

MYSTERY PICTURE

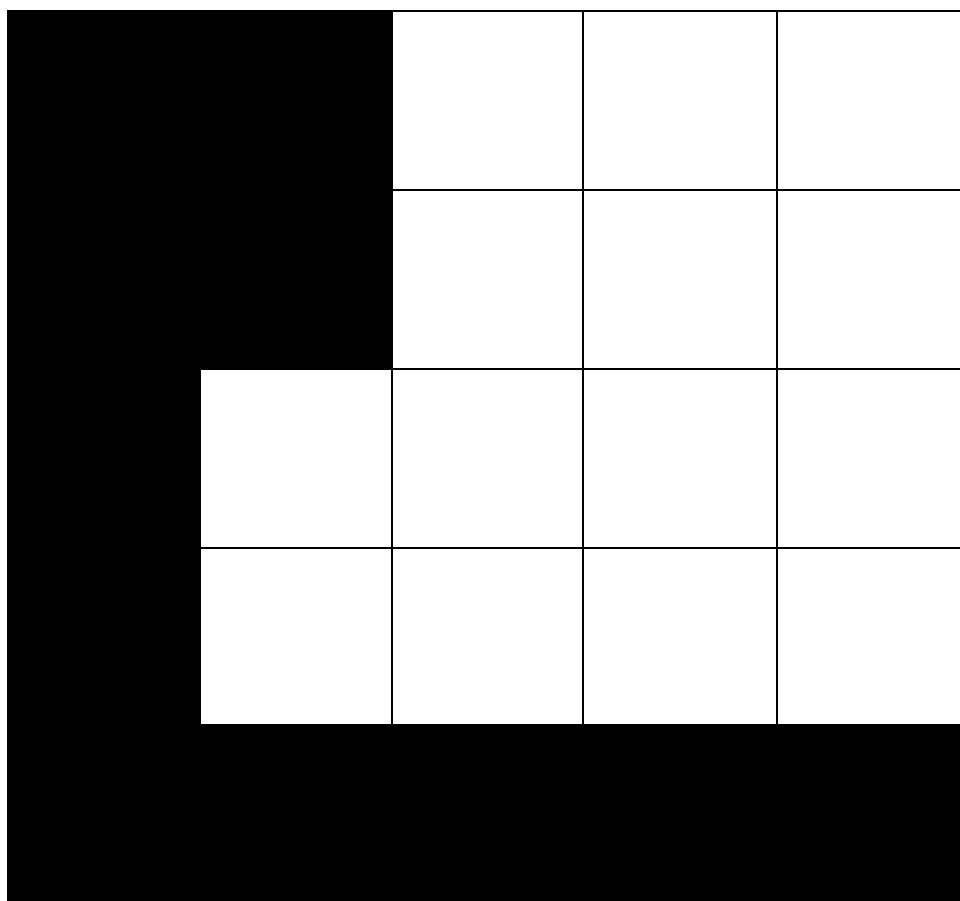


CONSTRUCTIONS: COPYING A SEGMENT AND AN ANGLE

Copying a Segment and an Angle: Do the Marks Prove the Copy?

25 strangers' copies · no numbers · a wrong square breaks the picture

FREE



1. **Hand out page 3**, one per student, and a compass each. That is the whole preparation.
2. **Say this once:** *“A copy that looks right proves nothing. Look for the marks: an arc on the original, the same opening on the copy, and the point of the compass where it should be.”*
3. **Fill a square with slanted lines if its marks prove the copy is exactly the original's size. Leave it white if they do not.** A picture appears. Eleven 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 is somebody else's finished copy, and the student judges it. The marks are left on. The original is on the left and the copy is on the right. Each of the fourteen white squares shows one mistake: no arc on the original (two), the arc on the copy centered at a point along the ray instead of at its endpoint (two), the compass opened again between the original and the copy (two), the last arc of an angle copy drawn with the first opening, so the copy is 60° whatever the original was (two), the last arc centered on the vertex instead of on the crossing (two), no small arc at all (two), and a new opening for the first arc of the copy (two).

Six white squares are drawn exactly right. This is the hardest idea in the lesson. A figure that looks correct is not evidence, because a ruler or a protractor makes the same picture faster. Some students learn “never change the compass” from the segment copy and use it for angles too. Such a student leaves five correct squares white, because a correct angle copy uses two openings. The same student fills eight squares that should be white, because all their arcs have one opening. That is thirteen squares wrong in all. An angle copy needs two settings.

Guessing does not work. Every simple guessing rule, such as filling every square that has an arc on the original, gets at least six squares wrong. The picture then has holes that a student can see from their own desk.



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 the copy?

Name _____

Period _____

Date _____

Each square is somebody's finished copy. The original is on the left. The copy is on the right. Every point that was marked has a dot. Do the marks prove the copy is exactly the size of the original? If yes, fill the square with slanted lines. If no, leave it white. A copy that only looks right is white. Use your compass to compare two arcs. You do not measure anything. When you finish, look at the picture. If it does not look right, check a square again.

Copy a segment — one setting. Set the compass on the given segment. Do not reopen it. The copy ends where the arc crosses the ray. The ray keeps going past that point. The dot at the end of the ray is not the end of the copy.

Copy an angle — two settings. First, choose any opening. Use that same opening at the given angle and at the copy. Second, use the compass to measure the distance between the two crossings on the given angle, then mark that same distance on the copy.

Last lesson: any opening is a legal move. Nothing is ever measured. *Measure to check, never to build.*

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

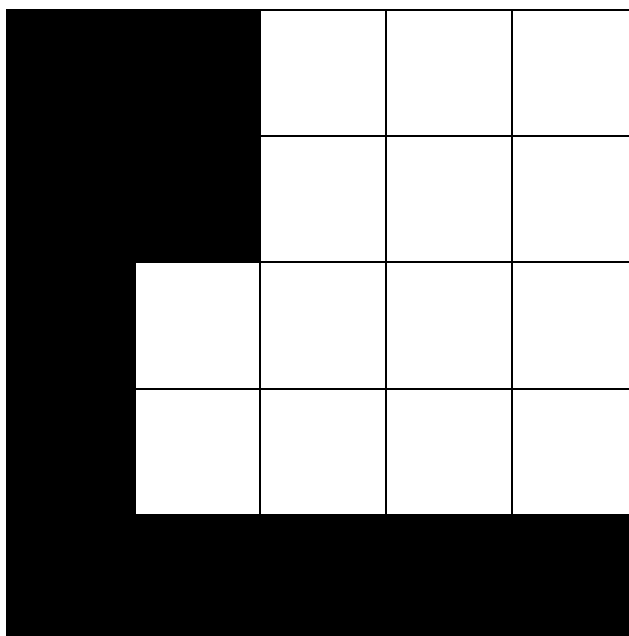


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Mystery Picture — answers

For the teacher

The finished sheet is **the letter L: a stroke down the left side that starts two squares wide at the top and narrows to one square wide, then 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 arc on the original, same opening on the copy	FILL one opening at both, then the distance between crossings carried	white no arc on the original	white arc not centered at the end of the ray	white compass opening changed for the copy
6–10	FILL arc on the original, same opening on the copy	FILL one opening at both, then the distance between crossings carried	white last arc used the first opening, so 60°	white last arc centered on the vertex, not the crossing	white no small arc: the distance was never carried
11–15	FILL arc on the original, same opening on the copy	white a new first opening on the copy	white no arc on the original	white arc not centered at the end of the ray	white compass opening changed for the copy
16–20	FILL one opening at both, then the distance between crossings carried	white last arc used the first opening, so 60°	white last arc centered on the vertex, not the crossing	white no small arc: the distance was never carried	white a new first opening on the copy
21–25	FILL arc on the original, same opening on the copy	FILL one opening at both, then the distance between crossings carried	FILL arc on the original, same opening on the copy	FILL one opening at both, then the distance between crossings carried	FILL one opening at both, then the distance between crossings carried

No square depends on sharp eyes. Two arcs either have the same opening or differ by at least 3 mm. A dot is either on a line or arc, or at least 2.5 mm away from it.