

Boundary Line Logic

Turn descriptions and graph clues into linear inequalities.

HIGH SCHOOL • MA.912.AR.2.7

MA.912.AR.2.7 "Write two-variable linear inequalities to represent relationships between quantities from a graph or a written description within a mathematical or real-world context."

NAME _____

DATE _____

READ THE BOUNDARY

Use the boundary line as the equation part of an inequality. A solid boundary means points on the line are included, so use $\leq$ or $\geq$. A dashed boundary means points on the line are not included, so use $<$ or $>$; shading above means greater y -values and shading below means smaller y -values.

WORKED EXAMPLE

A graph has a solid boundary line $y = 4x + 12$ and is shaded above the line. Write the inequality.

1. Start with the boundary equation: $y = 4x + 12$.
2. The line is solid, so include the boundary.
3. The shading is above the line, so use greater than or equal to.

Answer: $y \geq 4x + 12$

PRACTICE 6 problems

- 1** A graph has a dashed boundary line $y = 2x - 5$ and is shaded below the line. Write the inequality.

ANSWER _____

- 2** A graph has a solid boundary line $y = -3x + 7$ and is shaded above the line. Write the inequality.

ANSWER _____

- 3** Let x be the number of art prints ordered and y be the total cost. The total cost is at least \$8 per print plus a \$5 shipping charge. Write an inequality.

ANSWER _____

- 4** Let x be the number of game levels completed and y be the points earned. A player earns no more than 6 points per level plus a 1-point bonus. Write an inequality.

ANSWER _____

- 5** A graph has a solid boundary line $y = x - 10$ and is shaded below the line. Write the inequality.

ANSWER _____

- 6** A graph has a dashed boundary line $y = -2x + 13$ and is shaded above the line. Write the inequality.

ANSWER _____

APPLY IT Show your work

- 1** A ride-share company charges a \$3 booking fee and at least \$2 for each mile traveled. Let x be the number of miles and y be the total fare. Write an inequality that represents the fare.

WORK SPACE

ANSWER _____

- 2** A custom hoodie order may receive a discount. Let x be the number of hoodies and y be the final cost. The final cost will be no more than \$18 per hoodie plus a \$16 shipping charge. Write an inequality that represents the final cost.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A dashed boundary line passes through $(0, -6)$ and $(3, 0)$. The graph is shaded above the line. Write the inequality and explain how you chose the inequality symbol.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A graph has a dashed boundary line $y = 2x - 5$ and is shaded below the line. Write the inequality.	$y < 2x - 5$
2	A graph has a solid boundary line $y = -3x + 7$ and is shaded above the line. Write the inequality.	$y \geq -3x + 7$
3	Let x be the number of art prints ordered and y be the total cost. The total cost is at least \$8 per print plus a \$5 shipping charge. Write an inequality.	$y \geq 8x + 5$
4	Let x be the number of game levels completed and y be the points earned. A player earns no more than 6 points per level plus a 1-point bonus. Write an inequality.	$y \leq 6x + 1$
5	A graph has a solid boundary line $y = x - 10$ and is shaded below the line. Write the inequality.	$y \leq x - 10$
6	A graph has a dashed boundary line $y = -2x + 13$ and is shaded above the line. Write the inequality.	$y > -2x + 13$

PART 2 • APPLY IT

1. $y \geq 2x + 3$ Multiply the miles by \$2 and add the \$3 booking fee. The phrase "at least" means use $\geq$.
2. $y \leq 18x + 16$ The cost is based on \$18 times the number of hoodies plus \$16 shipping. The phrase "no more than" means use $\leq$.

CHALLENGE

$y > 2x - 6$. The slope is 2, and the y-intercept is -6. The line is dashed, so the boundary is not included, and shading above means y is greater.

Accept algebraically equivalent inequalities, such as $y - 2x > -6$ for the challenge. Require the correct inequality direction and whether the boundary is included or excluded.