Lesson 3: Solving Systems of Linear Equations by Inspection and by Substitution

Friday, August 31, 2018 3:55 AM

Systems of Linear Equations Lesson #3:
Solving Systems of Linear Equations by Inspection and by Substitution

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Method of Inspection

In some simple cases, a system of linear equations can be solved by mentally trying different values for the variables until a correct solution is reached. This is called the method of inspection and is really only practical if the equations are very simple.

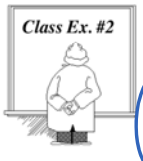
The sum of two numbers is 14 and the difference between the numbers is 2. Form two equations in two variables and determine the numbers by inspection.

x & y = 2 numbers

$x+y=14$ $\quad$ $x-y=2$

$8+6=14$ $\quad$ $8-6=2$

$x=8$, $y=6$



Solve the system $x+2y=12$ and $x+3y=17$ by inspection.

$x=2$, $y=5$

$x+2(5)=12$

$x+10=12$

$x=2$

$x+3(5)=17$

$x+15=17$

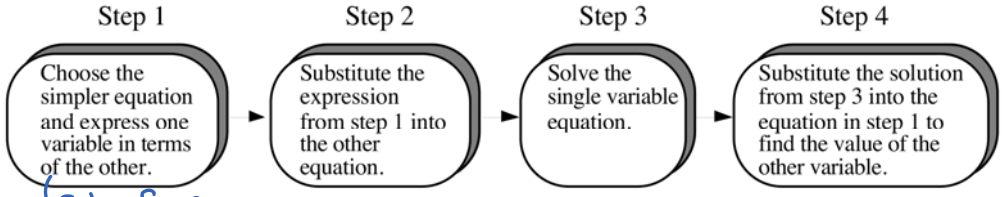
$x=2$

Complete Assignment Questions #1 - #3

Method of Substitution

If the equations are too complex to be solved by inspection, then algebraic procedures such as the method of substitution and the method of elimination (next lesson) may be used.

When using the method of substitution, there are four steps which are shown in the flowchart below.



(solve for x or y)

Consider the following system of equations: $x + 4y = 17$, $2x - y = 7$

a) Solve the system using the method of substitution by rewriting the first equation in the form $x = \ldots\ldots$

$x + 4y = 17$

$x = 17 - 4y$

Solve for x (no coefficient - makes it easier)

$2x - y = 7$

$2(17 - 4y) - y = 7$

$34 - 8y - y = 7$

$34 - 9y = 7$

$-34 \quad -34$

$-9y = -27$

$-9 \quad -9$

$y = 3$

$x = 17 - 4y$

$x = 17 - 4(3)$

$x = 17 - 12$

$x = 5$

$(5, 3)$

b) Solve the system using the method of substitution by rewriting the first equation in the form $y = \ldots\ldots$

$x + 4y = 17$

$\frac{4y}{4} = \frac{17}{4} - \frac{x}{4}$

$y = \frac{17}{4} - \frac{1}{4}x$

$2x - y = 7$

$2x - \left(\frac{17}{4} - \frac{1}{4}x\right) = 7$

$2x - \frac{17}{4} + \frac{1}{4}x = 7$

$8x - 17 + x = 28$

$9x - 17 = 28$

$+17 \quad +17$

$9x = 45$

$x = 5$

$y = \frac{17}{4} - \frac{1}{4}x$

$y = \frac{17}{4} - \frac{1}{4}(5)$

$y = \frac{17}{4} - \frac{5}{4}$

$y = \frac{12}{4}$

$y = 3$

c) Which method, a) or b), was simpler?

d) Verify that the solution satisfies both equations.

* plug in x & y, and make sure both sides are equal

e) Check the solution using a graphing calculator.

Consider the following system of equations: $4x + 3y = 0,\ 8x - 9y = 5.$

a) Solve and verify the system using the method of substitution.

$4x + 3y = 0$

$3y = -4x$

$y = -\frac{4}{3}x$

$8x - 9y = 5$

$8x - 9\left(-\frac{4}{3}x\right) = 5$

$8x + 12x = 5$

$20x = 5$

$x = \frac{1}{4}$

$y = -\frac{4}{3}x$

$y = -\frac{4}{3} \cdot \frac{1}{4}$

$y = -\frac{1}{3}$

b) Check the solution using a graphing calculator.

Consider the following system of equations: $5(2a - 3) + b = 5,\ 6a - 2(b - 4) = 20.$

coefficient 1

a) Solve the system using the method of substitution.

$5(2a-3)+b=5$

$10a-15+b=5$

$-15+b=-10a+5$

$b=-10a+20$

$6a-2(b-4)=20$

$6a-2(-10a+20)+8=20$

$6a+20a-40+8=20$

$26a-32=20$

$+32 \quad +32$

$\frac{26a}{26} = \frac{52}{26}$

$a=2$

$b=-10a+20$

$b=-10(2)+20$

$b=-20+20$

$b=0$

b) Verify algebraically that the solution satisfies both equations.

$5(2a-3)+b=5$

$5(2(2)-3)+0=5$

$5(4-3)=5$

$5(1)=5$

$5=5$ ✓

$6a-2(b-4)=20$

$6(2)-2(0-4)=20$

$12-2(-4)=20$

$12+8=20$

$20=20$ ✓

20 − 15

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#1, 4, 5
+ WS
Day 2

Complete Assignment Questions #4 - #10