

MYSTERY PICTURE

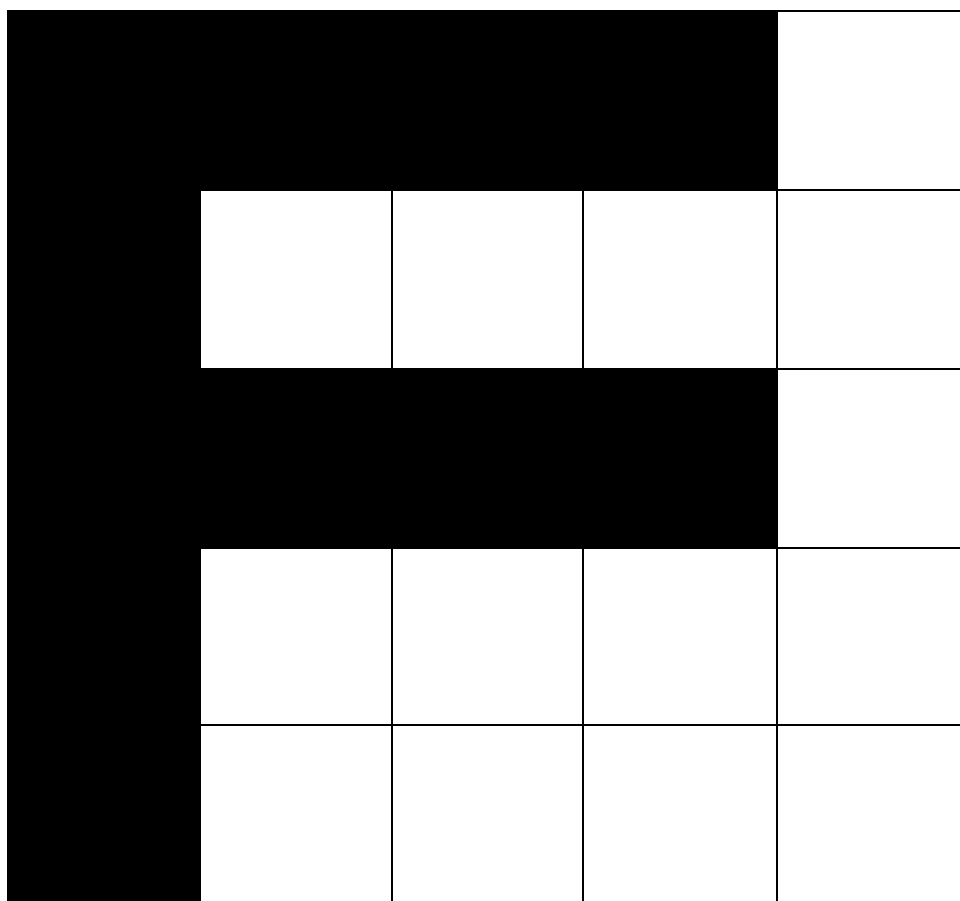


PERPENDICULAR BISECTORS AND THE CIRCUMCENTER

Is the Dot the Same Distance From Every Corner?

25 triangles · read the marks

FREE



1. **Hand out page 3**, one per student. Pencils. Nothing else is needed.
2. **Say this once:** *“A line counts only if it has a right-angle square and equal ticks at the middle of a side. Fill the square only when the marks show the dot is the same distance from all three corners.”*
3. **When a student finishes, look at the picture.** If it is not the letter F, a square is wrong. The student finds it and checks it again.

Student sheet	page 3, one per student. It shows a perpendicular bisector and the circumcenter of three kinds of triangle as small drawings.
Answers	page 4: the finished picture and the reason for every square.

This sheet practices reading marks. The circumcenter is the one point that is the same distance from the three corners of a triangle. The marks can show this in two ways. Two lines can cross at the dot, where each line is a perpendicular bisector of a side: it has a right-angle square *and* equal ticks on the two halves of that side. Every point on such a line is the same distance from the two ends of that side, so two of them are enough. Or three segments can run from the dot to the three corners with the same ticks.

The white squares show lines that look almost right. Some lines have a right-angle square but go through a corner and miss the middle of the side (three squares). Some go through the middle of a side but have no right-angle square (three). Some squares have one good line and one of these (three). In three, one of the three segments to the corners has different ticks. In two, three equal segments are perpendicular to the *sides*. They do not go to the corners. Students often mix up “the same distance from the sides” with “the same distance from the corners.”

The center is not always in the middle. In seven of the eleven filled squares the dot is on the longest side or outside the triangle. That is correct for right and obtuse triangles. Guessing does not work. Every simple guessing rule, such as filling the square when the dot is inside, gets at least nine 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

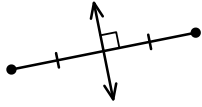
Name _____

Period _____

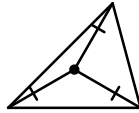
Date _____

Each square shows a triangle and a dot. Do the marks show that the dot is the same distance from all three corners? If yes, fill the square with slanted lines. If no, leave it white.

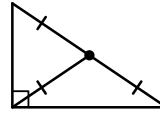
The **circumcenter** (the dot) is the one point that is the same distance from all three **corners**. The ticks show the three equal distances.



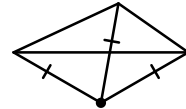
Perpendicular bisector of a side: a right-angle square and equal ticks.



Acute triangle: the circumcenter is **inside**.



Right triangle: it is the **middle of the longest side**.



Obtuse triangle: it is **outside**.

A line counts only if it has a right-angle square and equal ticks at the middle of a side. When you finish, look at the picture. If part of it is missing, or one square does not fit, check that square again.

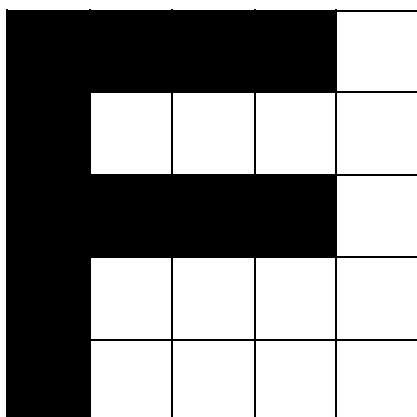
1 	2 	3 	4 	5
6 	7 	8 	9 	10
11 	12 	13 	14 	15
16 	17 	18 	19 	20
21 	22 	23 	24 	25



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Mystery Picture — answers

For the teacher



The finished picture is **the letter F**: a bar down the left side, with a bar along the top and a bar across the middle.

A square is filled when the marks show the dot is the same distance from all three corners: two lines that each have a square and equal ticks at the middle of a side, or three segments to the corners with the same ticks.

To check a square with a student, point to each line and ask two questions: is there a square, and are there equal ticks on the side?

Squares	Answer	Why
1, 3, 6, 12, 14, 16	FILL	Both lines have a square and equal ticks at the middle of a side. Both are perpendicular bisectors, so the dot where they cross is the same distance from all three corners. In square 3 the dot is on the longest side (a right triangle). In square 6 the dot is outside (an obtuse triangle). In square 14 the dot is outside (an obtuse triangle). In square 16 the dot is on the longest side (a right triangle).
2, 4, 11, 13, 21	FILL	The three segments from the dot to the corners have the same ticks, so they are equal. In square 2 the dot is outside (an obtuse triangle). In square 11 the dot is on the longest side (a right triangle). In square 21 the dot is outside (an obtuse triangle).
7, 15, 22	white	Each line has a square but goes through a corner. No ticks show the middle of a side.
9, 17, 23	white	Each line crosses the middle of a side (ticks), but no square shows a right angle.
10, 19, 25	white	One line is a perpendicular bisector. The other goes through a corner and has no ticks, so only two corners are shown to be the same distance away.
8, 18, 24	white	Two segments to the corners have one tick and the third has two. The third distance is not shown to be equal.
5, 20	white	The equal segments are perpendicular to the sides. They show the same distance from the sides, not from the corners.