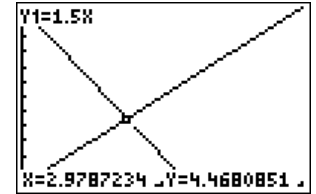


Building Understanding for Solving a System of Equations by Substitution

A solution to a system of equations can be found graphically and by using tables. Often these methods can be very tedious and may sometime lead to only an approximate solution.



To find the exact solutions, you'll need to work algebraically with the equations. Let's look at the substitution method.

On a rural highway a police officer sees a motorist run a red light at 50 mph and begins pursuit. At the instant the police officer passes through the intersection at 60 mph, the motorist is 0.2 mi down the road. When and where will the office catch up to the motorist?

X	Y1	Y2
1.5	2.25	0.25
2	3	0.5
2.5	3.75	0.75
3	4.5	1
3.5	5.25	1.25
4	6	1.5
4.5	6.75	1.75

X=3

- If d = the distance from the intersection and t = time traveled, write an equation in two variables to model this situation.
 - When the police car catches up to the motorist what will be true about the distance of the motorist from the intersection and the distance of the police car from the intersection?
 - Replace the d value in one equation with the d value from the other equation. Solve the equation for time.
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- What is the meaning of this time?
 - How far is each vehicle from the intersection at this time?
 - Check your answer by looking at a graph and a set of table values for both equations.

Can we always use the Substitution Method?

So far you have seen equations written in intercept form.

These equations make it easy to use the substitution method since they are already both solved for y .

$$y = 900 - 6x$$

$$y = 1000 - 10.3x$$

Sometimes it is necessary to place equations in intercept form before using substitution.

A pharmacist has 5% saline (salt) solution and 20% saline solution. How much of each solution should be combined to create a bottle of 90 ml of 10% solution.

Let x represent the amount of 5% solution you have and y represent the amount of 20% solution you have. First write an equation for the total amount of liquid in each container. Then write a second equation that describes the amount of salt in each solution.

Solve the one equation for x or y and then substitute it into the other equation.

What is the meaning of this solution.

One More Problem:

This system of equations models the profits of two home-based Internet companies.

$$\begin{cases} P = -12000 + 2.5N \\ P = -5000 + 1.6N \end{cases}$$

The variable P represents profit in dollars, and N represents hits to the company's website.

- Use the substitution method to find an exact solution.
- Is an approximate or exact solution more meaningful in this model?