

Shade the Solution

Graph linear inequalities in two variables.

HIGH SCHOOL • MA.912.AR.2.8

MA.912.AR.2.8 "Given a mathematical or real-world context, graph the solution set to a two-variable linear inequality."

NAME _____

DATE _____

GRAPHING THE REGION

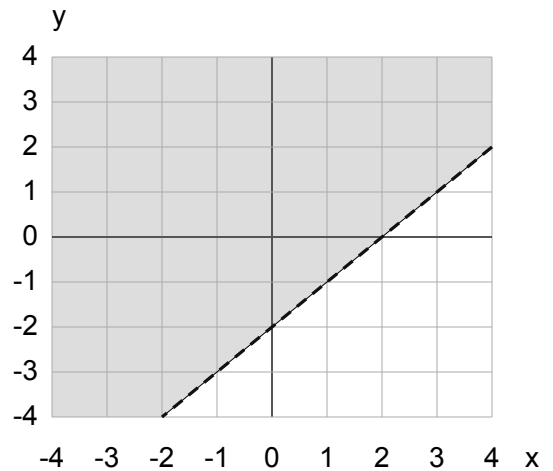
Rewrite in a convenient form, reversing the inequality when dividing by a negative number. Draw a solid boundary for $\leq$ or $\geq$, dashed for $<$ or $>$. Test a point off the boundary and shade the solution side. Vertical and horizontal boundaries work the same way. Use a ruler. The graph window is not a domain restriction.

WORKED EXAMPLE

Graph $y > x - 2$. Explain the boundary and shading.

1. Plot boundary points $(0, -2)$ and $(2, 0)$. Draw a dashed line.
2. Test $(0, 0)$: $0 > -2$ is true.
3. Shade the side containing $(0, 0)$, above the line.

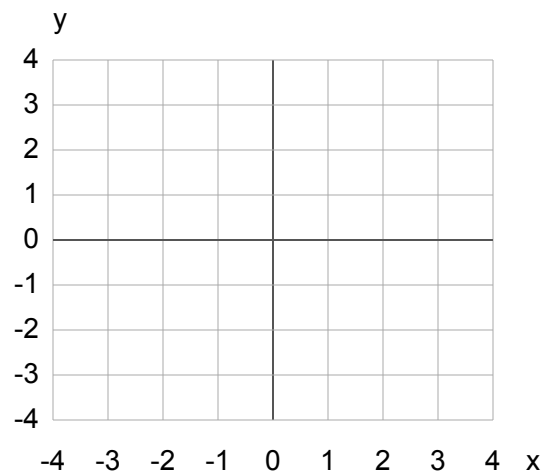
Answer: Dashed boundary $y = x - 2$; shaded above. Boundary points are excluded.



PRACTICE 4 problems

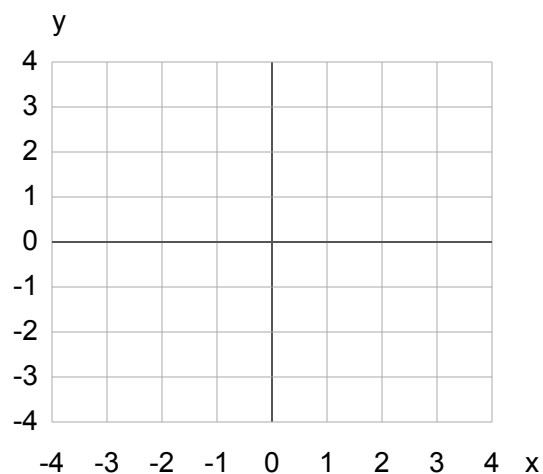
- 1** Graph the solution set. State whether the boundary is included. $y \leq 2x + 2$.

ANSWER _____



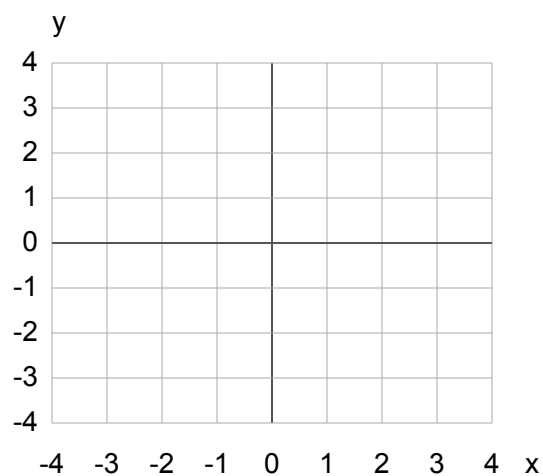
- 2** Graph the solution set. State whether the boundary is included. Standard form: $x - 2y \geq 4$.

ANSWER _____



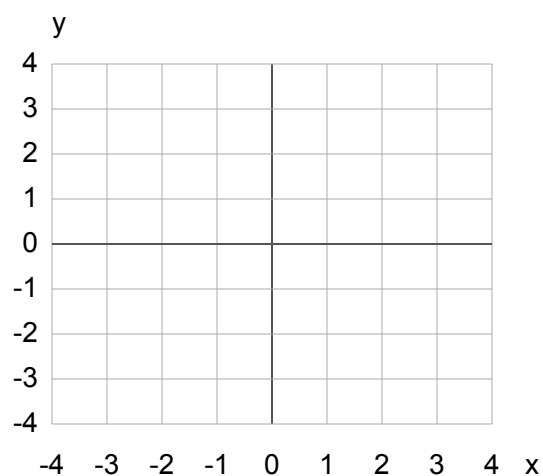
- 3** Graph the solution set. State whether the boundary is included. Point-slope form: $y - 1 > -(x - 1)$.

ANSWER _____



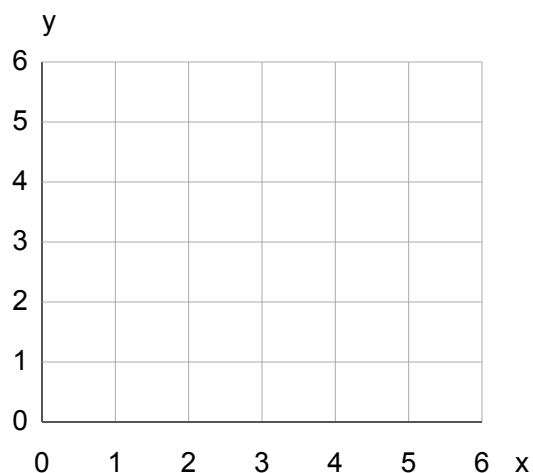
- 4** Graph the solution set. State whether the boundary is included. $0x + y < 1$.

ANSWER _____

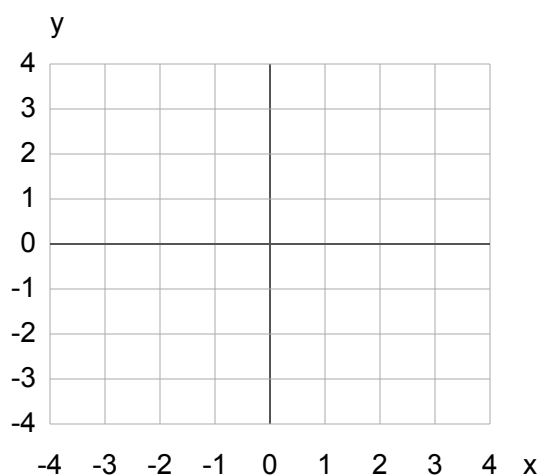


APPLY IT Show your work

- 1** A designer uses x meters of ribbon and y meters of cord, both nonnegative and continuously measurable. Ribbon costs \$2/m, cord \$3/m; budget is \$12. Write the inequality and graph all affordable combinations.



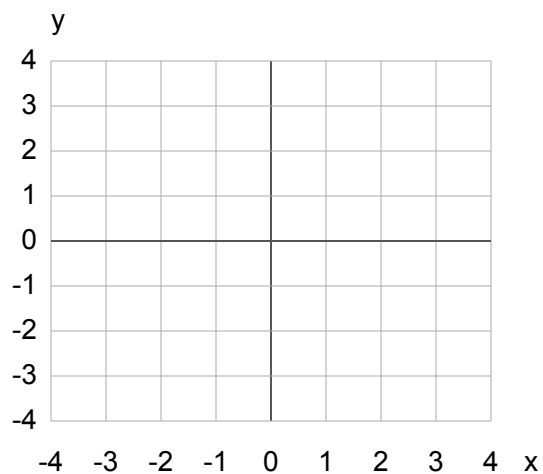
- 2** A design must extend at least 1 meter to the right of the vertical reference axis. Let x and y locate a point in meters. Graph all allowed points, with no restriction on y .



CHALLENGE One step up

Graph $2x - 3y > 6$. A student shades above the boundary after dividing by -3 . Explain and correct the error; test $(0,0)$.

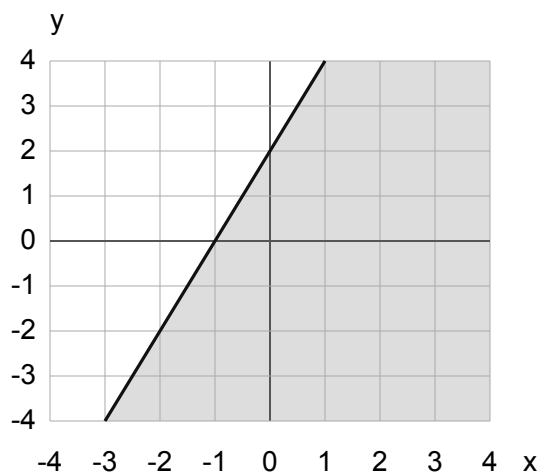
WORK SPACE AND ANSWER



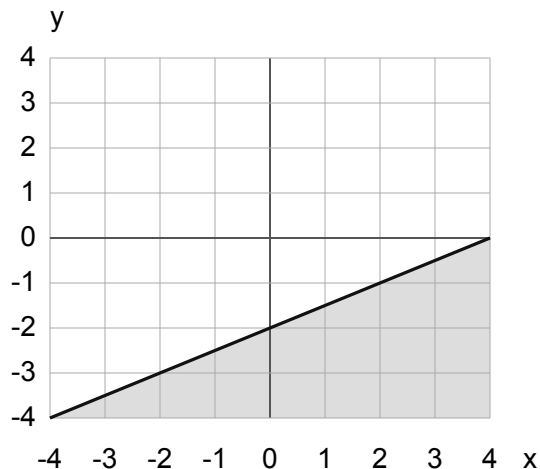
Require the boundary and the entire solution side, not just sample points. Check solid/dashed status and the sign reversal. All graphs continue beyond the displayed window except where context restricts them. Budget amounts are continuous lengths, so the feasible triangle is filled, not an integer lattice.

PRACTICE 1

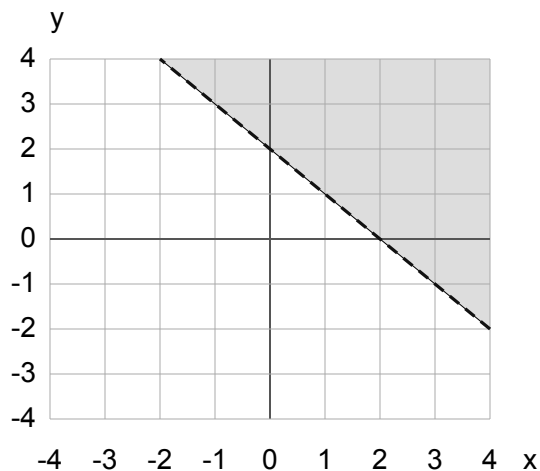
Solid line $y = 2x + 2$; shade below.

**PRACTICE 2**

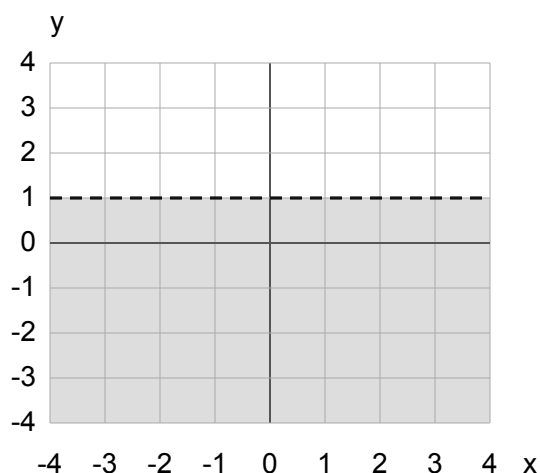
$y \leq x/2 - 2$. Solid boundary, shade below; reverse the sign when dividing by -2.

**PRACTICE 3**

$y > -x + 2$. Dashed boundary, shade above.

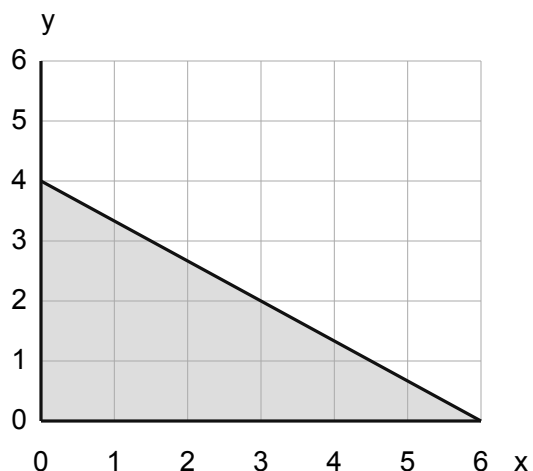
**PRACTICE 4**

Dashed horizontal boundary $y = 1$; shade below.



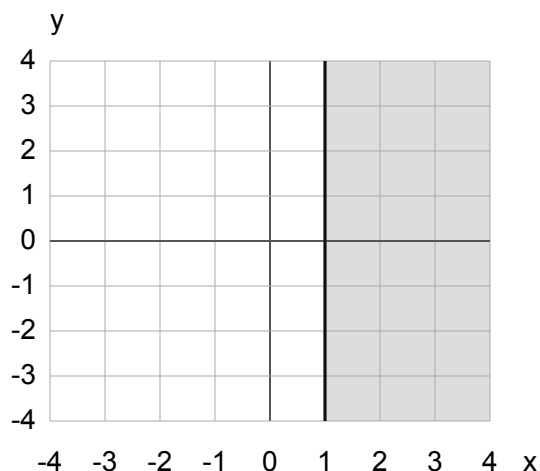
APPLY IT 1

$2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$. Solid triangular region with vertices $(0,0)$, $(6,0)$, $(0,4)$. Partial meters are allowed, so shade continuously.



APPLY IT 2

$x \geq 1$. Solid vertical boundary at $x = 1$; shade right. All real y values are allowed. The zero y coefficient creates a vertical boundary.



CHALLENGE

$y < (2/3)x - 2$. Dashed boundary, shade below. Dividing by -3 reverses $>$ to $<$. $(0,0)$ is not a solution.

