Systems of Linear Equations in Two Variables

System of Linear Equations:

a. equations that are true for the same pairs of numbers
b. the solution is an ordered pair of numbers that satisfies both equations

A system of linear equations has:

a. only one solution if their graphs intersect at only one point.
b. no solution if their graphs do not intersect.
c. infinitely many solutions if their graphs coincide.

Kinds of Systems of Linear Equations

1. Consistent and Dependent Equations:
   a. has infinitely many solutions
   b. the slopes of the lines are equal
   c. the y-intercepts are also equal
   d. the graphs coincide
2. Consistent and Independent Equations:
   a. has exactly one solution
   b. the slopes are not equal
   c. the y-intercepts could be equal or unequal
   d. the graphs intersect
3. Inconsistent and Independent Equations:
   a. has no solution
   b. the slopes are equal
   c. the y-intercepts are not equal
   d. the graphs are parallel

Type	Graph	Slopes	y-intercepts	Solutions
Consistent, Independent	Intersecting	Unequal	Equal or unequal	One
Inconsistent, Independent	Parallel	Equal	Unequal	None
Consistent, Dependent	Coinciding	Equal	Equal	Infinitely many

Practice Exercises

Determine whether each system of linear equations is consistent and dependent, consistent and independent, or inconsistent.

1. $\begin{cases} 2x - y = 7 \\ 3x - y = 5 \end{cases}$
2. $\begin{cases} x - 2y = -3 \\ 2x + y = 6 \end{cases}$
3. $\begin{cases} x - 2y = 9 \\ 2x - 4y = 18 \end{cases}$
4. $\begin{cases} -3x + y = 10 \\ 4x + y = 7 \end{cases}$
5. $\begin{cases} 6x - 2y = 8 \\ y = 3x - 4 \end{cases}$

Problem Set

Determine whether each system of linear equations is consistent and dependent, consistent and independent, or inconsistent.

1. $\begin{cases} 8x + 2y = 7 \\ y = -4x + 1 \end{cases}$
2. $\begin{cases} x - 2y = 9 \\ x + 3y = 14 \end{cases}$
3. $\begin{cases} x + 3y = 8 \\ x - 3y = 8 \end{cases}$
4. $\begin{cases} 2y = 6x - 5 \\ 3y = 9x + 1 \end{cases}$
5. $\begin{cases} 3x + 5y = 15 \\ 4x - 7y = 10 \end{cases}$

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