

Shade the Overlap

Graph systems of two-variable inequalities.

HIGH SCHOOL • MA.912.AR.9.5

MA.912.AR.9.5 "Graph the solution set of a system of two-variable inequalities."

NAME _____

DATE _____

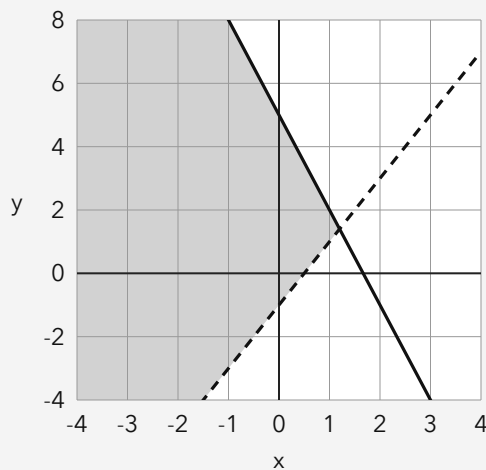
You will need: Pencil; Ruler

GRAPH BOTH, KEEP BOTH

Graph each boundary line or curve: solid for $\leq$ or $\geq$, dashed for $<$ or $>$. Test a point to choose each side. Line style tells inclusion, not which side to shade. The solution is where all inequalities hold. Shading can continue beyond the graph window.

WORKED EXAMPLE

Graph $y > 2x - 1$ and $y \leq -3x + 5$. Identify their overlap.

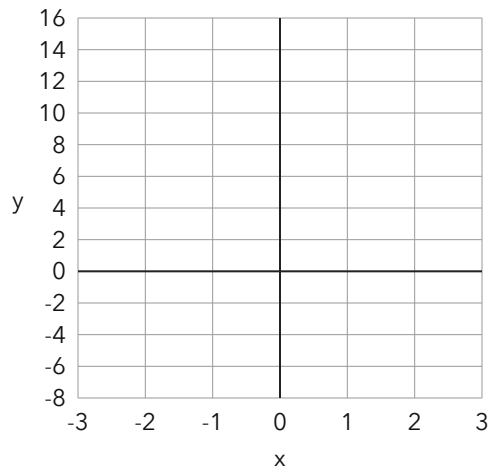


1. Draw $y = 2x - 1$ dashed: the $>$ sign excludes its boundary. Shade above it.
2. Draw $y = -3x + 5$ solid: the $\leq$ sign includes its boundary. Shade below it.
3. Keep the overlap. For example, $(0, 0)$ satisfies both inequalities.

Answer: The solution is the overlap above $y = 2x - 1$ and on or below $y = -3x + 5$.

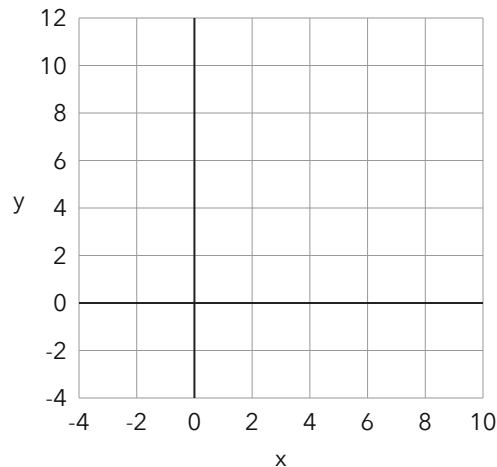
PRACTICE 4 problems

- 1** Graph: $y \geq 4x + 6$ and $y < -4x + 8$. State the boundary styles and overlap.



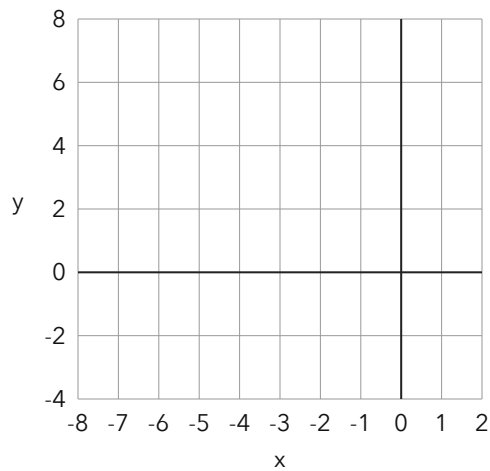
ANSWER _____

- 2** Graph: $x + y \leq 7$ and $x - y > -9$. State the boundary styles and overlap.



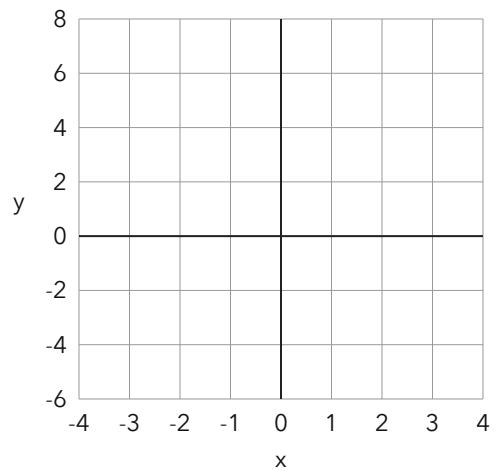
ANSWER _____

- 3** Graph: $x > -6$ and $y \leq 4$. State the boundary styles and overlap.



ANSWER _____

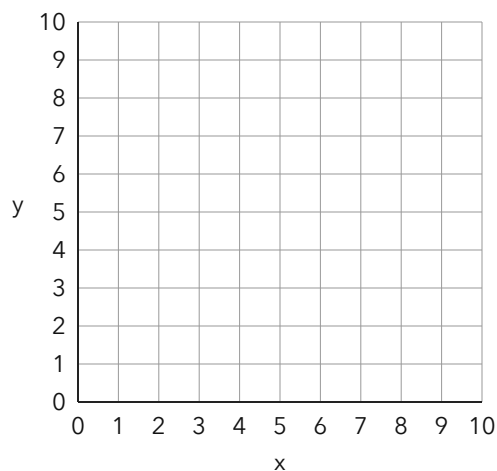
- 4** Graph $y \geq x^2 - 4$ and $y \leq x + 2$. State the boundary styles and describe the overlap.



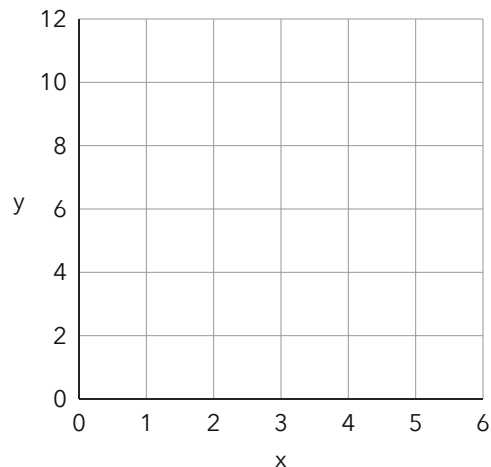
ANSWER _____

APPLY IT Show your work

- 1** A music club makes x posters and y button packs. It can make at most 8 total items and needs at least 28 quality points, where posters earn 7 points and button packs earn 4 points. Graph $x + y \leq 8$, $7x + 4y \geq 28$, $x \geq 0$, and $y \geq 0$. Give the vertices of the feasible region.

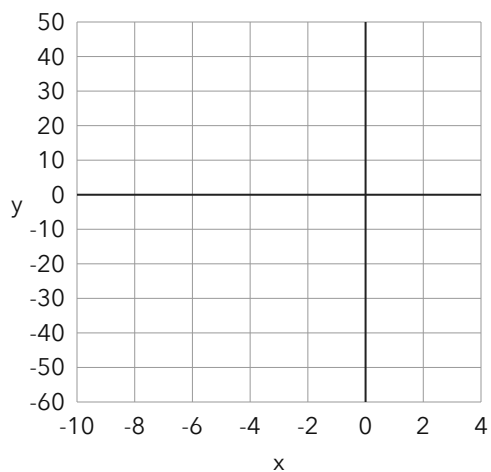
**REASONING AND ANSWER**

- 2** A video club spends x hours on editing and y hours on captions. It allows at most 4 editing hours and needs more than 9 total work hours. Graph $x \leq 4$, $x + y > 9$, $x \geq 0$, and $y \geq 0$.

**REASONING AND ANSWER**

CHALLENGE One step up

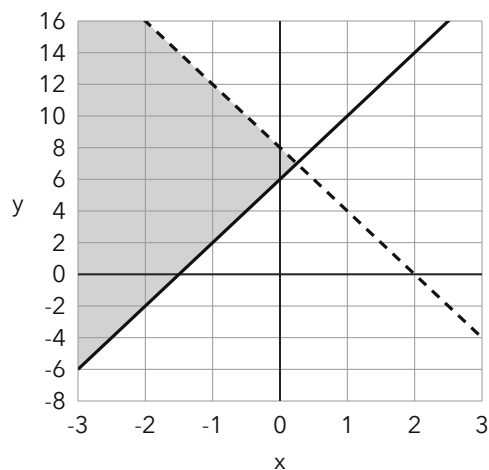
Graph $x > -8$, $y \geq 6x - 7$, and $y < -4x + 11$. Is the solution set bounded? Explain in one sentence.



WORK SPACE AND ANSWER

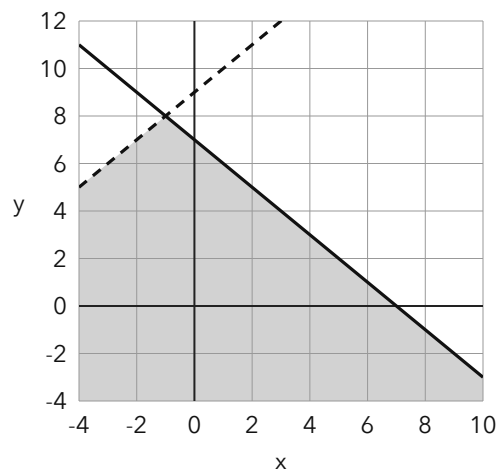
PRACTICE 1

Solid $y = 4x + 6$, dashed $y = -4x + 8$. Shade on or above the first line and below the second line.



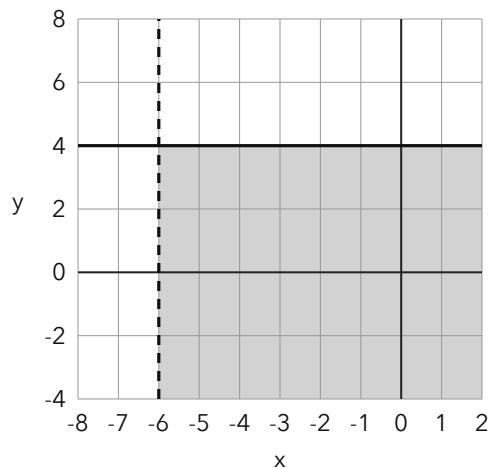
PRACTICE 2

Solid $x + y = 7$, dashed $x - y = -9$. Shade on or below $x + y = 7$ and in the region where $x - y > -9$.



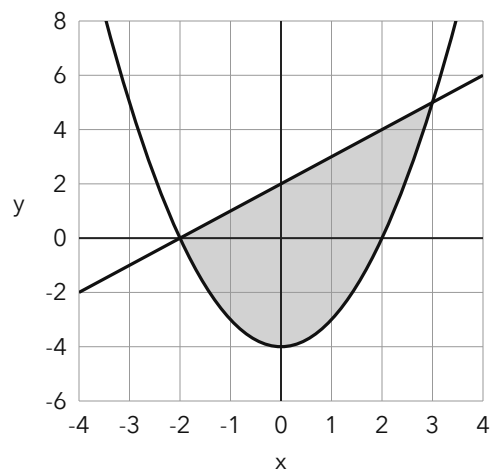
PRACTICE 3

Dashed $x = -6$, solid $y = 4$. Shade right of $x = -6$ and on or below $y = 4$.



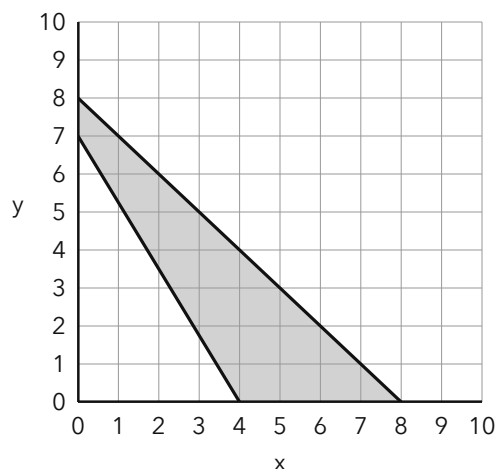
PRACTICE 4

Both boundaries are solid. Shade above $y = x^2 - 4$ and below $y = x + 2$, including their intersection points $(-2, 0)$ and $(3, 5)$.



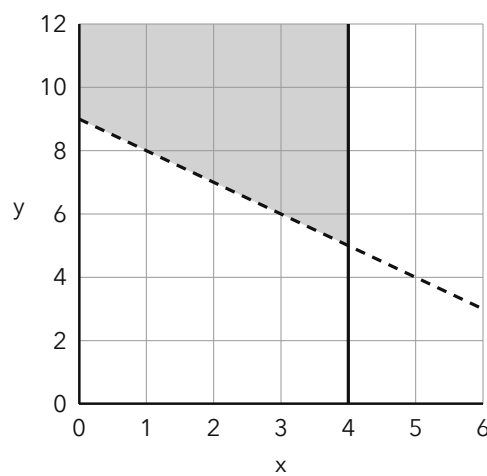
APPLY IT 1

Shade the first-quadrant overlap on or below $x + y = 8$ and on or above $7x + 4y = 28$. The vertices are $(4,0)$, $(8,0)$, $(0,8)$, and $(0,7)$. Graph both solid boundary lines and keep the overlap in the first quadrant. The quality line meets the axes at $(4,0)$ and $(0,7)$.



APPLY IT 2

Use a solid vertical boundary $x = 4$ and a dashed boundary $x + y = 9$. Shade in the first quadrant, on or left of $x = 4$, and above $x + y = 9$. At most 4 editing hours gives the solid boundary $x = 4$. More than 9 total hours gives the dashed line $y = 9 - x$. Keep their first-quadrant overlap.



CHALLENGE

Graph dashed $x = -8$ and $y = -4x + 11$, solid $y = 6x - 7$, and shade their overlap; it is bounded because $-8 < x < 9/5$ and y lies between the slanted boundaries.

Require an actual graph with the common shaded region, including for the nonlinear system. A dashed boundary excludes equality; a solid boundary includes it only where every other inequality also holds. Shading decides the direction. Accept equivalent inequality forms and appropriate alternative scales. Window edges are not extra constraints. The challenge region is bounded, but its left and upper boundaries are excluded.

