Chapter 3: Linear Systems

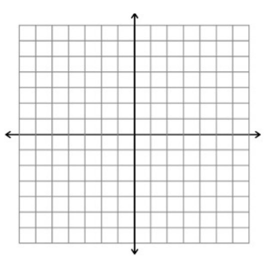
Lesson 3.1 Solving Systems Using Tables and Graphs

Essential Understanding: To solve a system of equations, find a set of values that replace the variables in the equations and make each equation true.

System of Equations is a set of two or more equations.

A solution of a system is a set of values for the variables that makes all the equations true. You can solve a system of equations graphically or by using tables.

Ex. **What is the solution of the system?** $\begin{cases} -3x + 2y = 8 \\ x + 2y = -8 \end{cases}$



Method 2 Use a table. Write the equations in slope-intercept form.

$$-3x + 2y = 8 \qquad x + 2y = -8$$
$$2y = 3x + 8 \qquad 2y = -x - 8$$
$$y_1 = \frac{3}{2}x + 4 \qquad y_2 = -\frac{1}{2}x - 4$$

X	Y_1	Y_2
−5	−3.5	−1.5
−4	−2	−2
−3	−.5	−2.5
−2	1	−3
−1	2.5	−3.5
0	4	−4
1	5.5	−4.5

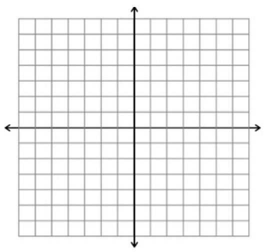
X=−4

Enter the equations in the **Y=** screen as **Y1** and **Y2**.
View the table. Adjust the x-values until you see $y_1 = y_2$.

When $x = -4$, both y_1 and y_2 equal -2. So, $(-4, -2)$ is the solution of the system.

Ex. What is the solution of the system: $x - 2y = 4$?

$3x + y = 5$



Ex. What is the solution of the system $2x - y = -1$?

$1/2x - 2 = y$

Ex. The diagrams show the birth lengths and growth rates of two species of shark. If the growth rates stay the same at what age would a Spiny Dogfish and a Greenland shark be the same length?

Ex. The table shows the populations of the New York City and Los Angeles metropolitan regions from the census reports fro 1950 through 2000. Assuming these linear trends continue, when will the populations of these regions be equal? What will that population be?

Populations of New York City and Los Angeles (1950–2000)

	1950	1960	1970	1980	1990	2000
New York City	12,911,994	14,759,429	16,178,700	16,121,297	18,087,251	21,199,865
Los Angeles	4,367,911	6,742,696	7,032,075	11,497,568	14,531,529	16,373,645

Go to Core Math Tools to input the data and then create the line of best fit. Use those equations to graph on desmos.com to find the solution.

You can classify a system of two linear equations by the number of solutions.

A **consistent system** has at least one solution.

An **inconsistent system** has no solution.

- Consistent system
  - Independent
  - Dependent
- Inconsistent system

An **independent system** has one solution.

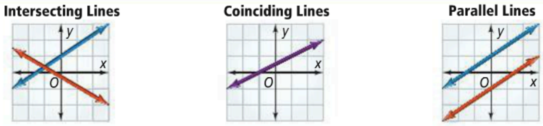
A **dependent system** has infinitely many solutions.

The graphs for an inconsistent system are parallel lines. So, there are no solutions. For a dependent system, the two equations represent the same line.

Take note

Concept Summary Graphical Solutions of Linear Systems

Intersecting Lines	Coinciding Lines	Parallel Lines



one solution	infinitely many solutions	no solution
Consistent	Consistent	Inconsistent
Independent	Dependent	

Ex. Without graphing, is the system independent, dependent, or inconsistent? (1, infinite many, or no solutions)

$4y - 2x = 6$

$8y = 4x - 12$

Ex. Without graphing, is the system independent, dependent, or inconsistent? (1, infinite many, or no solutions)

$-3x + y = 4$

$x - 1/3\, y = 1$

Ex. Without graphing, is the system independent, dependent, or inconsistent? (1, infinite many, or no solutions)

$2x + 3y = 1$

$4x + y = -3$