Where Both Hold: teacher script

IN10-V1 · IN10 Regions from several inequalities · teachers only. Without a screen, read each Say line and draw each Draw step on the board. About 90 seconds as a video.

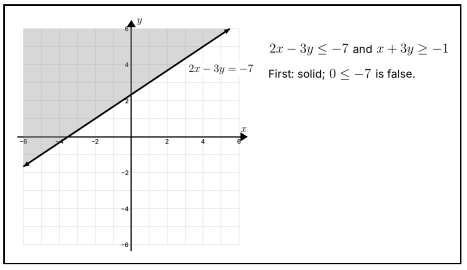
01



Say. Regions. Graph each inequality. Keep only the overlap, where all of them hold. And find the corners by solving.

Draw. Write the title “Where Both Hold” and the steps: 1. Graph each one; 2. Keep the overlap; 3. Solve for corners.

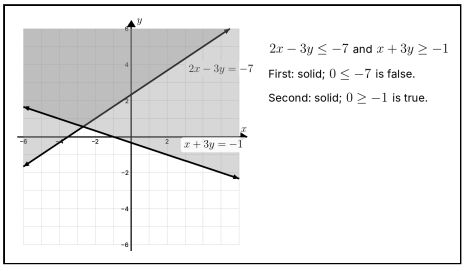
02



Say. Where do 2 x minus 3 y is at most negative 7, and x plus 3 y is at least negative 1, both hold? First, the line 2 x minus 3 y equals negative 7, solid. Test the origin: 0 is at most negative 7 is false, so shade away from the origin.

Draw. Clear the board and draw a grid with axes from -6 to 6. Draw the line 2x − 3y = −7, labelled “2x − 3y = −7”. Shade the region where 2x − 3y ≤ −7. Beside the grid, write “2x − 3y \le −7 and x + 3y \ge −1”. Beside the grid, write “First: solid; 0 \le −7 is false.”.

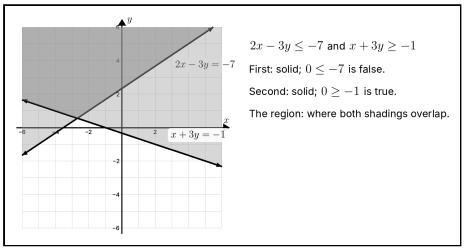
03



Say. Second, the line x plus 3 y equals negative 1, also solid. 0 is at least negative 1 is true, so shade the origin side.

Draw. Draw the line x + 3y = −1, labelled “x + 3y = −1”. Shade the region where x + 3y ≥ −1. Beside the grid, write “Second: solid; 0 \ge −1 is true.”.

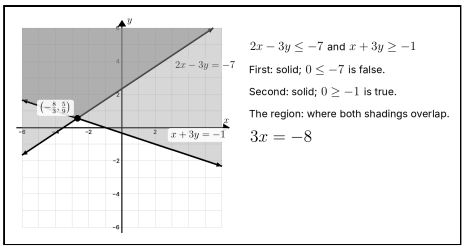
04



Say. The region is where the two shadings overlap: every point there makes both hold.

Draw. Shade the region where 2x − 3y ≤ −7 and x + 3y ≥ −1. Beside the grid, write “The region: where both shadings overlap.”.

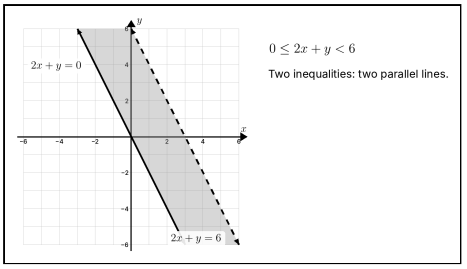
05



Say. Now the corner: add the two equations, and 3 x equals negative 8. So the corner is at negative 8 thirds, 5 ninths. Both lines are solid, so it belongs to the region.

Draw. Plot (-8/3, 5/9) and label it “(−8/3, 5/9)”. Beside the grid, write “3x = -8”.

06



Say. A chain is two inequalities: 2 x plus y is at least 0, and less than 6. The line 2 x plus y equals 0 is solid, and 2 x plus y equals 6 is dashed. They are parallel, so the region is a strip between them.

Draw. Clear the board and draw a grid with axes from -6 to 6. Draw the line 2x + y = 0, labelled “2x + y = 0”. Draw the line 2x + y = 6 dashed, labelled “2x + y = 6”. Shade the region where 2x + y ≥ 0 and 2x + y < 6. Beside the grid, write “0 \le 2x + y < 6”. Beside the grid, write “Two inequalities: two parallel lines.”.

07

Trap $y < 2x, \quad x + y \ge 3$

$\times$ $(1, 2)$ is in the region

✓ $2 < 2$ is false

Say. Watch for the trap: the corner 1, 2 is on the dashed line y equals 2 x, so it is not in the region: 2 is less than 2 is false.

Draw. Clear the board. Write “Trap” and y < 2x, x + y \ge 3. Below, write (1, 2) is in the region and cross it out ×. Then write 2 < 2 is false with a tick ✓.

08

Your turn

Each line on its own, then the overlap.
Solve for the corners.

Say. Now it is your turn. Graph each line on its own, keep the overlap, and solve for the corners.

Draw. Point to today’s activity: Each line on its own, then the overlap. Solve for the corners.