

Inequality Boundaries

Write linear inequalities from graphs and contexts.

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

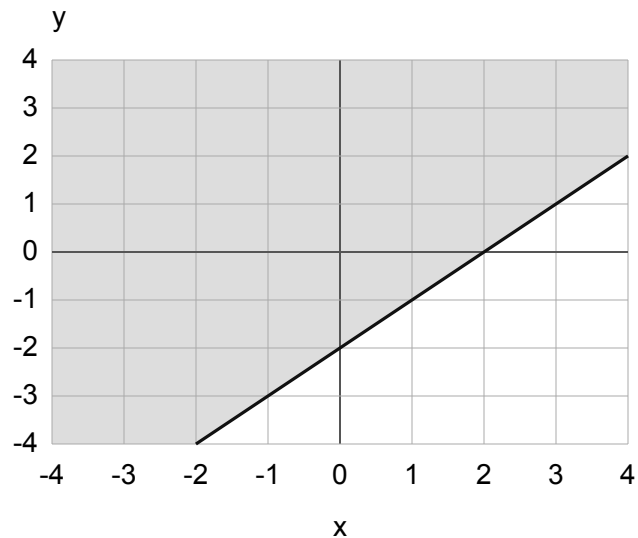
Find the boundary equation, then choose the side containing the shaded region. A solid boundary includes equality; a dashed one excludes it. Test a point off the boundary. Inequalities can use slope-intercept, standard or point-slope form. Vertical boundaries compare x ; horizontal ones compare y .

WORKED EXAMPLE

Write an inequality for the shaded region.
The boundary passes through $(0, -2)$ and $(2, 0)$.

1. Slope is 1, so the boundary is $y = x - 2$.
2. The solid line includes equality. Shading is above it.
3. Test $(0, 0)$: $0 \geq -2$ is true.

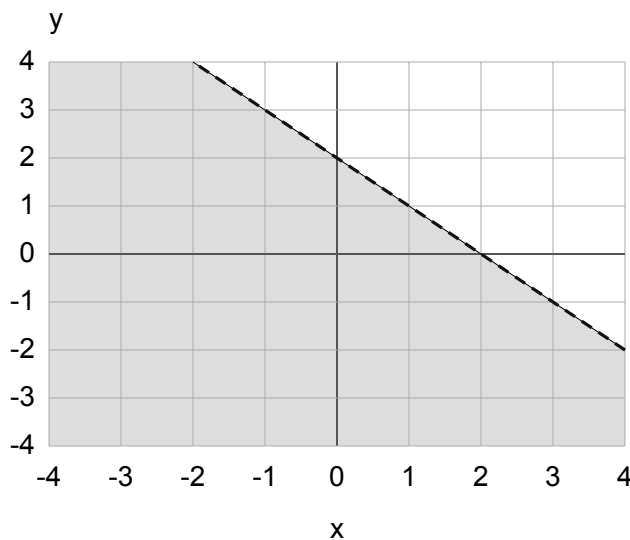
Answer: $y \geq x - 2$, equivalently $x - y \leq 2$.



PRACTICE 4 problems

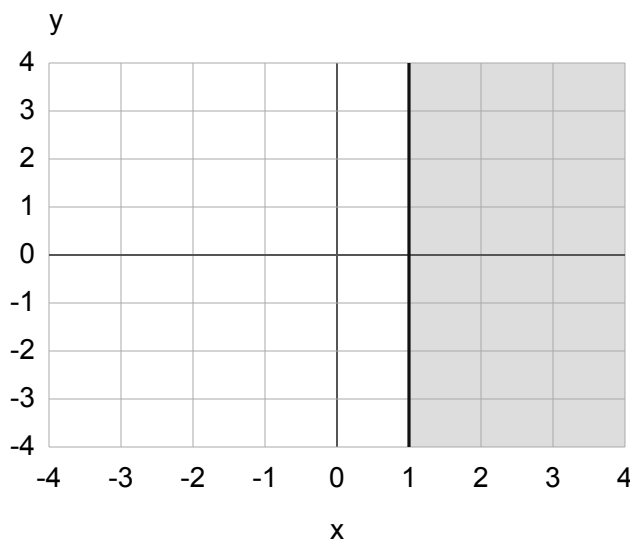
- 1** Write an inequality for the shaded graph. Its boundary passes through $(0,2)$ and $(2,0)$. Explain the inequality symbol.

ANSWER _____



- 2** Write an inequality for the shaded graph. Explain how a vertical boundary changes the variable you compare.

ANSWER _____



- 3** A solid horizontal boundary is $y = -2$; the region below it is shaded. Write an inequality and give one solution point.

ANSWER _____

- 4** The dashed boundary through (1,2) has slope 2. The region above it is shaded. Write the inequality in point-slope form, then simplify.

ANSWER _____

APPLY IT Show your work

- 1** A booth can spend at most \$12 on ribbon at \$2 per meter and cord at \$3 per meter. Let x be ribbon meters and y be cord meters; partial meters are allowed. Write the budget inequality and restrictions. Is (3,2) allowed?

WORK SPACE

2

A contest requires a score y greater than 3 points per round x plus 2 bonus points. Here x is a whole number from 1 through 5, and y is a nonnegative whole-number score. Write the inequality and domain restrictions. Test (2,8).

WORK SPACE

CHALLENGE One step up

Let x be a whole number of patches from 0 through 5, and y be total cost in dollars. The \$10 setup fee plus patches costing at most \$7 each puts an upper bound on y . Write that upper-bound inequality and the allowed x set. Explain why $x=2.5$ is excluded.

WORK SPACE AND ANSWER

Accept equivalent linear inequalities. For graphical items, both boundary inclusion and shaded side must match. Keep nonnegative/whole-number contextual restrictions separate from the budget or score inequality. The patch task asks only for an upper bound; exact patch prices are unspecified.

PRACTICE 1

$y < -x + 2$, or $x + y < 2$. Dashed boundary; shading below.

PRACTICE 2

$x \geq 1$. A solid vertical boundary at $x=1$ includes all points to its right.

PRACTICE 3

$y \leq -2$; for example $(0,-3)$.

PRACTICE 4

$y - 2 > 2(x - 1)$, so $y > 2x$.

APPLY IT 1

$2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$. $(3,2)$ is allowed: it costs \$12.
At most includes the \$12 boundary.

APPLY IT 2

$y > 3x + 2$; x in $\{1,2,3,4,5\}$, y a nonnegative integer. $(2,8)$ fails because 8 is not greater than 8.
Greater than is strict; equality does not qualify.

CHALLENGE

$y \leq 7x + 10$; x in $\{0,1,2,3,4,5\}$. A count of whole patches cannot equal 2.5. This is an upper bound, not an exact price.