

Solving Systems Algebraically by SUBSTITUTION

Steps	Example	Observations - What do you see? What action was taken in order to see what you see?
1	$6x - 5y = 12$ $y = -2x + 20$	<ul style="list-style-type: none"> • Arrow from y in 2nd eqn. • 1st eqn in standard but 2nd eqn in $y = mx + b$.
2	$6x - 5(-2x + 20) = 12$	<ul style="list-style-type: none"> • they plugged in $-2x + 20$ from the first equation to replace y in 2nd eqn.
3	$6x - 5(-2x + 20) = 12$ $\underline{6x} + \underline{10x} - 100 = 12$ $16x - 100 = 12$	<ul style="list-style-type: none"> • Distributed property. ✓ • Combined like terms. • SIMPLIFY.
4	$16x - 100 = 12$ $\underline{\quad +100} \quad \underline{\quad +100}$ $16x + 0 = 112$ $\frac{16x}{16} = \frac{112}{16}$ $x = 7$	<ul style="list-style-type: none"> • Inverse opp. • Divide your "x" by both side - get "x" by its self. • SOLVE.
5	$y = -2x + 20$ $y = -2(7) + 20$	<ul style="list-style-type: none"> • 1st eqn is from the original problem • Plug in your "x" for "x" - Substitute
6	$y = -2(7) + 20$ $y = -14 + 20$ $y = 6$ Solution: (7, 6)	<ul style="list-style-type: none"> • evaluate your eqn to get your "y" • $y = -2(7) + 20$ ✓
7	$6x - 5y = 12$ $6(7) - 5(6) = 12$ $42 - 30 = 12$ $12 = 12 \quad \checkmark$ $y = -2x + 20$ $6 = -2(7) + 20$ $6 = -14 + 20$ $6 = 6 \quad \checkmark$	<ul style="list-style-type: none"> • Check your work. • If your work is correct then your work is correct. • → plug in 7 for x and 6 for y into BOTH equations

Key Ideas

- Remember that in systems of equations, both the x and y values are the same for each equation at the Solution (x,y).
- So the expression for x or y in one equation is good enough for Both equations!

Let's Try It!

Steps	Example	Anticipate - Your Own Words	"Formal" Steps
1	$x = 2y - 8$ $4x + y = 13$	x is by itself.	Identify the variable that is already isolated.
2	$4(2y - 8) + y = 13$	Plug in for x	Substitute the given expression into the variable of the other equation.
3	$8y - 8 + 1y = 13$ $9y - 8 = 13$	<ul style="list-style-type: none"> • Combined like terms. • Distribute. * <u>Simplify</u> 	Simplify this equation. (Use distributive property. Combine like terms.)
4	$9y - 8 = 13$ $\begin{array}{r} +82 \\ +82 \\ \hline 9y = 45 \\ \hline \frac{9y}{9} = \frac{45}{9} \\ y = 5 \end{array}$	<ul style="list-style-type: none"> • Inverse opp. • Divide "9" by <u>BOTH SIDES</u> 	Solve this equation. (Use inverse operations.)
5	$x = 2y - 8$ $x = 2(5) - 8$	<ul style="list-style-type: none"> • Replace "y" with (5) in the original equation 	Substitute the value for the variable you isolated back in the original equation.
6	$x = 10 - 8$ $x = 2$ $\text{solution } \begin{pmatrix} x \\ y \end{pmatrix} (2, 5)$	solve to get your "y".	Evaluate the original equation. Write the solution as an ordered pair.
7	$x = 2y = 8$ $2 = 2(5) - 8$ $2 = 10 - 8 = 2 \checkmark$ $4x + y = 13$ $4(2) + 5 = 13$ $8 + 5 = 13$ $13 = 13 \checkmark$	<ul style="list-style-type: none"> • Plug in (2, 5) to BOTH eqn. 	Check that the solution makes both equations true.