

Lesson 2: Finding Systems of Inequalities That Describe Triangular and Rectangular Regions

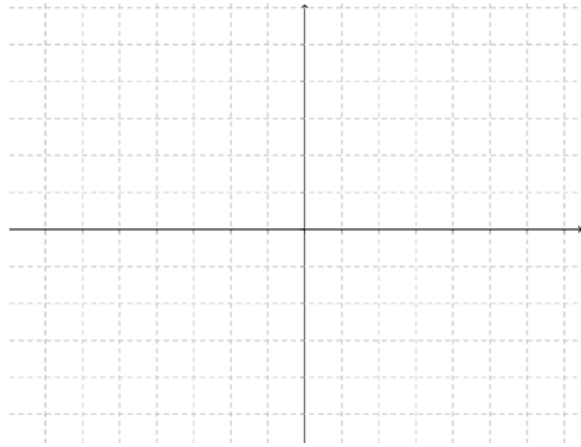
Classwork

Opening Exercise

Graph each system of inequalities.

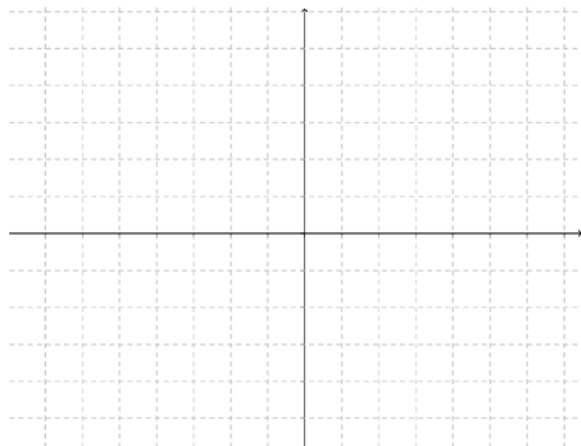
1.
$$\begin{cases} y \geq 1 \\ x \leq 5 \end{cases}$$

- Is $(1, 2)$ a solution? Explain.
- Is $(1, 1)$ a solution? Explain.
- The region is the intersection of how many half-planes? Explain how you know.

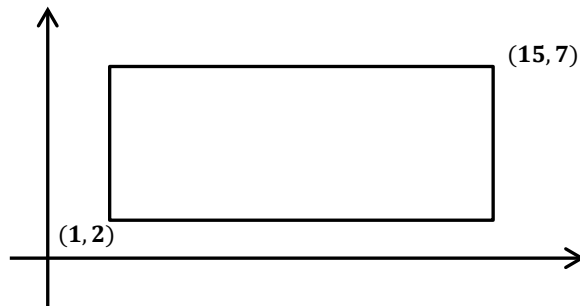


2.
$$\begin{cases} y < 2x + 1 \\ y \geq -3x - 2 \end{cases}$$

- Is $(-2, 4)$ in the solution set?
- Is $(1, 3)$ in the solution set?
- The region is the intersection of how many half-planes? Explain how you know.

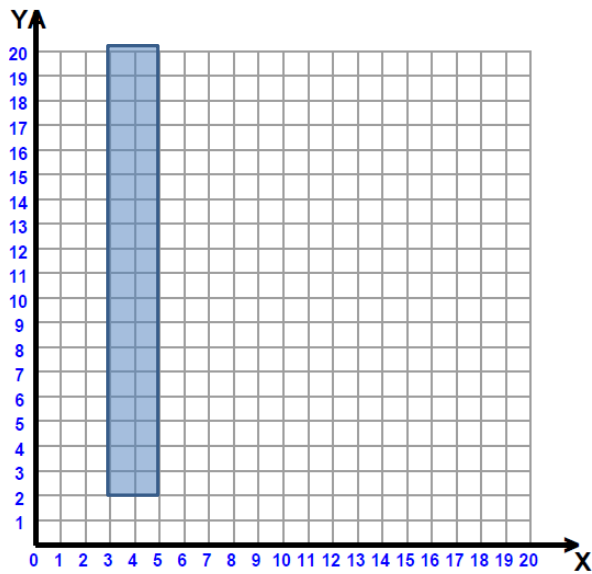


Example 1



Exercises 1–3

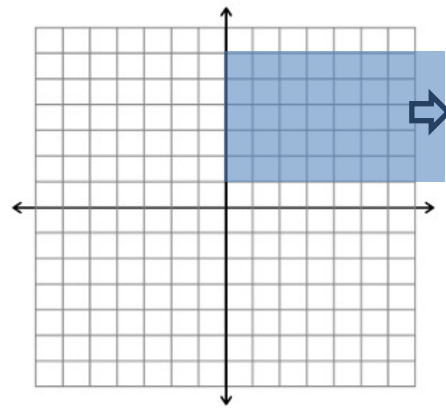
1. Given the region shown to the right:
 - a. Name three points in the region.
 - b. Name three points on the boundary.
 - c. Explain in words the points in the region.
 - d. Write the inequality describing the x -values.
 - e. Write the inequality describing the y -values.



- f. Write this as a system of equations.
- g. Will the lines $x = 4$ and $y = 1$ pass through the region? Draw them.

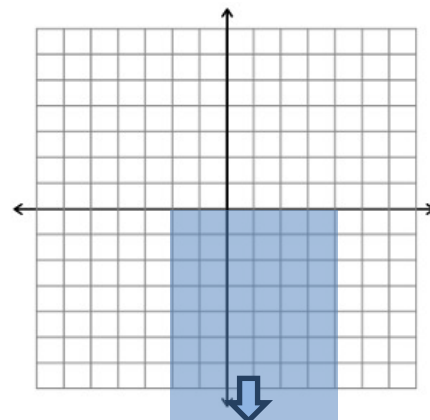
2. Given the region that continues unbound to the right as shown to the right:

- a. Name three points in the region.
- b. Describe in words the points in the region.
- c. Write the system of inequalities that describe the region.
- d. Name a horizontal line that passes through the region.



3. Given the region that continues down without bound as shown to the right:

- a. Describe the region in words.
- b. Write the system of inequalities that describe the region.
- c. Name a vertical line that passes through the region.



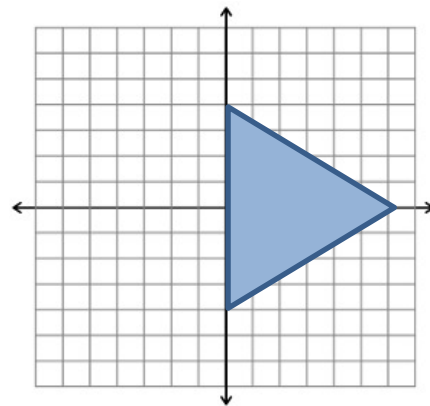
Example 2

Draw the triangular region in the plane given by the triangle with vertices $(0, 0)$, $(1, 3)$, and $(2, 1)$. Can we write a set of inequalities that describes this region?

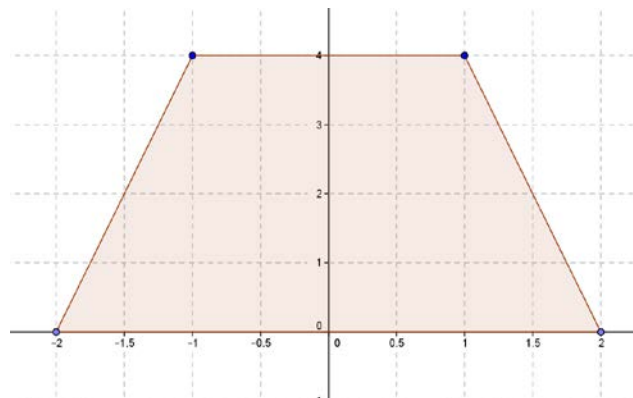


Exercises 4–5

4. Given the triangular region shown, describe this region with a system of inequalities.

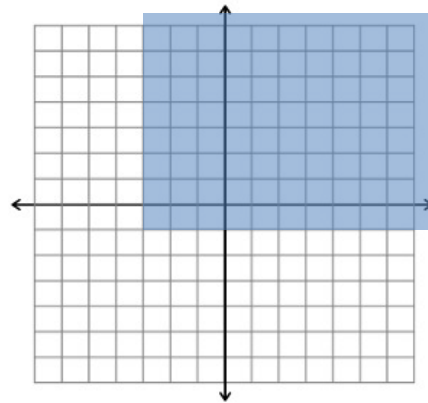


5. Given the trapezoid with vertices $(-2, 0)$, $(-1, 4)$, $(1, 4)$, and $(2, 0)$, describe this region with a system of inequalities.

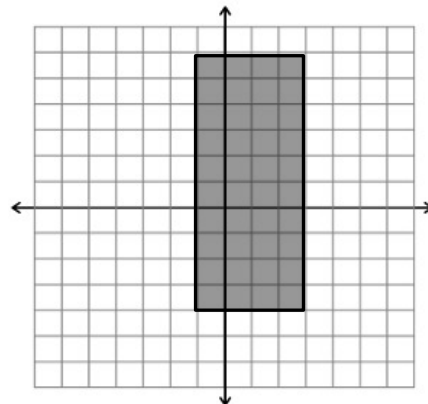


Problem Set

1. Given the region shown:
 - a. How many half-planes intersect to form this region?
 - b. Name three points on the boundary of the region.
 - c. Describe the region in words.

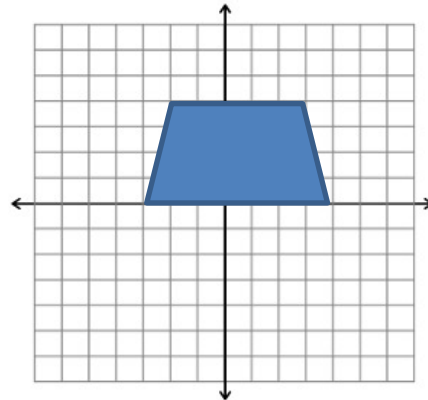


2. Region T is shown to the right.
 - a. Write the coordinates of the vertices.
 - b. Write an inequality that describes the region.
 - c. What is the length of the diagonals?
 - d. Give the coordinates of a point that is both in the region and on one of the diagonals.



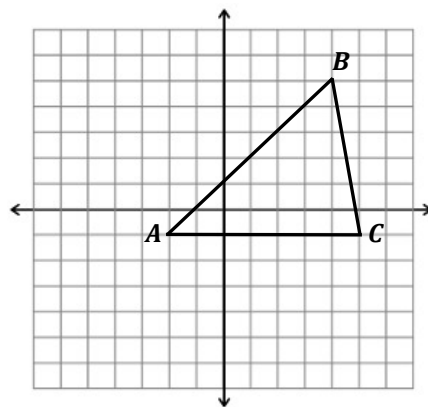
3. Jack wants to plant a garden in his back yard. His yard is 120 feet wide and 80 feet deep. He wants to plant a garden that is 20 feet by 30 feet.
 - a. Set up a grid for the backyard and place the garden on the grid. Explain why you placed your garden in its place on the grid.
 - b. Write a system of inequalities to describe the garden.
 - c. Write the equation of three lines that would go through the region that he could plant on, and explain your choices.

4. Given the trapezoidal region shown to the right:
- Write the system of inequalities describing the region.
 - Translate the region to the right 3 units and down 2 units. Write the system of inequalities describing the translated region.



Challenge Problems:

5. Given the triangular region shown with vertices $A(-2, -1)$, $B(4, 5)$, and $C(5, -1)$:
- Describe the systems of inequalities that describe the region enclosed by the triangle.
 - Rotate the region 90° counterclockwise about Point A . How will this change the coordinates of the vertices?
 - Write the system of inequalities that describe the region enclosed in the rotated triangle.



6. Write a system of inequalities for the region shown.

