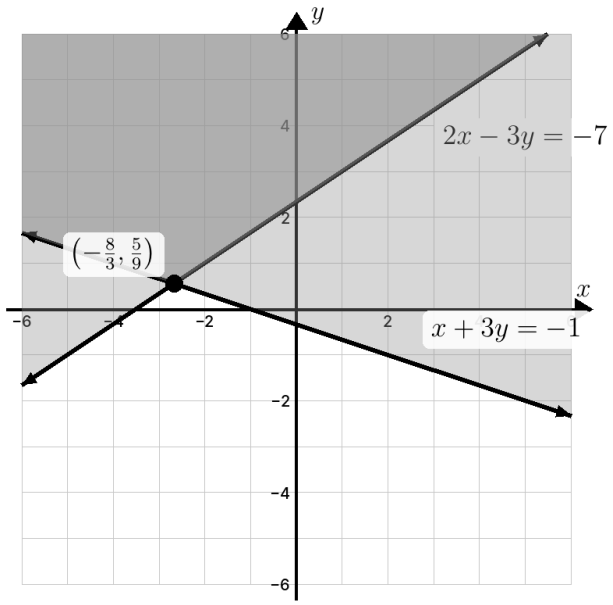
Where Both Hold

IN10-V1 · storyboard · IN10 Regions from several inequalities. Read each picture with its sentences.

Picture 1



$2x - 3y \leq -7$ and $x + 3y \geq -1$

First: solid; $0 \leq -7$ is false.

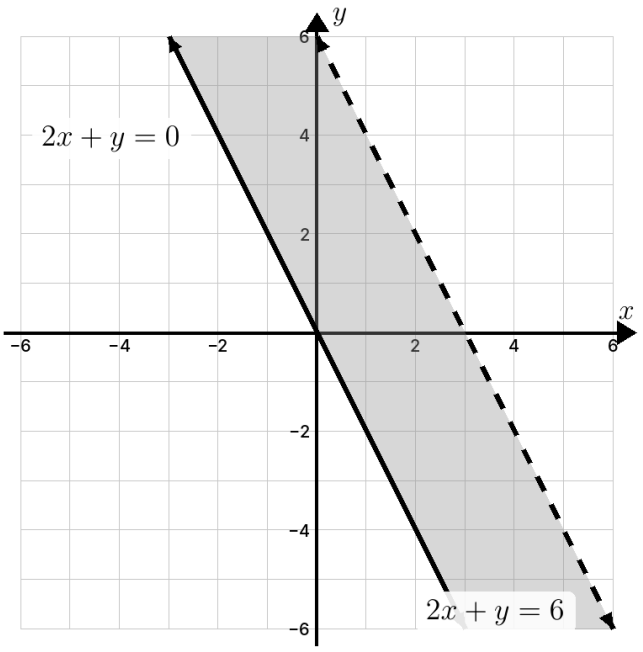
Second: solid; $0 \geq -1$ is true.

The region: where both shadings overlap.

$$3x = -8$$

1. Where do 2 x minus 3 y is at most negative 7, and x plus 3 y is at least negative 1, both hold?
2. First, the line 2 x minus 3 y equals negative 7, solid.
3. Test the origin: 0 is at most negative 7 is false, so shade away from the origin.
4. Second, the line x plus 3 y equals negative 1, also solid.
5. 0 is at least negative 1 is true, so shade the origin side.
6. The region is where the two shadings overlap: every point there makes both hold.
7. Now the corner: add the two equations, and 3 x equals negative 8.
8. So the corner is at negative 8 thirds, 5 ninths.
9. Both lines are solid, so it belongs to the region.

Picture 2



$$0 \leq 2x + y < 6$$

Two inequalities: two parallel lines.

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

Picture 3

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

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

✓ $2 < 2$ is false

13. 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.