LESSON MAKER PRO

Shade the Overlap

Graph systems of linear inequalities and find the shared region.

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 _____

FIND THE SHARED REGION

Graph each boundary line first. Use a solid line for <= or >= because points on the line count, and use a dashed line for < or > because points on the line do not count. Shade the side that makes each inequality true, then keep only the overlap.

WORKED EXAMPLE

Graph the system: y <= 5x + 17 and y > -4x - 23.

1. Draw y = 5x + 17 as a solid boundary line.
2. Draw y = -4x - 23 as a dashed boundary line.
3. Shade below the solid line.
4. Shade above the dashed line. Keep the overlapping region.

Answer: The solution is the region below or on y = 5x + 17 and above y = -4x - 23. The solid boundary is included, and the dashed boundary is not included.

PRACTICE 6 problems

1 Graph the system: y >= x - 6 and y < -2x + 10.

ANSWER _____

2 Graph the system: x > -7 and y <= 12.

ANSWER _____

3 Graph the system: 2x + 3y >= 18 and x - y < 6.

ANSWER _____

4 Graph the system: x + y >= 1 and x - y <= 8.

ANSWER _____

5 Graph the system: y > -3x + 14 and y <= x + 1.

ANSWER _____

6 Graph the system: x <= 6, y >= -1, and x + y < 8.

ANSWER _____

APPLY IT Show your work

1 A student design club plans an apparel order. Let x be the number of hoodies and y be the number of T-shirts. The club needs at least 18 items. Each hoodie uses 3 printing hours and each T-shirt uses 1 printing hour, and the order can use at most 42 printing hours. Graph all possible nonnegative orders.

WORK SPACE

ANSWER _____

2 An esports club schedules x practice drills and y scrimmages for a training week. A drill lasts 1 hour, and a scrimmage lasts 2 hours. The club wants at least 15 total sessions and has at most 27 hours available. Graph all possible nonnegative schedules.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Graph the system: x + y <= 15, 2x + y > 12, x >= 1, and y >= 0. Then list every corner point of the boundary and state whether it is included.

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_____

ANSWER KEY

Shade the Overlap

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Graph the system: y >= x - 6 and y < -2x + 10.	**Draw y = x - 6 as a solid line and shade above it. Draw y = -2x + 10 as a dashed line and shade below it. The overlap is the solution; the boundary lines meet at (16/3, -2/3), which is not included.**
2	Graph the system: x > -7 and y <= 12.	**Draw x = -7 as a dashed vertical line and y = 12 as a solid horizontal line. Shade to the right of x = -7 and at or below y = 12.**
3	Graph the system: 2x + 3y >= 18 and x - y < 6.	**Draw y = -2/3x + 6 as a solid line and shade above it. Draw y = x - 6 as a dashed line and shade above it. The overlap above both lines is the solution.**
4	Graph the system: x + y >= 1 and x - y <= 8.	**Draw y = 1 - x as a solid line and shade above it. Draw y = x - 8 as a solid line and shade above it. The overlap above both solid lines is the solution.**
5	Graph the system: y > -3x + 14 and y <= x + 1.	**Draw y = -3x + 14 as a dashed line and shade above it. Draw y = x + 1 as a solid line and shade below it. The overlap is the solution.**
6	Graph the system: x <= 6, y >= -1, and x + y < 8.	**Draw x = 6 as a solid vertical line, y = -1 as a solid horizontal line, and y = 8 - x as a dashed line. Shade left of x = 6, above y = -1, and below y = 8 - x.**

PART 2 · APPLY IT

1. **x + y >= 18, 3x + y <= 42, x >= 0, y >= 0. Graph all boundaries as solid lines and shade the first-quadrant overlap. The feasible region has vertices (0, 18), (0, 42), and (12, 6).** Translate "at least" to x + y >= 18 and "at most" to 3x + y <= 42. Restrict the graph to nonnegative values because item counts cannot be negative.
2. **x + y >= 15, x + 2y <= 27, x >= 0, y >= 0. Graph all boundaries as solid lines and shade the first-quadrant overlap. The feasible region has vertices (15, 0), (27, 0), and (3, 12).** Use x + y >= 15 for the session goal and x + 2y <= 27 for the time limit. The solution is the overlap in the first quadrant.

CHALLENGE

Use solid boundaries x + y = 15, x = 1, and y = 0. Use a dashed boundary 2x + y = 12. Shade below x + y = 15, above 2x + y = 12, right of x = 1, and above y = 0. The boundary corner points are (1, 10), excluded; (1, 14), included; (15, 0), included; and (6, 0), excluded.

Accept equivalent forms of each inequality and any graph with the correct overlapping region. Check that <= and >= boundaries are solid, while < and > boundaries are dashed.