

MYSTERY PICTURE

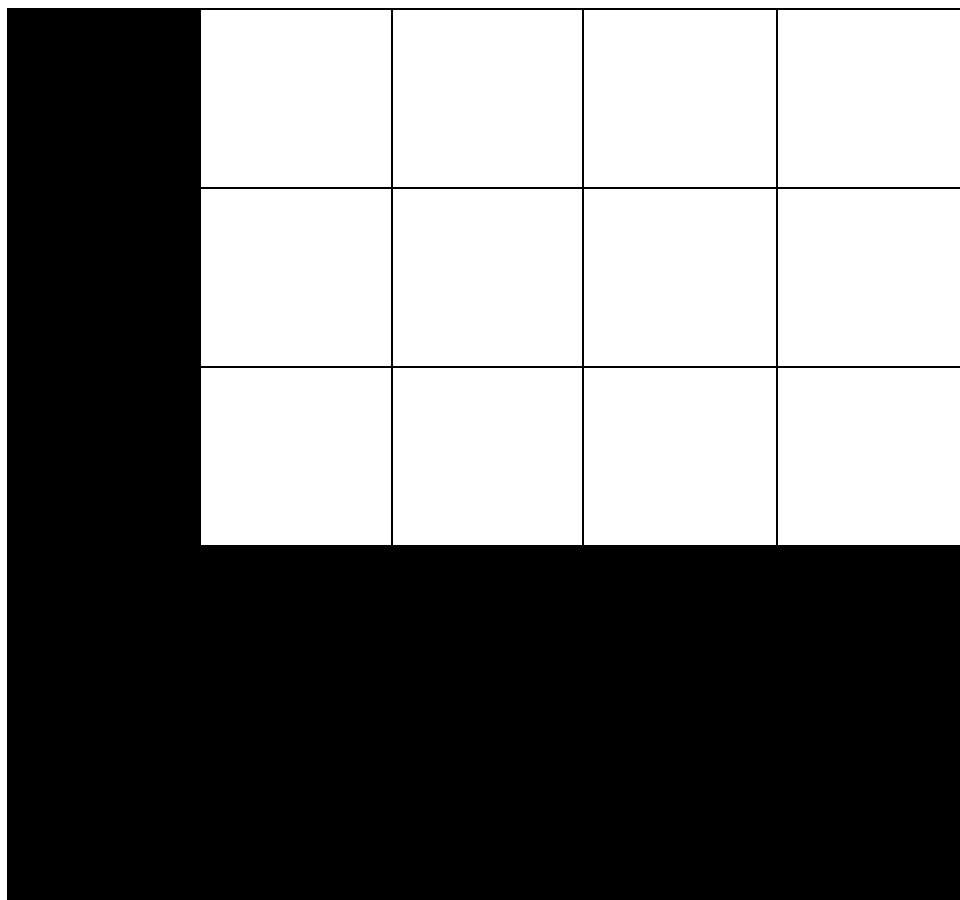


ALTITUDES AND THE ORTHOCENTER

Is the Thick Segment an Altitude?

25 triangles · read the marks

FREE



1. **Hand out page 3**, one per student. Pencils. Nothing else is needed.
2. **Say this once:** *“An altitude starts at a corner. It stops at the line of the opposite side, and the square is where it meets that line. Fill the square only when the marks show all of that.”*
3. **When a student finishes, look at the picture.** If it is not the letter L, a square is wrong. The student finds it and checks it again.

Student sheet	page 3, one per student. At the top it shows, as small drawings, an altitude in an acute, an obtuse and a right triangle, and a median.
Answers	page 4: the finished picture and the reason for every square.

This sheet practices reading the marks of an altitude. An altitude of a triangle is a segment. It starts at a corner and goes to the opposite side, or to the line that side lies on. It meets that line at a right angle, and the right-angle square shows this. Thirteen squares are filled. In five of them the altitude meets the dashed line outside an obtuse triangle. In three the altitude is a leg of a right triangle. Many students believe an altitude must be inside the triangle, or must not be a side. Both beliefs are wrong.

Each white square breaks one part of the rule. A median goes to the middle of the side (ticks) with no square (three squares). A perpendicular bisector, or a segment square to a side, starts on a side and not at a corner (four). A ray has an arrowhead, so it does not stop at the side (two). One segment from a corner has no square at all. And in two squares the square is at the corner where the segment starts, not where it meets the opposite side.

Guessing does not work. Every simple guessing rule, such as filling every square that has a right-angle square, gets at least eight 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

Read the marks

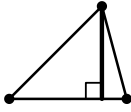
Name _____

Period _____

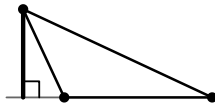
Date _____

Each square shows a triangle and one thick segment. Is the thick segment an altitude of the triangle? If yes, fill the square with slanted lines. If no, leave it white.

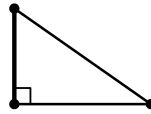
An **altitude** is a segment from a corner to the line of the opposite side. The right-angle square shows it meets that line at a right angle. In each drawing below, the thick segment is the one named.



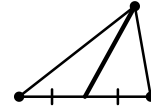
An **altitude** goes from a corner and meets the opposite side at a right angle.



It may meet the **line** of the side, outside the triangle (dashed).



In a right triangle, a **leg** is an altitude.



A **median** goes to the middle of the side (ticks). It is not an altitude.

Check three things. It starts at a corner. It stops at the opposite side, or at the dashed line of that side. The square is where it meets that side. When you finish, look at the picture. If part of it is missing, or one square does not fit, check that square again.

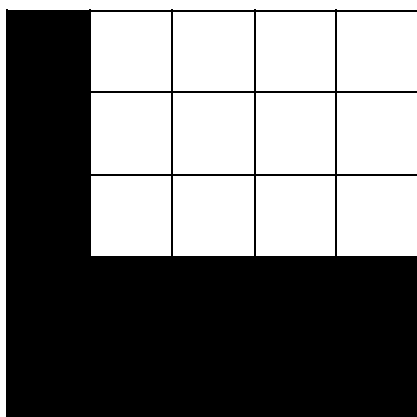
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25



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Mystery Picture — answers

For the teacher



The finished picture is **the letter L**: a bar down the left side, standing on a thick bar two rows deep.

A square is filled when the thick segment starts at a corner, stops at the opposite side or its dashed line, and has the right-angle square where it meets that side.

To check a square with a student, ask three questions. Where does it start? Where does it stop? Where is the square?

Squares	Answer	Why
1, 16, 19, 22, 24	FILL	It starts at a corner and stops at the opposite side. The square shows a right angle there. So it is an altitude.
6, 17, 20, 21, 25	FILL	It starts at a corner and stops at the dashed line, which is the line of the opposite side. The square shows a right angle there. The triangle is obtuse, so this altitude is outside it.
11, 18, 23	FILL	The square at the corner shows the two legs are perpendicular. So each leg goes from a corner to the opposite side at a right angle. A leg of a right triangle is an altitude.
2, 9, 15	white	It goes to the middle of the side (the ticks). No square shows a right angle. It is a median, not an altitude.
8	white	It starts at the middle of a side (the ticks), not at a corner. It is a perpendicular bisector, not an altitude.
14	white	It starts at a point on a side, not at a corner. An altitude must start at a corner.
4, 13	white	The square is right, but the segment starts at a point on a side, not at a corner. An altitude must start at a corner.
3, 10	white	The arrowhead shows it goes on past the side. An altitude is a segment that stops at the side.
7	white	It starts at a corner, but no square shows a right angle where it meets the side.
5, 12	white	The square is at the corner where the segment starts. It says nothing about the far end. No square shows a right angle where it meets the opposite side.