

MYSTERY PICTURE

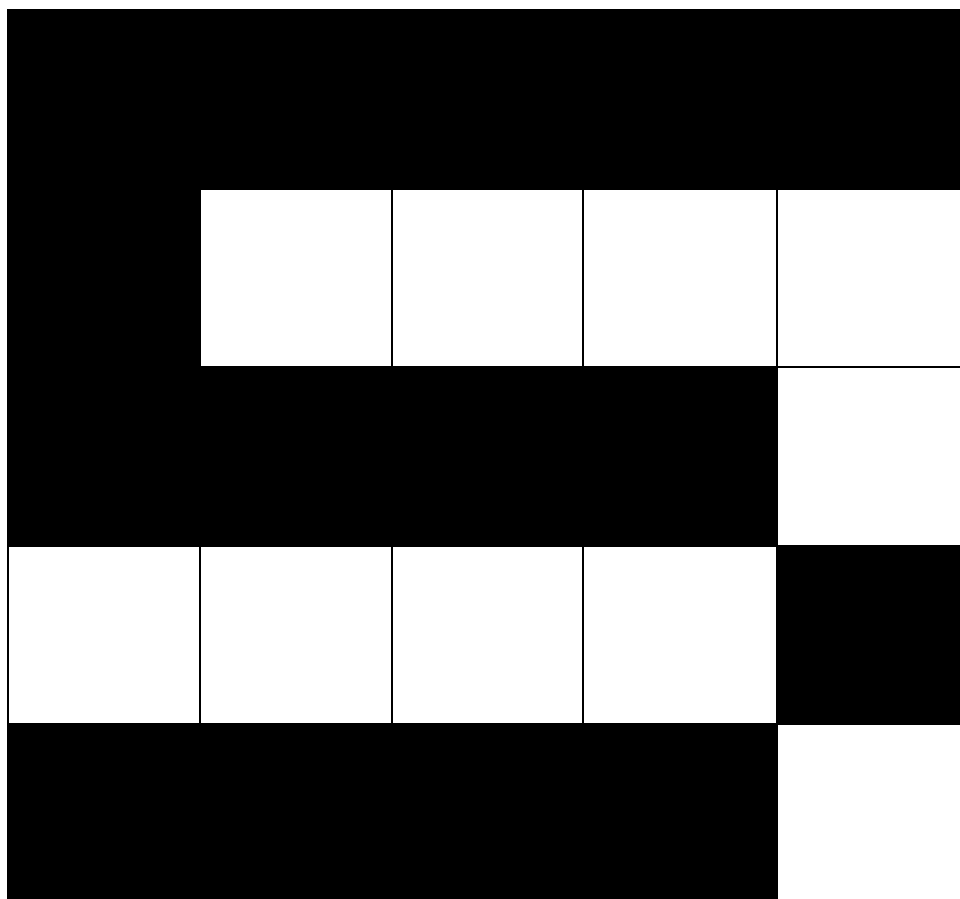


CONSTRUCTING AN EQUILATERAL TRIANGLE AND A SQUARE

Equilateral Triangle & Square: Do the Marks Prove It?

25 strangers' constructions · looking square proves nothing · a wrong square breaks the picture

FREE



1. **Hand out page 3**, one per student, and a compass each. Nothing is measured and no protractor is needed. That is the whole preparation.
2. **Say this once:** *“Looking right proves nothing. A triangle needs two circles, both opened to the length of the segment. A square needs its right angles at the two dots, not in the middle. It also needs the length of the segment copied up both sides. Four equal sides are not enough.”*
3. **Fill a square with slanted lines if its marks prove the figure is an equilateral triangle or a square. Leave it white if they do not.** A picture appears. Fifteen of the 25 are filled.

Student sheet	page 3, one per student. The compass-opening box is printed on it.
Answers	page 4 — the finished picture and the reason for every square.

Each square shows someone's finished triangle or square, with every compass mark left on. Nine of the 25 show a triangle and sixteen show a square, because the square is harder. The ten white squares show the usual mistakes. The right angle is built at the middle of the side with the perpendicular bisector (two). Four equal sides are copied with no right angle, which may give a rhombus (two). A right angle is built at one dot only (one). The triangle has only one circle, and its top corner is put on it by eye (two). The second circle has a different opening (one). There are no arcs at all (two).

Nine white squares are drawn exactly right. They are white because their marks prove nothing, not because they look wrong. Guessing does not work: every simple guessing rule, such as filling every figure that looks right, gets at least eight squares wrong. When two compass openings decide a square, they differ by at least 4 mm.

Two common half-right ideas. A student who trusts every length copied with the compass and never checks the corners gets eight squares wrong. A student who fills every drawing of a square with a right angle built somewhere on it gets three wrong. Ask that student: *how did you get the right angles at the corners instead of at the middle?* The third corner of a triangle can be at either crossing of the two circles, so it is not always on the same side.



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

Do the marks prove it?

Name _____

Period _____

Date _____

Each square is a finished attempt at an equilateral triangle or a square, built on the segment between the two dots. Every arc was left on. Do the marks prove the figure is what it should be? If yes, fill the square with slanted lines. If no, leave it white. A triangle needs a circle about each dot through the other. A square needs a right angle at each dot and the length carried up both sides. A figure that only looks right is white. Compare arcs with your compass. Nothing is measured. **When you finish, look at the picture. If it does not look right, check a square again.**

This lesson. The triangle: **one setting, taken from the given segment, used for both circles and never reopened.** The square: the same setting for carrying the length, and the rule from two lessons ago for the two perpendiculars at the ends. The line must be carried past each end first.

Last lesson: it had no rule of its own. **Every rule so far** is one question: two circles about the ends of a segment meet at two points, one, or none. It depends on the two openings and the gap.

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

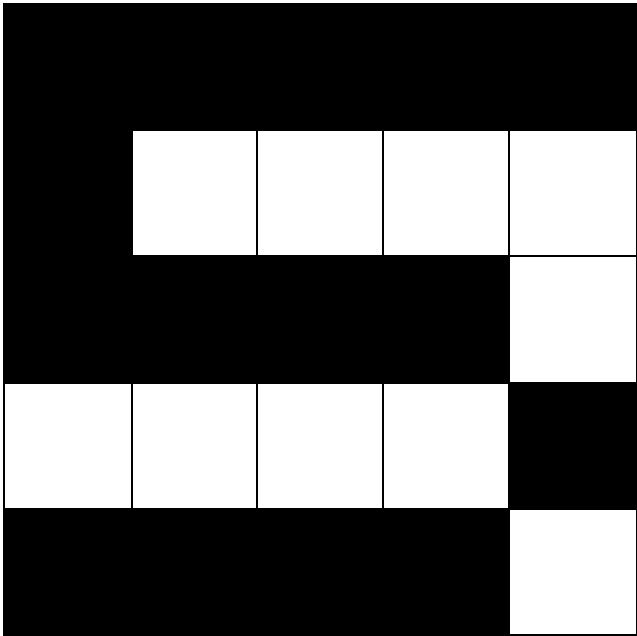


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Mystery Picture — answers

For the teacher

The finished sheet is **the number 5** — a bar across the top, straight down the left side, a bar across the middle, straight down the right side, and a bar across the bottom. The table reads left to right, the way the sheet is read; the squares are numbered on the student's sheet.



1–5	FILL triangle, both circles right	FILL square, right angles at both dots	FILL triangle, both circles right	FILL square, right angles at both dots	FILL triangle, both circles right
6–10	FILL square, right angles at both dots	white triangle, only one circle	white triangle, no marks	white triangle, second circle has another opening	white square, right angle in the middle
11–15	FILL triangle, both circles right	FILL square, right angles at both dots	FILL triangle, both circles right	FILL square, right angles at both dots	white square, equal sides but no right angle
16–20	white square, right angle at one dot only	white square, no marks	white triangle, only one circle	white square, right angle in the middle	FILL square, right angles at both dots
21–25	FILL square, right angles at both dots	FILL square, right angles at both dots	FILL square, right angles at both dots	FILL square, right angles at both dots	white square, equal sides but no right angle

Two common half-right ideas, and the squares they get wrong. A student who trusts every length copied with the compass and never checks the corners gets squares 7, 9, 10, 15, 16, 18, 19 and 25 wrong. A student who fills every drawing of a square with a right angle built somewhere on it gets squares 10, 16 and 19 wrong.

No square depends on sharp eyes. Two arcs either have the same compass opening or differ by at least 4 mm. A crossing of two arcs is either on a line or at least 2.5 mm away from it.