LESSON MAKER PRO

Shade the Overlap

Graph systems of inequalities and find the shared region.

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 ______________

FIND THE SHARED REGION

Graph each inequality boundary first. Use a solid line for <= or >=, and use a dashed line for < or >. Shade the side that makes each inequality true, then keep only the region where all shadings overlap.

WORKED EXAMPLE

Graph the system: y >= 3x - 5 and y < -2x + 8.

1. Graph y = 3x - 5 as a solid line.
2. Graph y = -2x + 8 as a dashed line.
3. Set 3x - 5 = -2x + 8. Then 5x = 13, so the lines meet at (13/5, 14/5).
4. Shade above or on the solid line and below the dashed line.

Answer: The solution is the region above or on y = 3x - 5 and below y = -2x + 8. The lines meet at (13/5, 14/5), but that point is not included because y < -2x + 8 is strict.

PRACTICE 6 problems

1 Graph the system: y <= x + 4 and y > -x + 6.

ANSWER ______________________________

2 Graph the system: x + y >= 7 and x - y < 1.

ANSWER ______________________________

3 Graph the system: x >= 4 and y < 6.

ANSWER ______________________________

4 Graph the system: y >= 4x + 7 and y < 4x + 9.

ANSWER ______________________________

5 Graph the system: y <= 0 and x + y > 9.

ANSWER ______________________________

6 Graph the system: x >= 0, y >= 0, and x + y <= 7.

ANSWER ______________________________

APPLY IT Show your work

1 For a club sale, you make x custom stickers and y pin buttons. A sticker takes 4 minutes to make, a pin takes 1 minute, and you have at most 36 minutes. You need at least 9 items. Write and graph a system, including nonnegative amounts.

WORK SPACE

ANSWER ______________________

2 A school concert sells x standard tickets for $6 each and y VIP tickets for $9 each. The club can sell at most 10 tickets and needs at least $54 in ticket revenue. Write and graph a system, including nonnegative amounts.

WORK SPACE

ANSWER ______________________

CHALLENGE One step up

CHALLENGE

Graph the system: y < x + 4, y < -x + 6, and y >= 0. Identify each boundary type and explain why none of the three corner points is included.

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ANSWER KEY # Shade the Overlap

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Graph the system: y <= x + 4 and y > -x + 6.	**Draw y = x + 4 solid and shade below it. Draw y = -x + 6 dashed and shade above it. The overlap is between the lines to the right of their intersection, (1, 5), and (1, 5) is not included.**
2	Graph the system: x + y >= 7 and x - y < 1.	**Rewrite as y >= -x + 7 and y > x - 1. Draw y = -x + 7 solid and y = x - 1 dashed, then shade above both lines. They meet at (4, 3), which is not included.**
3	Graph the system: x >= 4 and y < 6.	**Draw x = 4 as a solid vertical line and shade right. Draw y = 6 as a dashed horizontal line and shade below. The solution is the overlap.**
4	Graph the system: y >= 4x + 7 and y < 4x + 9.	**Draw y = 4x + 7 solid and y = 4x + 9 dashed. Shade above or on the lower line and below the upper line. The solution is the strip between the parallel lines.**
5	Graph the system: y <= 0 and x + y > 9.	**Rewrite x + y > 9 as y > -x + 9. Draw y = 0 solid and y = -x + 9 dashed. Shade below or on y = 0 and above y = -x + 9. The lines meet at (9, 0), which is not included.**
6	Graph the system: x >= 0, y >= 0, and x + y <= 7.	**Draw all three boundaries as solid lines. Shade the first-quadrant triangle below x + y = 7, including its edges. Its vertices are (0, 0), (7, 0), and (0, 7).**

PART 2 · APPLY IT

1. **4x + y <= 36, x + y >= 9, x >= 0, y >= 0. Graph the first-quadrant region below or on 4x + y = 36 and above or on x + y = 9. The boundary vertices are (0, 9), (0, 36), and (9, 0).** Use total making time for 4x + y <= 36 and total items for x + y >= 9. The feasible graph is the overlap in the first quadrant, with all boundaries solid.
2. **x + y <= 10, 6x + 9y >= 54, x >= 0, y >= 0. Graph the first-quadrant region below or on x + y = 10 and above or on 6x + 9y = 54. The boundary vertices are (9, 0), (10, 0), (0, 10), and (0, 6).** Use the ticket limit for x + y <= 10 and the revenue requirement for 6x + 9y >= 54. Both inequalities include equality, so all boundary lines are solid.

CHALLENGE

Draw y = x + 4 and y = -x + 6 as dashed lines. Draw y = 0 as a solid line. Shade the triangular region above or on y = 0 and below both dashed lines. The corner points are (-4, 0), (6, 0), and (1, 5), and none is included because each lies on at least one dashed boundary.

Accept equivalent inequality forms and correct graphs with the same boundary types and overlap region. In the two contexts, x and y represent item or ticket counts, so actual choices are nonnegative whole-number points in the graphed region.