From a Line to a Region

An equation gives a line. An inequality gives a region: one whole side of that line, a half-plane. The boundary is the line from m and b. Dashed for strict signs, solid for or-equal signs.

1 THE VOCABULARY
Words we use

Solution a point that makes the inequality true. Put x and y in and read the sentence.

Half-plane one whole side of a line: the region of solutions.

Boundary line the edge of the region: the line with an equals sign, graphed from m and b.

Dashed strict sign (< or >): the edge is not included.

Solid or-equal sign: the edge is included.

- Watch out for these.
- Thinking the solutions are still just the line. They fill a whole side.
- Drawing a strict inequality solid. No equals bar means dashed.
- Counting a point on a dashed edge. It is not a solution.
- Forgetting the boundary is graphed exactly as in Unit 3: read m and b.

2 THE METHOD
Line to region

1. **FIND THE BOUNDARY** swap the sign for an equals sign: that line is the edge. Read m and b.
2. **DASHED OR SOLID** < or >: dashed (edge out). ≤ or ≥: solid (edge in).
3. **THE REGION** one whole side of the boundary: a half-plane (Lesson 2 says which side).
4. **CHECK A POINT** put x and y in; true means solution. On a solid edge counts; on a dashed edge does not.

WHY A WHOLE SIDE
Take one x. The line has one y there. The inequality wants every y bigger (or smaller) than that, a whole tower of points. Every x has its tower, and the towers together fill one side of the line.

3 CHECKING POINTS
y > 2x + 1 (dashed) and y ≥ 2x + 1 (solid)

boundary: y = 2x + 1	m = 2, b = 1. Graph it from m and b
(1, 5): 5 > 3	true, so (1, 5) is a solution: above the line, in the region
(2, 5): 5 > 5	false for the strict sign: (2, 5) is on the dashed edge, not a solution
(2, 5): 5 ≥ 5	true for the or-equal sign: on the solid edge, a solution
(3, 2): 2 > 7	false: below the line, outside the region

ON THE PICTURE
Solutions sit in the shaded half-plane, and on the line only when it is solid.

SAY IT OUT LOUD
Same boundary line, a whole region of answers. Strict is dashed, or-equal is solid.