Writing Linear Inequalities from Graphs: Number Lines and Half-Planes

Original tasks 1, 2, 3, 4 / complete keys

Task 1

An open dot is at −3 on a number line, with shading to the right. Write the inequality.

Answer: $x > -3$

Reason: The open dot means strict inequality, and shading to the right means greater than. The endpoint is −3.

Check: Test $x = 0$: $0 > -3$ is true and 0 is shaded. Test $x = -4$: $-4 > -3$ is false and −4 is unshaded.

Task 2

A closed dot is at 5 on a number line, with shading to the left. Write the inequality.

Answer: $x \leq 5$

Reason: The closed dot means inclusive, and shading to the left means less than or equal to. The endpoint is 5.

Check: Test $x = 4$: $4 \leq 5$ is true and shaded. Test $x = 6$: $6 \leq 5$ is false and unshaded.

Task 3

A dashed boundary line has equation $y = 3x - 2$. The region above the line is shaded. Write the inequality.

Answer: $y > 3x - 2$

Reason: The boundary is given as $y = 3x - 2$. A dashed line means a strict inequality (< or >). Test (0,0), which is above the line and in the shaded region: $0 > 3(0) - 2$, i.e. $0 > -2$, is true. Therefore the inequality is $y > 3x - 2$.

Check: Test (0,0): $0 > -2$ true. Test (0,−3), below the line: $-3 > -2$ false. The inequality matches the shaded side.

Task 4

A solid vertical boundary line is at $x = 4$, and the region to the left of the line is shaded. Write the inequality.

Answer: $x \leq 4$

Reason: A vertical boundary has equation $x = 4$. Solid means inclusive. Shading to the left means x is less than or equal to 4.

Check: Test (3,0): $3 \leq 4$ true and shaded. Test (5,0): $5 \leq 4$ false and unshaded.

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Source rubric / reflection

- [ ] Correct endpoint value or boundary equation identified.
- [ ] Correct symbol chosen from open/closed dot or dashed/solid line.
- [ ] Correct direction or shaded side represented by the inequality symbol.
- [ ] Equivalent algebraic forms accepted if the solution set is unchanged.
- [ ] Convention stated if it differs from open/closed circles or solid/dashed lines.
- [ ] Check method uses at least one point from each region.

Reflection: What did you check, what did you change, and what will you try next?