Name _____ Class _____ Date _____

6-6 Reteaching

Systems of Linear Inequalities

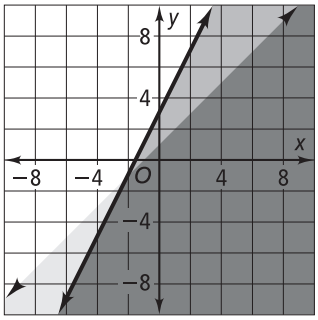
A system of linear inequalities is a set of linear inequalities in the same plane. The solution of the system is the region where the solution regions of the inequalities of the system overlap.

Problem

What is the graph of the system of linear inequalities: $\begin{matrix} x - y > -1 \\ y \leq 2x + 3 \end{matrix}$?

Put the first inequality into slope-intercept form, $y < x + 1$. Use a dashed line since $<$ does not include the points on the boundary line in the solution. Using the point (0, 0), decide where to shade the first inequality. The point (0, 0) makes the inequality true, so shade the region including (0, 0).

Then graph the boundary line of the second inequality, $y \leq 2x + 3$. It is a solid line because of the $\leq$ sign. Use the point (0, 0) to decide where to shade the second inequality. The point (0, 0) makes the second inequality true, so shade the region including (0, 0).



The overlapping region of the 2 inequalities is the solution to the system. It includes the points (0, 0), (1, 1), (3, 1). You can test any point in the region in both equations to see if it makes both equations true. In word problems, the solutions often cannot be negative (cars, tickets sold, etc.). Two requirements are that $x \geq 0$ and $y \geq 0$. Keep this in mind when graphing word problems.

Problem

A cash register has fewer than 200 dimes and quarters worth more than $39.95. How many of each coin are in the register?

type of coin	quantity	value of coin	value in cents
quarters	q	\$0.25	$25q$
dimes	d	\$0.10	$10d$
TOTAL	200		3995

The system of inequalities that you get from the table is: $\begin{matrix} q + d < 200 \\ 25q + 10d > 3995 \end{matrix}$

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6-6 Reteaching (continued)

Systems of Linear Inequalities

Using elimination, solve for q by multiplying all terms in the first equation by -10 and eliminating d: $(q + d < 200)(-10)$.

$-10q - 10d > -2000$ — Now add the 2 systems together to solve for q.

$25q + 10d > 3995$

$15q > 1995$

$q > 133$

$q + d < 200$ — Write first inequality.

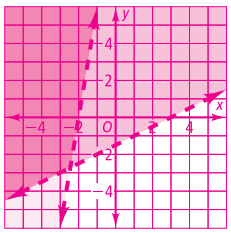
$133 + d < 200,\ d < 67$ — Substitute in 133 for q, subtract 133 from both sides and solve for d.

The register contains at least 133 quarters and no more than 67 dimes.

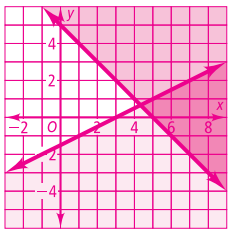
Exercises

Graph the following systems of inequalities.

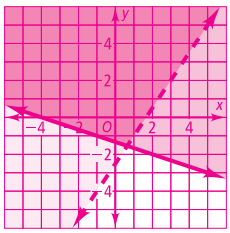
1. $x - 2y < 3$
$\frac{y}{2} > 3x + 6$



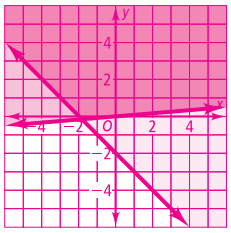
2. $y \geq -x + 5$
$-x \leq -2y - 3$



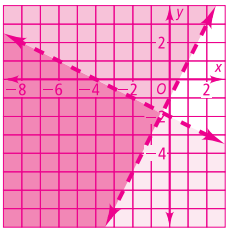
3. $x + 3y \geq -4$
$3x - 2y < 5$



4. $3y \geq \frac{x}{4}$
$-y \leq x + 2$



5. $2x - y < 1$
$x + 2y < -4$



6. $5x - 4y \geq 3$
$2x + 3y \leq -2$