

Section 3.1 - Systems of Linear Equations in Two Variables

The **solution of a system of linear equations** consists of all ordered pairs that satisfy both equations at the same time (simultaneously).

A **consistent** system has exactly one solution.

An **inconsistent** system has no solution.

A **dependent** system has an infinite number of solutions.

How to Solve a System of Equations using the Substitution Method

1. Isolate one of the variables (either x or y) in one of the equations. If a variable is already isolated then proceed to step 2.
2. Substitute the expression found in step 1 into the other equation for the variable that was isolated in step 1. This forms an equation in one variable.
3. Solve the equation found in step 2 for the variable.
4. Plug in the value found in step 3 into either of the original equations and solve for the remaining variable.
5. Check your answer!

Solving a System of Equations by the Addition (Elimination) Method

1. If necessary, rewrite the equations so that the variable terms are lined up on the left side, and the constants line up on the right side of the equation.
2. Mentally add up the two equations, and see if a variable term cancels out. If so, proceed to step 3. If a variable term does not cancel out, multiply one or both equations by a constant(s) so that when you add the equations a variable term will cancel out, and the result will be one equation with one variable.
3. Solve the equation found in step 2
4. Plug in the value found in step 3 into either of the original equations and solve for the remaining variable.
5. Check your answer!

Solving a System of Equations by the Addition (Elimination) Method

1. If necessary, rewrite the equations so that the y variable is isolated or solve both equations for y .
2. Enter the first equation into Y_1 .
3. Enter the second equation into Y_2 .
4. Hit GRAPH.
5. Use the INTERSECT option to find where the two graphs intersect (the answer).
 - 2nd TRACE (CALC) #5 intersect
 - Move the cursor close to the intersection.
 - Hit ENTER 3 times

Progress Check 2 Determine if the given ordered pairs are solutions of the system

$$5x + 2y = 11$$

$$x + 2y = -1$$

- a. $(5, -7)$ b. $(3, -2)$

Problem Using the same system from **Progress Check 2**

$$\begin{array}{l} 5x + 2y = 11 \\ x + 2y = -1 \end{array}, \text{ solve the system by each of the following methods:}$$

- a. graphing
b. substitution
c. addition-elimination

Progress Check 4 Solve by substitution: $y = 2,000 + 6x$
 $y = 9,000 + 2x$

Progress Check 7 Solve by addition-elimination: $6x + 6y = 7$
 $8x - 9y = -2$

Progress Check 8 Solve the system.

- a. $-4x + y = -1$
 $8x - 2y = 2$

Progress Check 9 How should a \$60,000 investment be split so that the total annual earnings are \$6,000 if one portion is invested at 8.5 percent annual interest and the rest at 10.5 percent?

Review **Examples** 2, 3, 4, 5, 6, 7, 8, and 9 from the textbook for this section.