Systems of Inequalities

Shade each inequality the Unit 5 way; the solution of the system is the overlap. A point is a solution only if it makes every inequality true.

1 THE VOCABULARY

Words we use

System of inequalities two or more that must all be true at once.

Overlap the region shaded by every inequality: the solutions. Also called the feasible region.

Test in both all true: in the overlap. Any false: not.

Edges each boundary keeps its style; dashed edges are not included.

- Watch out for these.
- Stopping after one shading. Both, then the overlap.
- Testing a point in only one inequality.
- Treating a dashed edge of the overlap as included.
- Forgetting that parallel boundaries facing away from each other give an empty overlap: no solution.

2 THE METHOD

Four steps

1. SHADE THE FIRST solve for y, boundary from m and b, dashed or solid, shade, test.
2. SHADE THE SECOND IN ANOTHER COLOR same procedure.
3. KEEP THE OVERLAP covered by both. Edges keep their own style.
4. TEST A POINT IN BOTH all true means solution.

> WHY THE OVERLAP
> A solution must make both inequalities true. Inequality 1 is true in its shaded half-plane, inequality 2 in its own. Both true means both shadings at once: the overlap.

3 TWO SHADINGS

$y \leq x + 1$ and $y > -x + 3$

first: $y = x + 1$, solid, shade below	or-equal, y less
second: $y = -x + 3$, dashed, shade above	strict, y greater
overlap: the wedge to the right of (1, 2)	below the rising line and above the falling one
test (4, 2): $2 \leq 5$ true, $2 > -1$ true	in the overlap: a solution
test (0, 0): $0 \leq 1$ true, $0 > 3$ false	not a solution: blue only
(1, 2) on the dashed edge: $2 > 2$ false	not a solution

> EMPTY OVERLAP
> $y > x + 2$ and $y < x - 1$: parallel boundaries with the shadings facing away. Nothing is in both. No solution.

> SAY IT OUT LOUD
> Shade both. The overlap is the answer. It has to obey every inequality.