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

Worked example / complete source key

A coordinate graph shows a solid boundary line passing through (0, 1) and (2, 5). The region below the line is shaded. Write the inequality.

Answer: $y \leq 2x + 1$

Reason: Slope $m = (5 - 1)/(2 - 0) = 2$. Using (0,1), $b = 1$, so the boundary is $y = 2x + 1$. The line is solid, so the symbol is $\leq$ or $\geq$. Test (0,0), which is below the line and in the shaded region: $0 \leq 2(0) + 1$ is true. Therefore the inequality is $y \leq 2x + 1$.

Check: Test (0,0): $0 \leq 1$ is true, so it is in the shaded region. Test (0,2), above the line: $2 \leq 1$ is false, so it is outside. The inequality matches the graph.