Study Guide and Intervention

Alg1 6.0

Graphing Inequalities in Two Variables

Graph Linear Inequalities The solution set of an inequality that involves two variables is graphed by graphing a related linear equation that forms a boundary of a **half-plane**. The graph of the ordered pairs that make up the solution set of the inequality fill a region of the coordinate plane on one side of the half-plane.
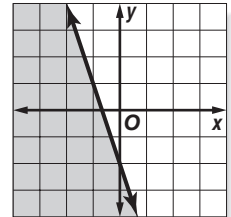
Example **Graph $y \leq -3x - 2$.**

Graph $y = -3x - 2$.

Since $y \leq -3x - 2$ is the same as $y < -3x - 2$ and $y = -3x - 2$, the boundary is included in the solution set and the graph should be drawn as a solid line.

Select a point in each half plane and test it. Choose $(0, 0)$ and $(-2, -2)$.

$$y \leq -3x - 2 \qquad\qquad y \leq -3x - 2$$
$$0 \leq -3(0) - 2 \qquad\qquad -2 \leq -3(-2) - 2$$
$$0 \leq -2 \text{ is false.} \qquad\qquad -2 \leq 6 - 2$$
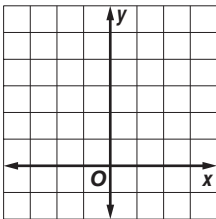$$\qquad\qquad\qquad\qquad -2 \leq 4 \text{ is true.}$$

The half-plane that contains $(-2, -2)$ contains the solution. Shade that half-plane.

Exercises

Graph each inequality.

1. $y < 4$
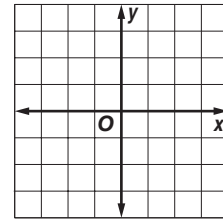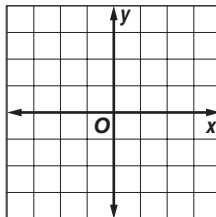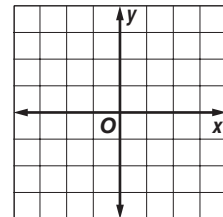
2. $x \geq 1$
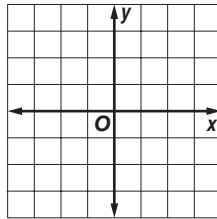
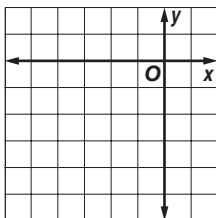**3.** $3x \leq y$

4. $-x > y$

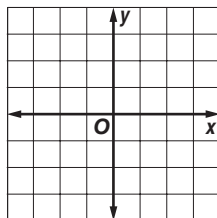**5.** $x - y \geq 1$
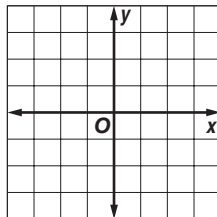
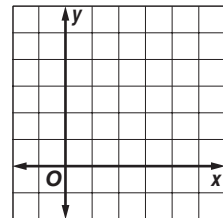**6.** $2x - 3y \leq 6$

7. $y < -\dfrac{1}{2}x - 3$

8. $4x - 3y < 6$

9. $3x + 6y \geq 12$

Study Guide and Intervention *(continued)*

Graphing Inequalities in Two Variables

Solve Real-World Problems When solving real-life inequalities, the domain and range of the inequality are often restricted to nonnegative numbers or to whole numbers.

Example **BANKING A bank offers 4.5% annual interest on regular savings accounts and 6% annual interest on certificates of deposit (CD). If Marjean wants to earn at least $300 interest per year, how much money should she deposit in each type of account?**

Let x = the amount deposited in a regular savings account.

Let y = the amount deposited in a CD.

Then $0.045x + 0.06y \geq 300$ is an open sentence representing this situation.

Solve for y in terms of x.

$$0.045x + 0.06y \geq 300 \qquad \text{Original inequality}$$
$$0.06y \geq -0.045x + 300 \qquad \text{Subtract } 0.045x \text{ from each side.}$$
$$y \geq -0.75x + 5000 \qquad \text{Divide each side by 0.06.}$$

Graph $y \geq -0.75x + 5000$ and test the point $(0, 0)$. Since $0 \geq -0.75(0) + 5000$ is false, shade the half-plane that does not contain $(0, 0)$.

One solution is $(4000, 2000)$. This represents $4000 deposited at 4.5% and $2000 deposited at 6%.

Interest on Accounts
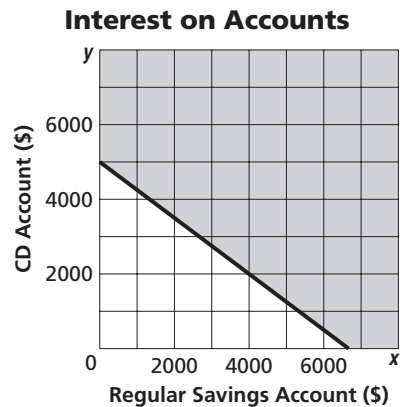
Exercises

1. **SOCIAL EVENTS** Tickets for the school play cost $5 per student and $7 per adult. The school wants to earn at least $5400 on each performance.

   a. Write an inequality that represents this situation.

   b. Graph the solution set.

   c. If 500 adult tickets are sold, what is the minimum number of student tickets that must be sold?

Ticket Sales
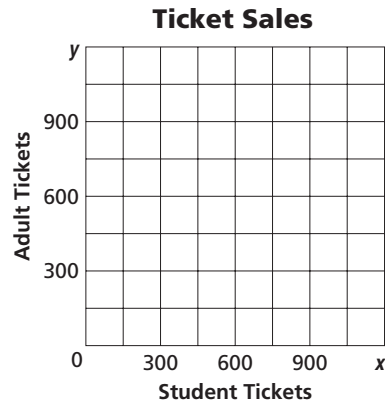
2. **MANUFACTURING** An auto parts company can produce 525 four-cylinder engines or 270 V-6 engines per day. It wants to produce up to 300,000 engines per year.

   a. Write an inequality that represents this situation.

   b. Are there restrictions on the domain or range?

3. **GEOMETRY** The perimeter of a rectangular lot is less than 800 feet. Write an inequality that represents the amount of fencing that will enclose the lot.