Describing the Solutions of a Linear System: Consistent, Inconsistent, Deper

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Learning Objectives

- Classify a system of linear equations as consistent or inconsistent
- Determine whether a consistent system is dependent or independent
- Solve linear systems both graphically and analytically
- Use slope-intercept form to predict the behavior of a system's graph

Solve each system or analyze its behavior, then classify it as consistent independent, consistent dependent, or inconsistent.

1. Verify whether the ordered pair (2, 1) is a solution of the system.

$$\begin{cases} x + y = 3 \\ 2x - y = 3 \end{cases}$$

Answer: ______________________

2. Convert each equation to slope-intercept form and identify the slope and y-intercept.

$$2x + 3y = 12$$

Answer: ______________________

3. Solve the system graphically and classify it.

$$\begin{cases} y = x + 1 \\ y = -x + 3 \end{cases}$$

Answer: ______________________

4. Solve the system by substitution and classify the solution.

$$\begin{cases} y = 2x - 1 \\ 3x + y = 9 \end{cases}$$

Answer: ______________________

5. Solve the system by elimination and classify the solution.

$$\begin{cases} 2x + 3y = 7 \\ 4x - 3y = 5 \end{cases}$$

Answer: ______________________

6. Without solving, use the slopes and y-intercepts to determine whether the system has one solution, no solution, or infinitely many solutions.

$$\begin{cases} y = 3x + 2 \\ y = 3x - 5 \end{cases}$$

Answer: ______________________

7. Determine the number of solutions for the system after converting to slope-intercept form.

$$\begin{cases} 2x - y = 4 \\ 4x - 2y = 8 \end{cases}$$

Answer: ______________________________________

8. Solve the system analytically and classify it.

$$\begin{cases} x + 2y = 6 \\ x + 2y = 10 \end{cases}$$

Answer: ______________________________________

9. Classify the system by comparing slopes and y-intercepts after converting to slope-intercept form.

$$\begin{cases} 3x + y = 5 \\ 6x + 2y = 10 \end{cases}$$

Answer: ______________________________________

10. Solve the system and classify it as consistent independent, consistent dependent, or inconsistent.

$$\begin{cases} 5x - 2y = 4 \\ 3x + y = 9 \end{cases}$$

Answer: ______________________________________

This worksheet covers identifying solutions of linear systems: verifying a given solution, solving graphically, solving analytically (substitution and elimination), converting general form to slope-intercept form, comparing slopes and y-intercepts to predict one solution, no solution, or infinitely many solutions, and classifying systems as consistent/inconsistent and dependent/independent.

Solutions

1. Verify whether the ordered pair (2, 1) is a solution of the system.

$$\begin{cases} x + y = 3 \\ 2x - y = 3 \end{cases}$$

→ *Apply the substitution method to the system [x + y = 3] and [2x - y = 3].*
→ *Reduce to one variable and solve to get x = 2.*
→ *Substitute back to get y = 1.*
→ *The solution is (2, 1); it checks in both original equations.*

Answer: $(2,\ 1)$

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2. Convert each equation to slope-intercept form and identify the slope and y-intercept.

$$2x + 3y = 12$$

→ *Subtract 2x from both sides to get 3y equals negative 2x plus 12.*
→ *Divide every term by 3 to isolate y.*
→ *The slope is negative two-thirds and the y-intercept is 4.*

Answer: $y = -\frac{2}{3}x + 4,\ m = -\frac{2}{3},\ b = 4$

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3. Solve the system graphically and classify it.

$$\begin{cases} y = x + 1 \\ y = -x + 3 \end{cases}$$

→ *Apply the substitution method to the system [y = x + 1] and [y = -x + 3].*
→ *Reduce to one variable and solve to get x = 1.*
→ *Substitute back to get y = 2.*
→ *The solution is (1, 2); it checks in both original equations.*

Answer: $(1,\ 2)$

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4. Solve the system by substitution and classify the solution.

$$\begin{cases} y = 2x - 1 \\ 3x + y = 9 \end{cases}$$

→ *Apply the substitution method to the system [y = 2x - 1] and [3x + y = 9].*
→ *Reduce to one variable and solve to get x = 2.*
→ *Substitute back to get y = 3.*
→ *The solution is (2, 3); it checks in both original equations.*

Answer: $(2,\ 3)$

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5. Solve the system by elimination and classify the solution.

$$\begin{cases} 2x + 3y = 7 \\ 4x - 3y = 5 \end{cases}$$

→ *Apply the substitution method to the system [2x + 3y = 7] and [4x - 3y = 5].*
→ *Reduce to one variable and solve to get x = 2.*
→ *Substitute back to get y = 1.*
→ *The solution is (2, 1); it checks in both original equations.*

Answer: (2, 1)

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6. Without solving, use the slopes and y-intercepts to determine whether the system has one solution, no solution, or infinitely many solutions.

$$\begin{cases} y = 3x + 2 \\ y = 3x - 5 \end{cases}$$

→ *Eliminate a variable using substitution.*
→ *The equations reduce to a false statement, so the lines are parallel.*
→ *Therefore the system has no solution.*

Answer: No solution

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7. Determine the number of solutions for the system after converting to slope-intercept form.

$$\begin{cases} 2x - y = 4 \\ 4x - 2y = 8 \end{cases}$$

→ *Rewrite the first equation as y equals 2x minus 4.*
→ *Rewrite the second equation as y equals 2x minus 4.*
→ *Both equations represent the same line, so every point on the line is a solution.*
→ *The system is consistent and dependent with infinitely many solutions.*

Answer: Infinitely many solutions; consistent and dependent

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8. Solve the system analytically and classify it.

$$\begin{cases} x + 2y = 6 \\ x + 2y = 10 \end{cases}$$

→ *Eliminate a variable using substitution.*
→ *The equations reduce to a false statement, so the lines are parallel.*
→ *Therefore the system has no solution.*

Answer: No solution

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9. Classify the system by comparing slopes and y-intercepts after converting to slope-intercept form.

$$\begin{cases} 3x + y = 5 \\ 6x + 2y = 10 \end{cases}$$

→ *Rewrite the first equation as y equals negative 3x plus 5.*
→ *Rewrite the second equation as y equals negative 3x plus 5.*
→ *Both lines have the same slope and same y-intercept, so they are identical.*
→ *The system is consistent and dependent with infinitely many solutions.*

Answer: Consistent and dependent; infinitely many solutions

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10. Solve the system and classify it as consistent independent, consistent dependent, or inconsistent.

$$\begin{cases} 5x - 2y = 4 \\ 3x + y = 9 \end{cases}$$

→ *Apply the substitution method to the system [5x - 2y = 4] and [3x + y = 9].*
→ *Reduce to one variable and solve to get x = 2.*
→ *Substitute back to get y = 3.*
→ *The solution is (2, 3); it checks in both original equations.*

Answer: (2, 3)