses a base along a grid line and its height, counted in spaces, with $\frac{1}{2}$ for a triangle. The corners are given as if the lower-left grid crossing of each drawing were (0, 0). The table gives the reason for every square. It goes on over the page.

	The square	Answer	Why
1	Rectangle with corners (1, 1), (6, 1), (6, 4), (1, 4). Area = 5×3 .	fill	The rectangle is 5 by 3. The setup uses them.
2	Triangle with corners (1, 1), (5, 1), (7, 4). Area = $\frac{1}{2} \times 4 \times 3$.	fill	The triangle has base 4 (along a grid line) and height 3 (counted straight up from the base line, past the end of the base). The setup uses them with the $\frac{1}{2}$.
3	Triangle with corners (1, 1), (7, 1), (1, 5). Area = $\frac{1}{2} \times 6 \times 4$.	fill	The triangle has base 6 (along a grid line) and height 4 (counted straight up from the base line). The setup uses them with the $\frac{1}{2}$.
4	Triangle with corners (5, 1), (5, 6), (1, 3). Area = $\frac{1}{2} \times 5 \times 4$.	fill	The triangle has base 5 (along a grid line) and height 4 (counted straight across from the base line). The setup uses them with the $\frac{1}{2}$.
5	Triangle with corners (1, 1), (7, 1), (3, 6). Area = $\frac{1}{2} \times 6 \times 5$.	fill	The triangle has base 6 (along a grid line) and height 5 (counted straight up from the base line). The setup uses them with the $\frac{1}{2}$.
6	Triangle with corners (1, 1), (5, 1), (8, 5). Area = $\frac{1}{2} \times 4 \times 5$.	white	The 5 is a slant side, not the height. The height is 4, so the area is $\frac{1}{2} \times 4 \times 4$.
7	Triangle with corners (1, 1), (6, 1), (3, 5). Area = $\frac{1}{2} \times 6 \times 4$.	white	The base is 5, not 6: the grid lines were counted instead of the spaces. The area is $\frac{1}{2} \times 5 \times 4$.
8	Rectangle with corners (1, 1), (5, 1), (5, 6), (1, 6). Area = 4×5 .	fill	The rectangle is 4 by 5. The setup uses them.
9	Triangle with corners (3, 1), (6, 1), (1, 6). Area = $\frac{1}{2} \times 3 \times 5$.	fill	The triangle has base 3 (along a grid line) and height 5 (counted straight up from the base line, past the end of the base). The setup uses them with the $\frac{1}{2}$.
10	Triangle with corners (1, 1), (6, 1), (6, 4). Area = 5×3 .	white	The $\frac{1}{2}$ is missing. A triangle is half of the rectangle on its base and height: $\frac{1}{2} \times 5 \times 3$.
11	Triangle with corners (1, 1), (8, 1), (5, 4). Area = $\frac{1}{2} \times 7 \times 5$.	white	The 5 is a slant side, not the height. The height is 3, so the area is $\frac{1}{2} \times 7 \times 3$.
12	Triangle with corners (1, 1), (1, 5), (7, 6). Area = $\frac{1}{2} \times 4 \times 6$.	fill	The triangle has base 4 (along a grid line) and height 6 (counted straight across from the base line, past the end of the base). The setup uses them with the $\frac{1}{2}$.

Mystery Picture — answers, squares 13 to 25

For the teacher

	The square	Answer	Why
13	Triangle with corners (1, 1), (8, 1), (8, 4). Area = $\frac{1}{2} \times 7 \times 3$.	fill	The triangle has base 7 (along a grid line) and height 3 (counted straight up from the base line). The setup uses them with the $\frac{1}{2}$.
14	Rectangle with corners (1, 1), (7, 1), (7, 3), (1, 3). Area = 6×3 .	white	The height is 2, not 3: the grid lines were counted instead of the spaces. The area is 6×2 .
15	Triangle with corners (1, 1), (5, 1), (6, 4). Area = $\frac{1}{2} \times 4 \times \sqrt{10}$.	white	$\sqrt{10}$ is a slant side, and a correct area here never has a square root. The area is $\frac{1}{2} \times 4 \times 3$.
16	Triangle with corners (1, 1), (9, 1), (4, 4). Area = $\frac{1}{2} \times 8 \times 3$.	fill	The triangle has base 8 (along a grid line) and height 3 (counted straight up from the base line). The setup uses them with the $\frac{1}{2}$.
17	Rectangle with corners (1, 1), (4, 1), (4, 5), (1, 5). Area = 3×4 .	fill	The rectangle is 3 by 4. The setup uses them.
18	Triangle with corners (5, 1), (5, 5), (1, 4). Area = $\frac{1}{2} \times 4 \times 5$.	white	The 5 is a slant side, not the height. The height is 4, so the area is $\frac{1}{2} \times 4 \times 4$.
19	Triangle with corners (3, 1), (8, 1), (1, 5). Area = 5×4 .	white	The $\frac{1}{2}$ is missing. A triangle is half of the rectangle on its base and height: $\frac{1}{2} \times 5 \times 4$.
20	Triangle with corners (4, 1), (4, 6), (1, 2). Area = $\frac{1}{2} \times 6 \times 3$.	white	The base is 5, not 6: the grid lines were counted instead of the spaces. The area is $\frac{1}{2} \times 5 \times 3$.
21	Triangle with corners (1, 1), (6, 1), (8, 5). Area = $\frac{1}{2} \times 5 \times 4$.	fill	The triangle has base 5 (along a grid line) and height 4 (counted straight up from the base line, past the end of the base). The setup uses them with the $\frac{1}{2}$.
22	Triangle with corners (1, 1), (5, 1), (1, 6). Area = $\frac{1}{2} \times 4 \times 5$.	fill	The triangle has base 4 (along a grid line) and height 5 (counted straight up from the base line). The setup uses them with the $\frac{1}{2}$.
23	Rectangle with corners (1, 1), (8, 1), (8, 3), (1, 3). Area = 7×2 .	fill	The rectangle is 7 by 2. The setup uses them.
24	Triangle with corners (1, 1), (5, 1), (2, 5). Area = $\frac{1}{2} \times 4 \times 4$.	fill	The triangle has base 4 (along a grid line) and height 4 (counted straight up from the base line). The setup uses them with the $\frac{1}{2}$.
25	Triangle with corners (4, 2), (4, 6), (1, 1). Area = $\frac{1}{2} \times 4 \times 3$.	fill	The triangle has base 4 (along a grid line) and height 3 (counted straight across from the base line, past the end of the base). The setup uses them with the $\frac{1}{2}$.