# Solving Systems of Inequalities

To solve a system of inequalities we can graph both inequalities using the same pair of axes.

Look at the graph to the right to see how we would solve this system:

$$y < x + 2$$

$$y > 3 - 2x$$

One region has been shaded twice. The point (4,2) is in this region. Its coordinates make both inequalities true as shown in the table below, so (4,2) is a solution. Now you test the other points in the table below to see if they are solutions.
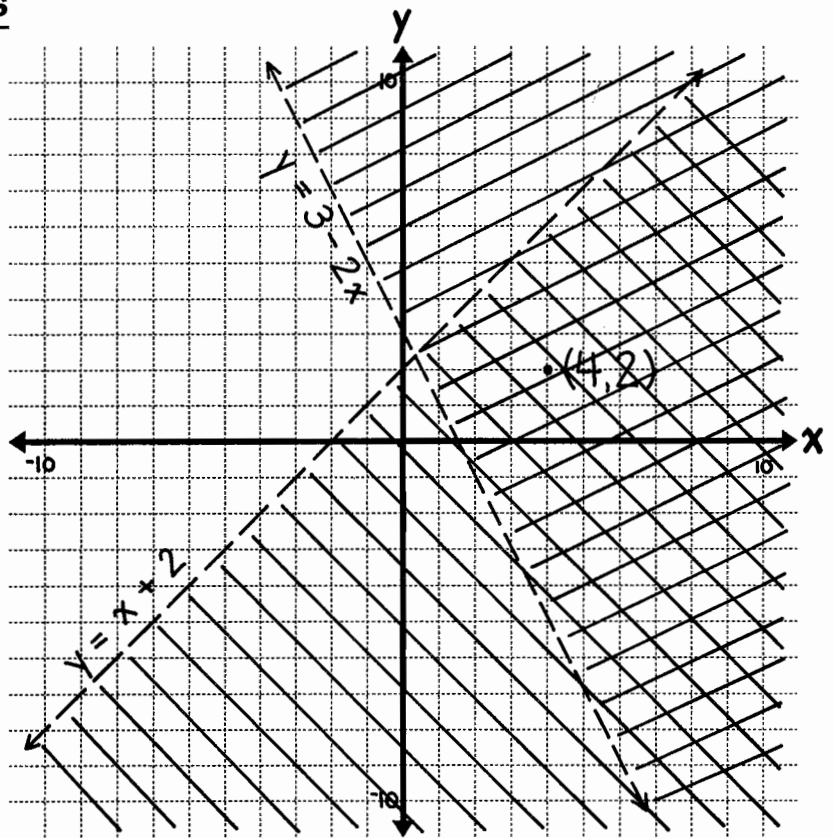
(x,y)	Is (x,y) in the double - shaded region?	? $y < x + 2$	? $y > 3 - 2x$	Is (x,y) a solution?
$(4,2)$	yes	$2 < 4 + 2$ $2 < 6$ yes	$2 > 3 - 2(4)$ $2 > \text{-}5$ yes	yes
$(6,\text{-}1)$				
$(2,\text{-}5)$				
$(\text{-}5,3)$				
$(3,5)$				
Pick a point.				

Did you notice that all points in the double-shaded region are solutions of both inequalities and points in other regions are not. The double-shaded region is the graph of the solution set for this system. Since we could not possibly list all the points in this region, the graph is the easiest way to show the solution set.

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Completing the Square

Earlier we solved some quadratic equations by finding the square root of each side. We can solve any quadratic equation which has real number solutions the same way. We just have to be able to find an equivalent equation which has the square of a binomial on one side and a number on the other.
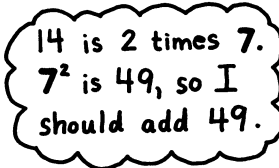
Look at what happens when we square the binomial $x + 5$.

	x	$+$	5
x	x^2		$5x$
$+$			
5	$5x$		25

$$(x + 5)^2 = x^2 + 5x + 5x + 25$$
$$= x^2 + 10x + 25$$

2 times 5   5 squared

When we square any binomial, $x + a$, the coefficient of x is always $2a$ and the constant term is always a^2. Knowing this, we can do some detective work to find out what to add to a binomial to make it a square.

14 is 2 times **7**. 7^2 is 49, so I should add 49.

$$x^2 + 14x + \underline{}$$

Decide what must be added to each expression to make it a square.

$x^2 + 20x$	$x^2 + 2x$	$x^2 - 6x$
Add: _____	Add: _____	Add: _____
$x^2 - 10x$	$x^2 + 4x$	$x^2 - 12x$
Add: _____	Add: _____	Add: _____
$x^2 + 18x$	$x^2 - 16x$	$x^2 + 8x$
Add: _____	Add: _____	Add: _____
$x^2 - 24x$	$x^2 - 2x$	$x^2 + 30x$
Add: _____	Add: _____	Add: _____