

Module 7 Lesson 3

Share 1 – 3 Possible Solutions

Example: Consider the following system of equations.

$$x - 2y = 8$$

$$3x + y = 10$$

Solve the system an alternate way. The changes are in bolded blue.

Solution:

The steps outlined in Steps 1 - 5 show one way you can solve this system using the method of substitution.

Before we start, number the equations, so they are easier to talk about:

$$x - 2y = 8 \quad (1)$$

$$3x + y = 10 \quad (2)$$

Step 1. Choose an equation. Isolate one of the variables in the equation.

A possibility is to solve (2) for y by subtracting 3x to each side.

$$3x + y = 10$$

$$3x - 3x + y = 10 - 3x$$

$$y = 10 - 3x \quad (2)$$

Step 2. Substitute the expression in step 1 into the other equation.

So substitute $y = 10 - 3x$ into (1).

Equation (1) is $x - 2y = 8$. Replace the y with $10 - 3x$

$$x - 2y = 8$$

$$x - 2(10 - 3x) = 8$$

Step 3. Expand the resulting expression, and solve for the unknown variable.

Use the distributive property.

$$x - 20 + 6x = 8$$

$$7x - 20 = 8$$

$$7x - 20 + 20 = 8 + 20$$

$$7x = 28$$

$$7x/7 = 28/7$$

$$x = 4$$

Step 4. Substitute the answer from step 3. into one of the original equations to obtain the value of the other unknown.

Substitute $x = 4$ into the original equation (2) and solve for y.

$$3x + y = 10 \quad (2)$$

$$3(4) + y = 10$$

$$12 + y = 10$$

$$12 - 12 + y = 10 - 12$$

$$y = -2$$

Step 5. Verify your solution by substituting the obtained values into the OTHER equation. IMPORTANT: Whatever equation we use in step d, we use the other equation in the verification.

so since we used equation (2) in step 4, we use equation (1) in this step

$$x - 2y = 8 \quad (1)$$

sub $x = 4$ and $y = -2$ and make sure both sides equal.

$$(4) - 2(-4) = 8$$

$$4 + 4 = 8$$

$$8 = 8$$

YES!!

So the solution or point of intersection is (4, -2).

Answers to questions:

1. When is it possible (or a good idea) to use substitution to solve a system?

It is a good idea when one of the letters in one of the equations, has a coefficient of 1.

2. Which of the two ways of solving a system do you find most effective? Was there a difference? Explain why.

Answers will vary – both solutions work well.

3. How does the substitution method compare with solving by graphing?

The substitution method would help find an answer that was not exact.