Name: ……. Date: ……..

Thinking with Models _ Linear Inequality

Investigation Task: Lighting the Classroom Efficiently Assessment Criterion: B and C

Criterion B: Investigating patterns

Achievement Level	Task-Specific Descriptor	Sample Response Evidence (from student work)
0	The student does not reach a standard described by any of the descriptors below.	No attempt made, or work shows no understanding of inequality solving.
1–2	The student attempts to apply simple mathematical techniques with limited success. Patterns or rules are incomplete or contain major errors.	• Tries to rearrange ($3x - 5 < x + 7$) but makes algebraic errors (e.g., ($2x < 2$)). • Does not interpret meaning of (x) in context. • No number line or incorrect shading.
3–4	The student correctly applies basic problem-solving steps with some accuracy to discover a pattern. Describes a simple rule but with limited justification.	• Simplifies correctly to ($x < 6$) but gives vague reasoning ("less than 6 means less light"). • Number line included but unclear labeling. • Mentions that "more tube lights give more brightness" without connecting to inequality logic.
5–6	The student selects and applies appropriate mathematical techniques accurately to discover and represent the pattern. Describes a valid general rule supported by correct reasoning. Provides partial justification using algebraic and contextual evidence.	• Correctly solves ($3x - 5 < x + 7$ therefore $x < 6$). • Represents solution correctly on number line (open circle at 6, shading left). • Explains that for ($x<6$), brightness is less than standard; thus, minimum 6 tube lights needed. • Begins to justify reasoning with substituted values (e.g., "if x=5, brightness is 10; requirement is 12").
7–8	The student effectively selects and applies appropriate techniques to discover complex patterns, expresses general rules consistent with findings, and verifies or justifies them thoroughly using mathematical and contextual reasoning.	• Accurately solves ($x < 6$) and extends model to ($2x - 4 < x + 6$, therefore $x < 10$). • Clearly explains pattern: "As brightness per tube decreases, required number of tube lights increases." • Uses substitution or reasoning to verify rule validity. • Justifies findings both algebraically and contextually ("school must install ≥6 lights to meet brightness, ≥10 for dimmer tubes"). • Presents clear, logical reasoning with evidence of understanding relationship between algebraic solution and real-world scenario.

Criterion C: Communicating

Achievement Level	Task-Specific Descriptor	Sample Response Evidence (from student work)
0	The student does not reach a standard described by any of the descriptors below.	No meaningful mathematical communication; incomplete or illegible work.
1–2	Uses limited mathematical language and symbols; work is poorly organized and difficult to follow. Few correct representations are used.	• Writes expressions like “3x – 5 < x + 7” but does not explain symbols. • Number line missing or incorrect. • Reasoning fragmented (“x is less, so fewer lights”). • Steps not in order or missing labels.
3–4	Uses some appropriate mathematical language and representation, though inconsistently. Reasoning shows partial coherence but lacks clear structure.	• Writes correct inequality but limited explanation of steps. • Includes a number line but omits open circle notation. • Uses some terms (“solution,” “variable”) correctly but not consistently. • Work partly organized, reasoning jumps between steps.
5–6	Consistently uses appropriate mathematical language, notation, and representation. Communicates ideas clearly with generally logical structure and complete reasoning. Moves between algebraic and graphical forms effectively.	• Uses correct symbols and terminology (“solve,” “inequality,” “less than,” “solution region”). • Presents algebraic solution, number line, and contextual sentence (“For x < 6 brightness is less than required”). • Explains steps sequentially and connects algebraic result to graph and real meaning. • Layout is clear with labelled sections.
7–8	Communicates with precision and fluency using appropriate mathematical language and terminology throughout. Selects and integrates multiple representations (algebraic, graphical, verbal) to convey reasoning that is complete, coherent, concise, and well-structured.	• Provides algebraic solution (x<6), correct number-line sketch, and clear written interpretation (“School must use ≥ 6 tube lights to meet standard”). • Uses terms like “variable,” “inequality,” “solution set,” and “verify.” • Smoothly transitions between equation, graph, and contextual explanation. • Work neatly organized with headings and logical flow of reasoning. • Includes verification (substitution) and concise concluding statement.