

Shade the Overlap

Graph systems of linear inequalities.

HIGH SCHOOL • MA.912.AR.9.4

MA.912.AR.9.4 "Graph the solution set of a system of two-variable linear inequalities."

NAME _____

DATE _____

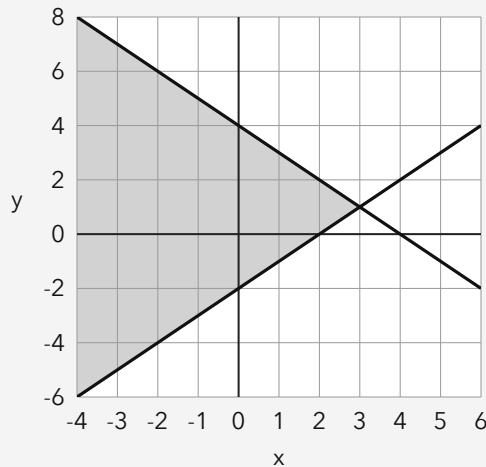
You will need: Pencil; Ruler

GRAPH BOTH INEQUALITIES

Graph every boundary: solid for $\leq$ or $\geq$ and dashed for $<$ or $>$. Test a point for each inequality. The solution is the overlap where every inequality holds. Shading may continue beyond the displayed window.

WORKED EXAMPLE

Graph $y \leq -x + 4$ and $y \geq x - 2$.

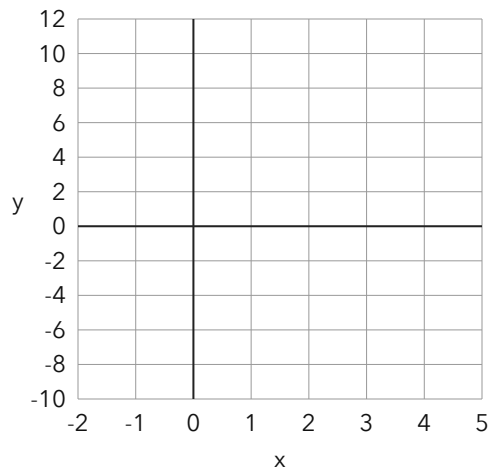


1. Both boundaries are solid because equality is included.
2. The lines meet at (3, 1). Shade below $y = -x + 4$ and above $y = x - 2$.
3. Keep only the overlap. The point (0, 0) satisfies both inequalities.

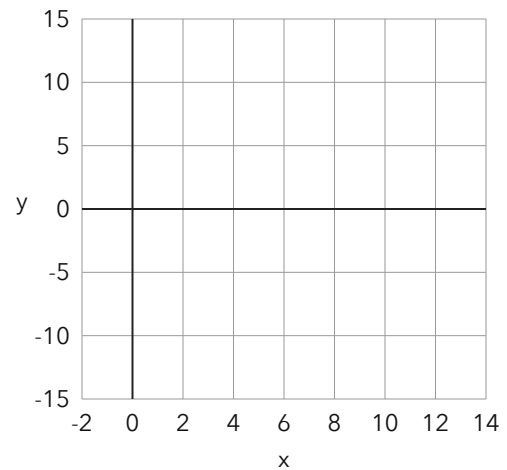
Answer: Shade between the solid lines, to the left of and including their intersection (3, 1).

PRACTICE 4 problems

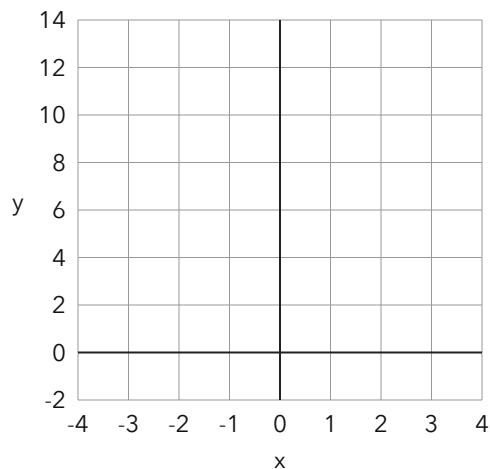
- 1**
- Graph the system:
- $y > 6x - 8$
- and
- $y \leq -2x + 9$
- .

**ANSWER** _____

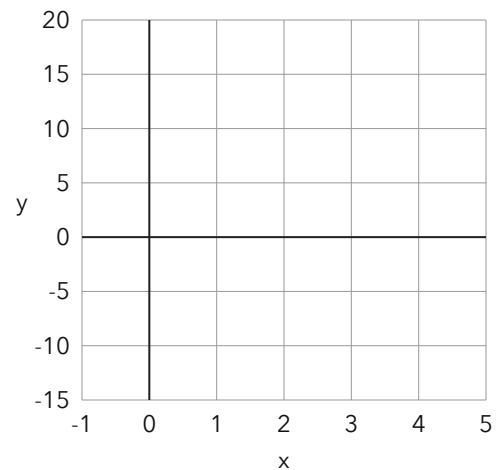
- 2**
- Graph the system:
- $x + y \geq 10$
- and
- $x - y < 12$
- .

**ANSWER** _____

- 3**
- Graph the system:
- $x > -1$
- and
- $y \leq 11$
- .

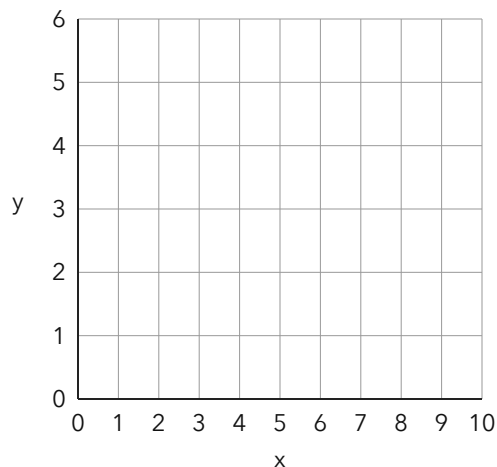
**ANSWER** _____

- 4**
- Graph the system:
- $y < \frac{2}{9}x - 6$
- and
- $y \geq -8x + 14$
- .

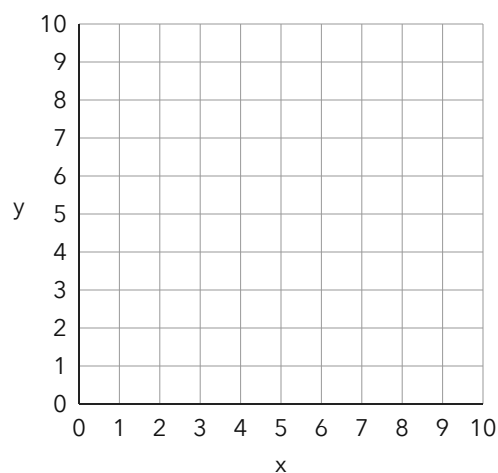
**ANSWER** _____

APPLY IT Show your work

- 1** A club buys x snack packs for \$2 each and y drink packs for \$4 each. It can spend at most \$20 and needs at least 8 total packs. Graph the system. Then list all whole-number choices.

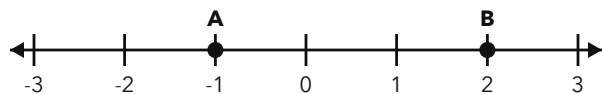
**REASONING AND ANSWER**

- 2** A student plans x hours of game design and y hours of video editing. The student has at most 9 hours total and wants at least $2x - 6$ hours of editing. Graph the system with $x \geq 0$ and $y \geq 0$. Give the vertices of the solution region.

**REASONING AND ANSWER**

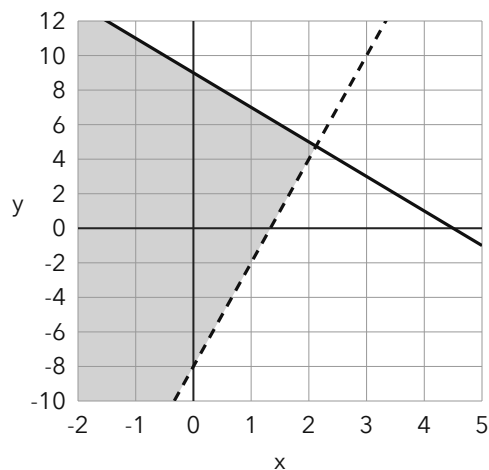
CHALLENGE One step up

The number line marks candidate smallest and largest x -coordinates for the solution set of $x \geq -1$, $y \geq x - 2$, and $y \leq -3x + 6$. Does it match the system? Explain.

**WORK SPACE AND ANSWER**

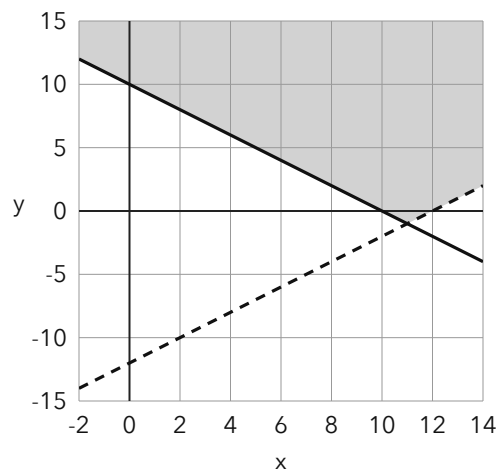
PRACTICE 1

Draw $y = 6x - 8$ dashed and $y = -2x + 9$ solid. Shade above the dashed line and on or below the solid line.



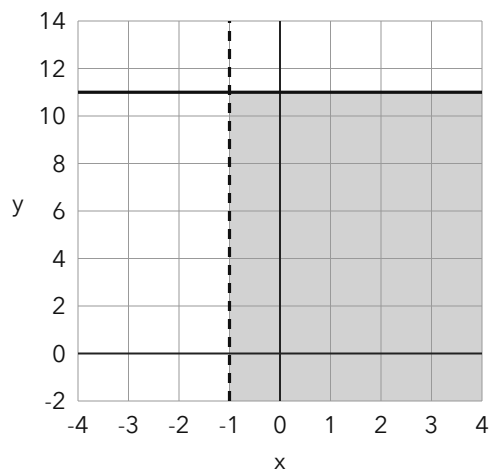
PRACTICE 2

Graph $y = 10 - x$ solid and $y = x - 12$ dashed. Shade on or above $y = 10 - x$ and above $y = x - 12$.



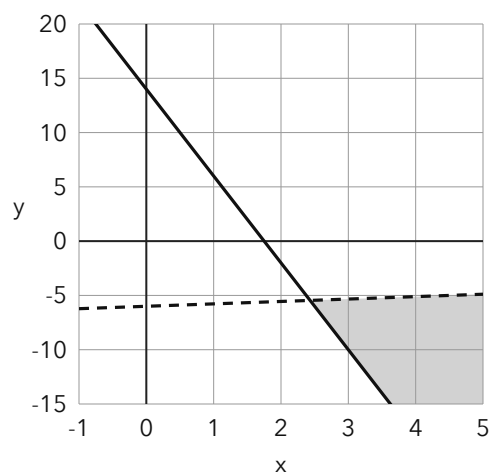
PRACTICE 3

Draw $x = -1$ dashed and $y = 11$ solid. Shade to the right of $x = -1$ and on or below $y = 11$.



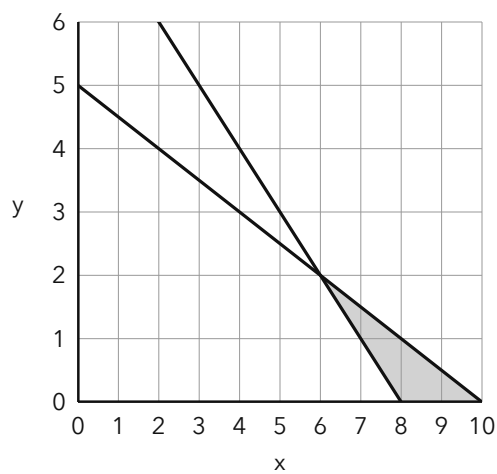
PRACTICE 4

Draw $y = \frac{2}{9}x - 6$ dashed and $y = -8x + 14$ solid. Shade below the dashed line and on or above the solid line.



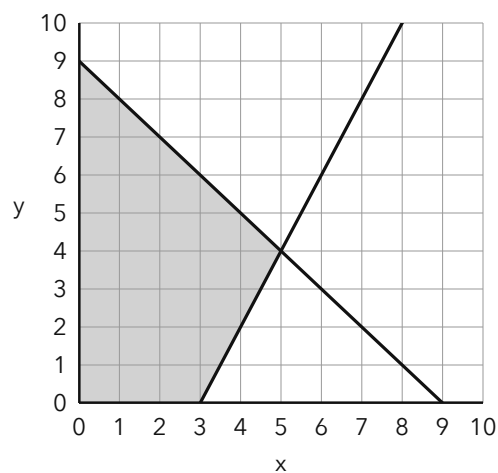
APPLY IT 1

Graph $x + 2y \leq 10$ and $x + y \geq 8$ in the first quadrant. The region has vertices $(8, 0)$, $(10, 0)$, and $(6, 2)$. Whole-number choices: $(8, 0)$, $(9, 0)$, $(10, 0)$, $(7, 1)$, $(8, 1)$, and $(6, 2)$. Write the cost inequality as $2x + 4y \leq 20$, then divide by 2. Graph both boundary lines as solid because both conditions include equality.



APPLY IT 2

Graph $x + y \leq 9$, $y \geq 2x - 6$, $x \geq 0$, and $y \geq 0$. The vertices are $(0, 0)$, $(3, 0)$, $(5, 4)$, and $(0, 9)$. Use the first quadrant. The lines $y = 0$ and $y = 2x - 6$ meet at $(3, 0)$, and $y = 2x - 6$ meets $y = 9 - x$ at $(5, 4)$.



CHALLENGE

Yes. $x \geq -1$ gives $A = -1$. For the two y inequalities to overlap, $x - 2 \leq -3x + 6$, so $x \leq 2$ and $B = 2$.

Require complete plotted boundaries and the common shaded region. Dashed boundaries are excluded even where another constraint is solid. The two applications use nonnegative coordinates. Verify all six whole-number pack choices in application 1. Equivalent graph windows are valid when the boundary positions, scale and shading are correct; viewport edges are not extra inequalities.

