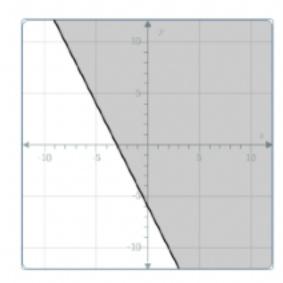
# Mathverse

## Contribution 2 — Chain of Thought Evaluation strategy



#### Question:

The x-intercept of the line is -3 and the y-intercept is -6. State the inequality that describes the region drawn in the plane.

**Answer:**  $y \ge -2x - 6$ .

Subject: A Expression

Version: Text Dominant

#### Model Output

The line passes through the points (-3, 0) and (0, -6). We can use these points to find the equation of the line. Let's use the slope-intercept form of a linear equation: y = mx + b, where m is the slope and b is the y-intercept. First, we'll find the slope (m) ...

### Key-step Extraction

- 1. Use the slope-intercept form of a linear equation: y = mx + b.
- 2. Find the slope (m) using the formula: m = (y2 y1) / (x2 x1). Using the points (-3, 0) and (0, -6): m = (-6 0) / (0 (-3)), m = -2.
- 3. Find the y-intercept (b) using one of the points and the slope-intercept form of the equation: 0 = -2 \* (-3) + b, b = -6.
- 4. Since the line is solid, the inequality is either  $y \le -2x 6$  or  $y \ge -2x 6$ .
- 5. The region below the line is shaded, which means the values of y should be less than or equal to -2x 6.
- 6. The inequality describing the region drawn in the plane is:  $y \le -2x 6$ .

### Multi-step Scoring

1.	The model correctly states that the slope-intercept form of a linear equation is $y = mx + b$ .	✓	1/1

- 2. The model correctly calculates the slope (m) using the given  $\sqrt{1/1}$  points (-3, 0) and (0, -6).
- 3. The model correctly finds the y-intercept (b) using one of the points and the slope-intercept form of the equation.
- 4. The equation of the line is correctly stated as y = -2x 6.  $\sqrt{1/1}$
- 5. The model incorrectly states that the region below the line is shaded. However, based on the diagram and the ground truth X 0/1 answer, the region above the line is shaded.
- 6. The final inequality provided by the model is  $y \le -2x 6$ , which does not match the ground truth answer of  $y \ge -2x 6$ .

Multi-step Score:  $(1+1+1+1+0+0)/6 = 2/3 \approx 0.67$ 

Final CoT Evaluation Score:  $0.67 \times 0.7 + 0 \times 0.3 = 0.47$ 

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## Result

- MLLMs struggle to understand math diagrams.
- MLLMs relying heavily on textual information.

