

MYSTERY PICTURE

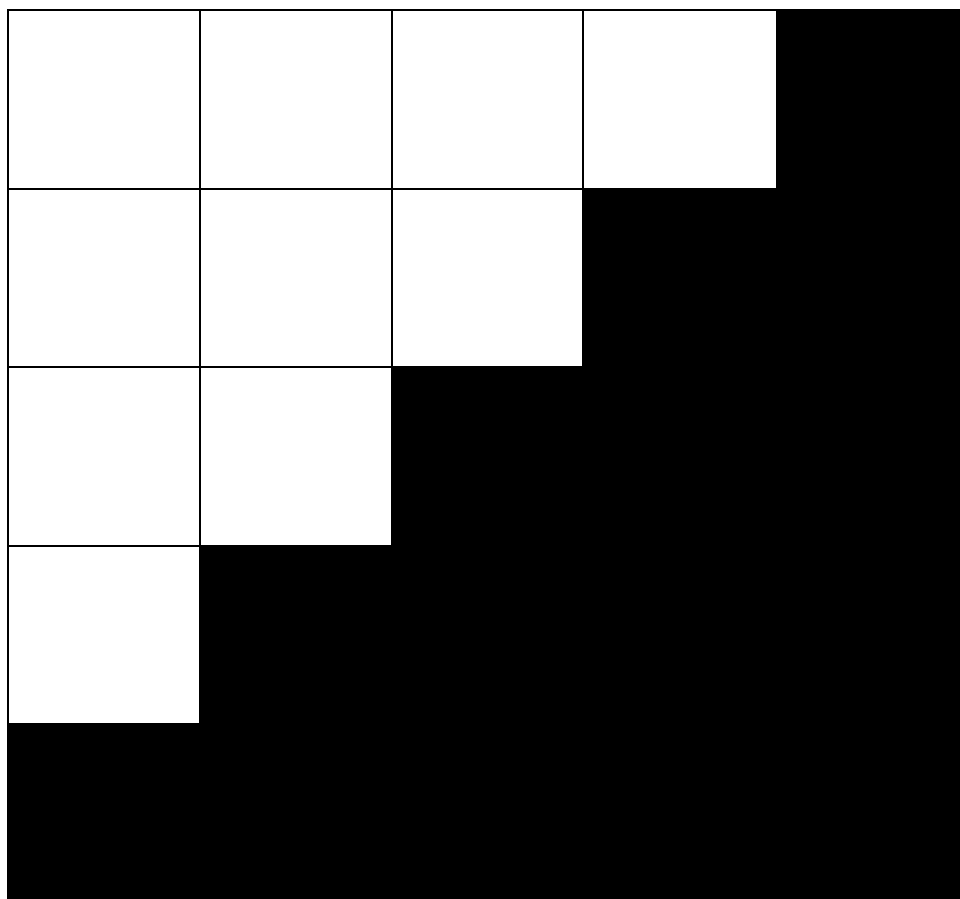


CONSTRUCTING A REGULAR HEXAGON IN A CIRCLE

The Hexagon in the Circle: Do the Marks Prove It?

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

FREE



25 squares · 1 student sheet · answer key · 4 pages

Geometry · Grades 8–10 · chooseyourlesson.com

1. **Hand out page 3**, one per student, and a compass each. No protractor is needed. That is the whole preparation.
2. **Say this once:** *“A hexagon that looks regular proves nothing. The marks prove it when every arc has the same opening as the radius of the circle. Every arc must pass through a corner. At most one side may be missing an arc.”*
3. **Fill a square with slanted lines if its marks prove the hexagon regular. 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 hexagon, drawn in a given circle with the center marked. The filled squares follow the lesson's construction. The compass is set to the radius and stepped around the circle from corner to corner. It is stepped five times, or six times with the last arc landing on the first corner, or in both directions from the first corner. Five sides made by the compass are enough. The five angles at the center are 60° each, which makes 300° , so the last angle is also 60° .

The ten white squares show the usual mistakes. There are no arcs at all, and the hexagon was placed by protractor or by eye (two). The stepping stopped early, and the other corners were put in by hand (three). The compass opening changed partway around (three). The last corner was moved away from where its arc crossed the circle (two). Five white squares are drawn exactly regular. 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 hexagon that looks regular, gets at least five squares wrong.

Every part of the rule matters. A student who checks for arcs at the corners but never checks the opening gets three wrong: the squares where the compass opening changed. A student who checks the opening but never checks that each arc passes through a corner gets two wrong: the squares with a moved corner. When two openings decide a square, they differ by at least 4 mm. So a compass set from the center to the circle clearly misses the wrong arc.



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 regular?

Name _____

Period _____

Date _____

Each square is somebody's hexagon. The compass was stepped round a circle from corner to corner, with every arc left on. Do the marks prove it regular? If yes, fill with slanted lines. If no, leave it white. It is regular when every arc is the circle's own radius. Every arc must run through a corner. Every corner but one must have an arc. To check the radius, set your compass from the center dot to the circle and try it. Five 60° angles at the center leave 60° for the last side. Looking regular is not enough. **When you finish, look at the picture. If it does not look right, check a square again.**

This lesson has one setting, taken from the circle itself. The compass point stays on the center. The pencil is on the circle. Never reopen it for the whole construction.

Last lesson: you used one setting, taken from the given segment, for the triangle's two circles. The same setting was carried for the square's sides. The perpendicular rule gave its right angles.

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

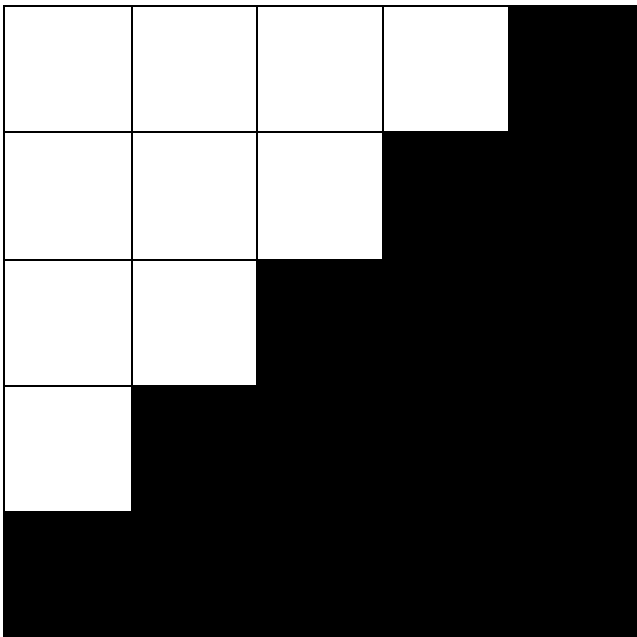


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Mystery Picture — answers

For the teacher

The finished sheet is **a staircase — five steps climbing from the bottom left to the top right**. The table reads left to right, the way the sheet is read; the squares are numbered on the student's sheet.



1–5	white no arcs at all	white some corners put in by hand	white compass opening changed	white last corner moved off its arc	FILL stepped with the radius
6–10	white no arcs at all	white some corners put in by hand	white compass opening changed	FILL stepped with the radius	FILL stepped with the radius
11–15	white last corner moved off its arc	white some corners put in by hand	FILL stepped with the radius	FILL stepped with the radius	FILL stepped with the radius
16–20	white compass opening changed	FILL stepped with the radius	FILL stepped with the radius	FILL stepped with the radius	FILL stepped with the radius
21–25	FILL stepped with the radius	FILL stepped with the radius	FILL stepped with the radius	FILL stepped with the radius	FILL stepped with the radius

Two common half-right ideas, and the squares they get wrong. A student who checks that every corner but one has an arc, but never checks the openings against the radius, gets squares 3, 8 and 16 wrong. A student who checks that five or more arcs match the radius, but never checks that each arc passes through a corner, gets squares 4 and 11 wrong.

No square depends on sharp eyes. Two arcs either have the same compass opening or differ by at least 4 mm. A corner is either on an arc or at least 2.5 mm away from it.