# Graphing Half-Planes and Systems

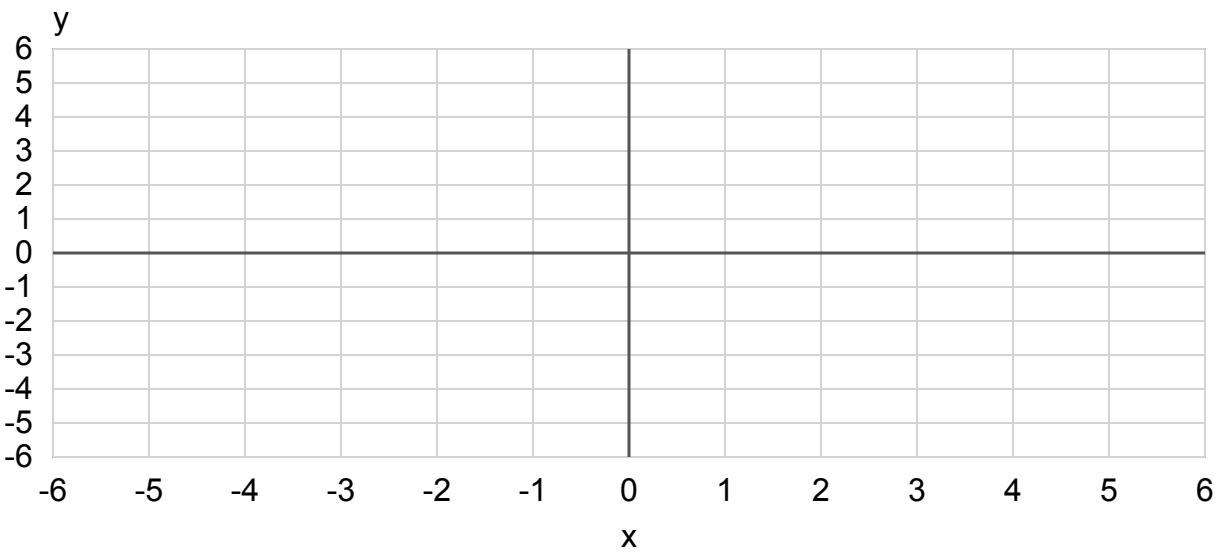
Use dashed and solid boundaries, shade solutions, and test points

Name: _____ Date: _____

## Part 1 - One Strict Inequality

**1.** Graph **y > -1/2x + 1**. Draw its boundary line first. Then shade the solution half-plane with diagonal lines. Listen as your teacher reads the shading reminder.

**Boundary reminder:** A strict sign (< or >) uses a **dashed** boundary. A boundary point is on the line; an interior point is in the shaded region; an exterior point is outside it.




**2.** Plot B(2, 0), I(0, 2), and E(0, 0). Substitute each point into the inequality. Decide whether the point makes the inequality true, then name its location.

| Point | Substitution | True or false? | Location |
|---|---|---|---|
| B(2, 0) | | | |
| I(0, 2) | | | |
| E(0, 0) | | | |

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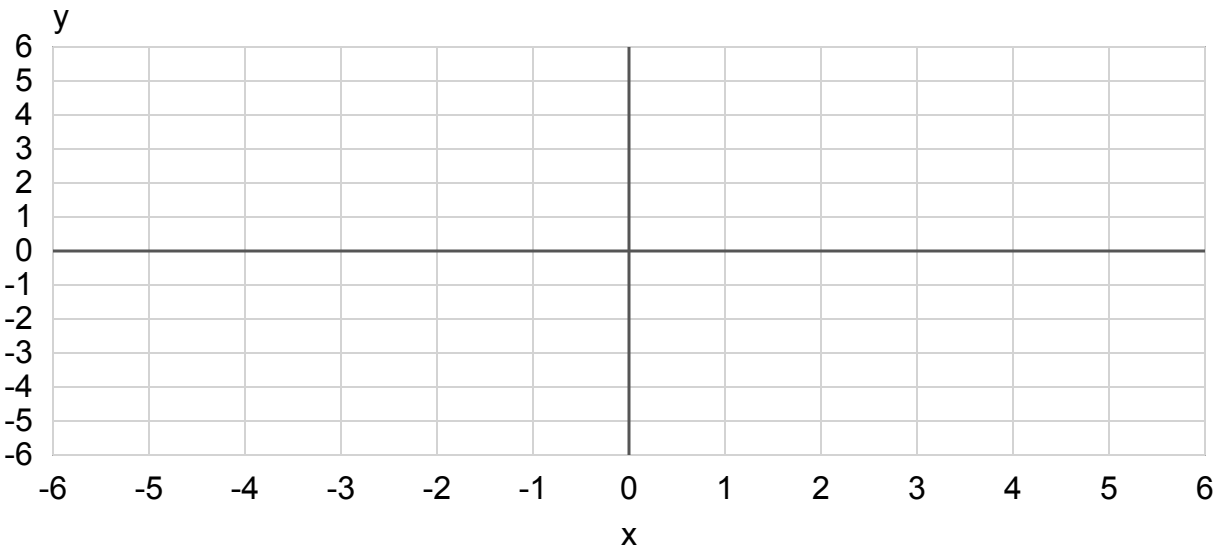
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## Part 2 - A System of Inequalities

**3.** Graph this system on the grid.

**y >= x - 2**
**y < -x + 4**

Use diagonal lines to shade the first inequality. Use dots to shade the second inequality. The overlap is the **intersection**. Write **INTERSECTION** in the overlap and plot one solution point labeled S.




**4.** Test each point in both inequalities. A point is a system solution only when **both** statements are true. Then classify it as boundary, interior, or exterior of the system.

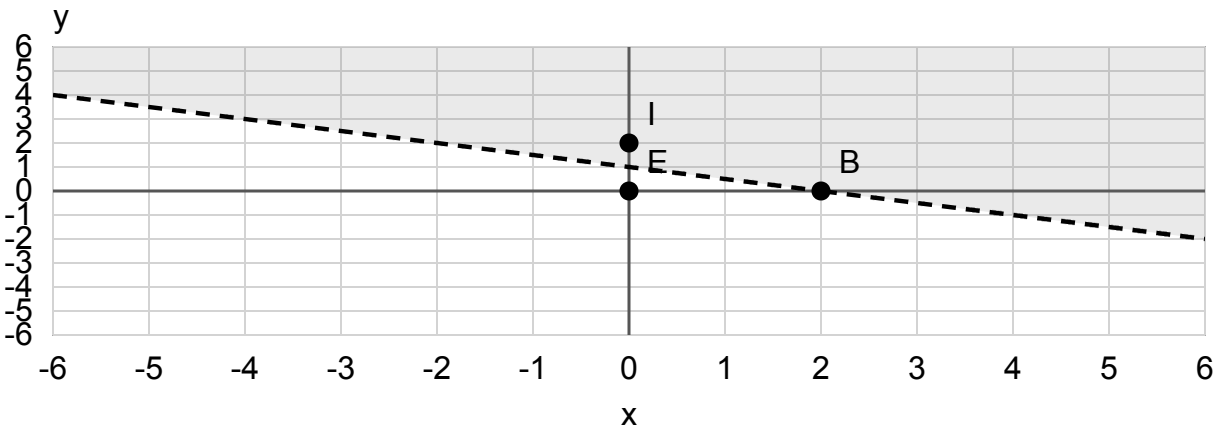
| Point | y >= x - 2 | y < -x + 4 | System solution? | Location |
|---|---|---|---|---|
| (0, -2) | | | | |
| (1, 1) | | | | |
| (0, -3) | | | | |
| (4, 0) | | | | |

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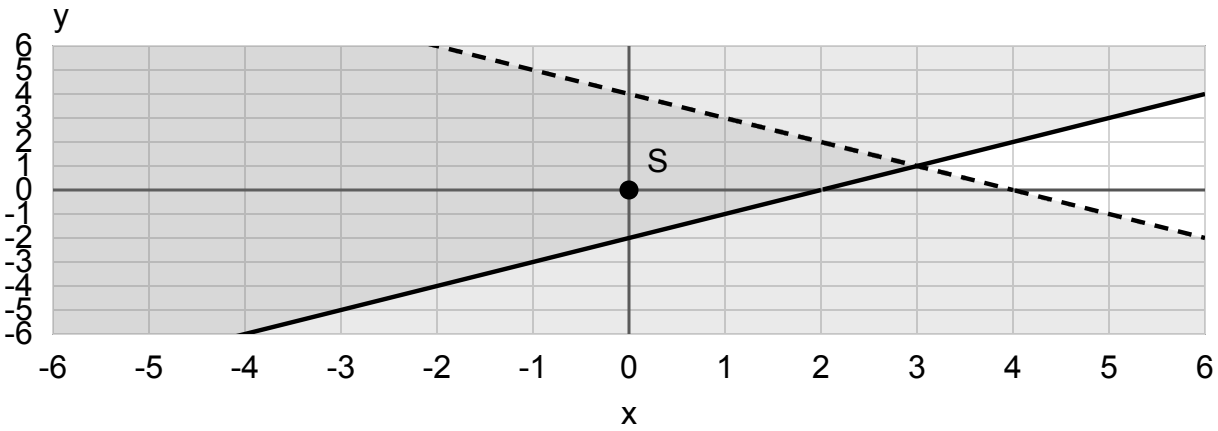
## Answer Key - Completed Graphs and Point Tests

**1.** Boundary: y = -1/2x + 1, drawn dashed because the inequality is strict. Shade above the line.




**2.** B: 0 > -1/2(2) + 1 gives 0 > 0, false; boundary and excluded. I: 2 > -1/2(0) + 1 gives 2 > 1, true; interior. E: 0 > 1, false; exterior.

**3.** Draw y = x - 2 solid and shade above it. Draw y = -x + 4 dashed and shade below it. The intersection is the overlapping wedge to the left of (3, 1). A valid S is (0, 0).




**4.** (0, -2): -2 >= -2 true; -2 < 4 true; yes, included boundary. (1, 1): 1 >= -1 true; 1 < 3 true; yes, interior. (0, -3): -3 >= -2 false; -3 < 4 true; no, exterior. (4, 0): 0 >= 2 false; 0 < 0 false; no, on the dashed boundary of the second inequality and outside the system.

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## Teaching Notes

**Materials supplied:** two blank coordinate grids, point-test tables, and pattern directions. **Additionally needed:** pencil, ruler or straightedge, and an eraser for each student. Print at 100% scale. Have students use diagonal marks for the first region and dots for the second so the overlap can be seen without color.

**Exact setup:** Give each student both pages face down, a ruler, and a pencil. Display no completed graph. Ask students to turn to Part 1 together. After Part 1, pause for a boundary check before students begin Part 2.

**Teaching script to read aloud:** “First graph the equation that makes the inequality equal. A greater-than or less-than sign does not include its boundary, so use a dashed line. Test a point not on the line if you need help deciding which side to shade. In a system, a solution must be in both shaded regions. The overlap is the intersection.”

**Observation method:** During work, record one code per student: D = correct dashed/solid boundary choice; H = correct half-plane direction after a point test; X = correctly identifies overlap as the system solution. Confer with students missing any code. Ask: “Does this boundary point make the statement true, or does the strict sign exclude it?”

**Quick scoring rubric:** Item 1: dashed line and above shading. Item 2: 1 point per correct substitution/result/location, 9 points. Item 3: solid first boundary, dashed second boundary, correct two regions, labeled overlap, valid S, 5 points. Item 4: 1 point for each correct pair of truth values and 1 point for correct system decision/location, 8 points.

**Source credit:** New York Next Generation Mathematics, AI-A.REI.12, “Represent and solve equations and inequalities graphically.” https://www.nysed.gov/curriculum-instruction/new-york-state-next-generation-mathematics-learning-standards